WILSON JONES

GrayLine.

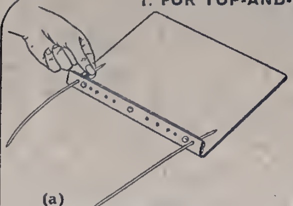
NYLON POST BINDER

25-1411N

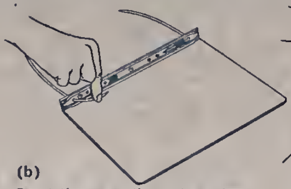
2 PURPOSE BINDER

This binder may be used to bind both marginal-punched sheets and forms punched with 2¾", 4¼", 6", 7", 8½", 13⅜" and 14⅜" center-to-center holes.

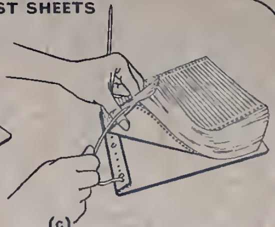
1. FOR TOP-AND-BOTTOM LOADING OF UNBURST SHEETS


(a)

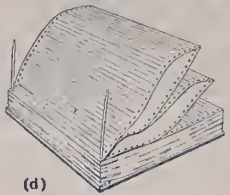
Insert posts thru end holes of bottom cover stub. Allow approximately 2 inches of the posts to extend inside the metal channel.


(b)

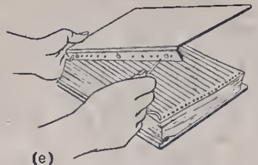
Bend these sections down into the channel, toward the center. Move the plastic slide locks over the posts and toward each end of the stub until they are snug.


(c)

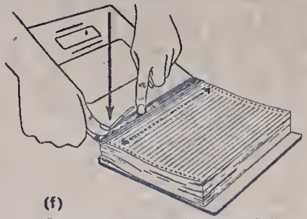
Gather forms in even stack. Insert posts in top holes at both sides of forms.


(d)

At this point the forms will be held in the binder in this unburst continuous fashion so that they can be read like the leaves of a stenographer's note book.


(e)

Hold the top cover over the sheet body with the stub turned under. Insert the upper end of the posts thru the end holes of the stub.


(f)

Bend the exposed lengths of the posts down into the top cover channel. Move the slide locks over the posts toward the outside ends of the channel until snug.

2. FOR CONVENTIONALLY PUNCHED LOOSE LEAF FORMS AND STRIPPED UNBURST FORMS

Follow steps (a) thru (f), except that posts should be inserted thru holes in stub that correspond to holes in forms to be bound.

H 25 U

Made in U.S.A.

****

```
L        ABSOLUTE ADDRESSES FOR UPDATE PROGRAM                                          USER'S PAGE NO.   1      F0

R00005                                     ECADR                    MNEMONIC
R0001                                      -----                    --------

 00015  REF    1                           01501 1           =ECADR UPSVFLAG
A00016
 0002   REF    1                           03606 1           =ECADR XSMD

 0003   REF    1                           01731 0           =ECADR REFSMMAT

 0004   REF    1                           03433 0           =ECADR DELVSLV

 0005   REF    1                           02C20 1           =ECADR RLS
```

```
R00001  THIS LGC PROGRAM IS INTENDED FOR USE IN THE LM DURING THE MANNED LUNAR LANDING MISSION OR ANY SUBSET THEREOF.
R00002  THE DETAILS OF IMPLEMENTATION ARE SPECIFIED IN REPORT R-567, AS AMENDED.


R000025                              GUIDANCE SYSTEM OPERATIONS PLAN
R00003                       FOR MANNED LM EARTH ORBITAL AND LUNAR MISSIONS
R000035                                  USING PROGRAM LUMINARY


R00004 *THIS PROGRAM AND R-567 HAVE BEEN PREPARED BY THE CHARLES STARK DRAPER LABORATORY, MASSACHUSETTS INSTITUTE
R00005 *OF TECHNOLOGY  75 CAMBRIDGE PARKWAY, CAMBRIDGE, MASSACHUSETTS UNDER PROJECT 55-238-90, SPONSORED BY THE
R00006 *MANNED SPACECRAFT CENTER OF THE NATIONAL AERONAUTICS AND SPACE ADMINISTRATION, CONTRACT NAS 9-4065.


R00007 *                THIS PROGRAM IS REFERRED TU AS LUMINARY 1E
R0001   TABLE OF LOG CARDS
```

12

```
R00015  ABSOLUTE ADDRESSES FOR UPDATE PROGRAM
R0002   ASSEMBLY AND OPERATION INFORMATION
R0003   TAGS FOR RELATIVE SETLOC AND BLANK BANK CARDS
R0005   CONTROLLED CONSTANTS
R0006   INPUT/OUTPUT CHANNEL BIT DESCRIPTIONS
R0007   FLAGWORD ASSIGNMENTS
R0008   SUBROUTINE CALLS


R0009   TABLE OF SUBROUTINE LOG SECTIONS
R0010           LUMERASE
R0011                   ERASABLE ASSIGNMENTS
R00112                  CHECK EQUALS LIST
R0012           LEMONAID
R0013                   INTERRUPT LEAD INS
R0014                   T4RUPT PROGRAM
R0015                   RCS FAILURE MONITOR
R0016                   DOWNLINK LISTS
R0017                   AGS INITIALIZATION
R0018                   FRESH START AND RESTART
R0019                   RESTART TABLES
R0020                   AOTMARK
R0021                   EXTENDED VERBS
R0022                   PINBALL NOUN TABLES
R0023                   LEM GEOMETRY
R0024                   IMU COMPENSATION PACKAGE
R0025                   R63
R0026                   ATTITUDE MANEUVER ROUTINE
R0027                   GIMBAL LOCK AVOIDANCE
R0028                   KALCMANU STEERING
R0029                   SYSTEM TEST STANDARD LEAD INS
R0030                   IMU PERFORMANCE TESTS 2
R0031                   IMU PERFORMANCE TESTS 4
```

```
L        ASSEMBLY AND OPERATION INFORMATION                                USER'S PAGE NO.   2      EO
R0032                      PINBALL GAMES BUTTONS AND LIGHTS
R0033                      R60,R62
R0034                      S-BAND ANTENNA FOR LM
R0035              LEMP20S
R0036                      RADAR LEADIN ROUTINES
R0037                      P20-P25
R0038              LEMP30S
R0039                      P30,P37
R0040                      P32-P35, P72-P75
R0042              KISSING
R0043                      GROUND TRACKING DETERMINATION PROGRAM - P21
R0044                      P34-P35, P74-P75
R0045                      R31
R0046                      P76
R0047                      R30
R0049              ELY
R0050                      BURN, BABY, BURN -- MASTER IGNITION ROUTINE
R0051                      P40-P47
R0052                      THE LUNAR LANDING
R0053                      THROTTLE CONTROL ROUTINES
R0054                      LUNAR LANDING GUIDANCE EQUATIONS
R0055                      P70-P71
R0056                      P12
R0057                      ASCENT GUIDANCE
R0058                      SERVICER
R0059                      LANDING ANALOG DISPLAYS
R0060                      FINDCDUW - GUIDAP INTERFACE
R0061              LEMP50S
R0062                      P51-P53
R0063                      LUNAR AND SOLAR EPHEMERIDES SUBROUTINES
R0064              SKIPPER
R0065                      DOWN-TELEMETRY PROGRAM
R0066                      INTER-BANK COMMUNICATION
R0067                      INTERPRETER
R0068                      FIXED-FIXED CONSTANT POOL
R0069                      INTERPRETIVE CONSTANTS
R0070                      SINGLE PRECISION SUBROUTINES
R0071                      EXECUTIVE
R0072                      WAITLIST
R0073                      LATITUDE LONGITUDE SUBROUTINES
R0074                      PLANETARY INERTIAL ORIENTATION
R0075                      MEASUREMENT INCORPORATION
R0076                      CONIC SUBROUTINES
R0077                      INTEGRATION INITIALIZATION
R0078                      ORBITAL INTEGRATION
R0079                      INFLIGHT ALIGNMENT ROUTINES
R0080                      POWERED FLIGHT SUBROUTINES
R0081                      TIME OF FREE FALL
R0082                      AGC BLOCK TWO SELF-CHECK
R0083                      PHASE TABLE MAINTENANCE
```

50

```
L        ASSEMBLY AND OPERATION INFORMATION                                                    USER'S PAGE NO.   3       E0

R0084                   RESTARTS ROUTINE
R0085                   IMU MODE SWITCHING ROUTINES
R0086                   KEYRUPT, UPRUPT
R0087                   DISPLAY INTERFACE ROUTINES
R0088                   SERVICE ROUTINES
R0089                   ALARM AND ABORT
R0090                   UPDATE PROGRAM
R0091                   RTB OP CODES
R0092              LMDAP
R0093                   T6-RUPT PROGRAMS
R0094                   DAP INTERFACE SUBROUTINES
R0095                   DAPIDLER PROGRAM
R0096                   P-AXIS RCS AUTOPILOT
R0097                   Q,R-AXIS RCS AUTOPILOT
R0098                   TJET LAW
R0099                   KALMAN FILTER
R0100                   TRIM GIMBAL CONTROL SYSTEM
R0101                   AOSTASK AND AOSJOB
R0102                   SPS BACK-UP RCS CONTROL


R0103              SYMBOL TABLE LISTING
R0104              UNREFERENCED SYMBOL LISTING
R0105              ERASABLE & EQUALS CROSS-REFERENCE TABLE
R0106              SUMMARY OF SYMBOL TABLE LISTINGS
R0107              MEMORY TYPE & AVAILABLITY DISPLAY
R0108              COUNT TABLE
R0109              PARAGRAPHS GENERATED FOR THIS ASSEMBLY
R0110              OCTAL LISTING
R0111              OCCUPIED LOCATIONS TABLE
R0112              SUBROS CALLED & PROGRAM STATUS
```

17

109

10

```
P0113             VERB LIST FOR LUMINARY

R0114    REGULAR VERBS

R0115    00 NOT IN USE
R0116    01 DISPLAY OCTAL COMP 1 IN R1
R0117    02 DISPLAY OCTAL COMP 2 IN R1
R0118    03 DISPLAY OCTAL COMP 3 IN R1
R0119    04 DISPLAY OCTAL COMP 1,2 IN R1,R2
R0120    05 DISPLAY OCTAL COMP 1,2,3 IN R1,R2,R3
R0121    06 DISPLAY DECIMAL IN R1 OR R1,R2 OR R1,R2,R3
R0122    07 DISPLAY DP DECIMAL IN R1,R2 (TEST ONLY)
R0123    08
R0124    09
R0125    10
R0126    11 MONITOR OCTAL COMP 1 IN R1
R0127    12 MONITOR OCTAL COMP 2 IN R1
R0128    13 MONITOR OCTAL COMP 3 IN R1
R0129    14 MONITOR OCTAL COMP 1,2 IN R1,R2
R0130    15 MONITOR OCTAL COMP 1,2,3 IN R1,R2,R3
R0131    16 MONITOR DECIMAL IN R1 OR R1,R2 OR R1,R2,R3
R0132    17 MONITOR DP DECIMAL IN R1,R2 (TEST ONLY)
R0133    18
R0134    19
R0135    20
R0136    21 LOAD COMPONENT 1 INTO R1
R0137    22 LOAD COMPONENT 2 INTO R2
R0138    23 LOAD COMPONENT 3 INTO R3
R0139    24 LOAD COMPONENT 1,2 INTO R1,R2
R0140    25 LOAD COMPONENT 1,2,3 INTO R1,R2,R3
R0141    26
R0142    27 DISPLAY FIXED MEMORY
R0143    28
R0144    29
R0145    30 REQUEST EXECUTIVE
R0146    31 REQUEST WAITLIST
R0147    32 RECYCLE PROGRAM
R0148    33 PROCEED WITHOUT DSKY INPUTS
R0149    34 TERMINATE FUNCTION
R0150    35 TEST LIGHTS
R0151    36 REQUEST FRESH START
R0152    37 CHANGE PROGRAM (MAJOR MODE)
R0153    38
R0154    39
```

```
P0155    EXTENDED VERBS

R0156    40 ZERO CDU-S
R0157    41 COARSE ALIGN CDU-S
R0158    42 FINE ALIGN IMU
R0159    43 LOAD IMU ATT ERROR METERS
R0160    44 TERMINATE RR CONTINUOUS DESIGNATE (V41N72 OPTION 2)
R0161    45
R0162    46
R0163    47 INITIALIZE AGS (R47)
R0164    48 REQUEST DAP DATA LOAD ROUTINE (R03)
R0165    49 REQUEST CREW DEFINED MANEUVER ROUTINE (R62)
R0166    50 PLEASE PERFORM
R0167    51
R0168    52 MARK X-RETICLE
R0169    53 MARK Y-RETICLE
R0170    54 MARK X OR Y-RETICLE
R0171    55 INCREMENT AGC TIME (DECIMAL)
R0172    56 TERMINATE TRACKING (P20 + P25)
R0173    57 PERMIT LANDING RADAR UPDATES
R0174    58 INHIBIT LANDING RADAR UPDATES
R0175    59 COMMAND LR TO POSITION 2.
R0176    60 DISPLAY VEHICLE ATTITUDE RATES ON FDAI ERROR NEEDLES.
R0177    61 DISPLAY DAP FOLLOWING ATTITUDE ERRORS.
R0178    62 DISPLAY TOTAL ATTITUDE ERRORS WITH RESPECT TO NOUN 22.
R0179    63 SAMPLE RADAR ONCE PER SECOND (R04).
R0180    64 REQUEST S-BAND ANTENNA ROUTINE (R05)
R0181    65 DISABLE U AND V JET FIRINGS DURING DPS BURNS.
R0182    66 VEHICLES ARE ATTACHED.  MOVE THIS VEHICLE STATE TO OTHER VEHICLE.
R0183    67 DISPLAY W MATRIX
R0184    68 DISABLE TERRAIN MODEL
R0185    69 CAUSE RESTART
R0186    70 UPDATE LIFTOFF TIME
R0187    71 UNIVERSAL UPDATE-BLOCK  ADR
R0188    72 UNIVERSAL UPDATE-SINGLE ADR
R0189    73 UPDATE AGC TIME (OCTAL)
R0190    74 INITIALIZE ERASABLE DUMP VIA DOWNLINK
R0191    75 ENABLE U AND V JET FIRINGS DURING DPS BURNS.
R0192    76 MINIMUM IMPULSE COMMAND MODE
R0193    77 RATE COMMAND AND ATTITUDE HOLD MODE
R0194    78 LR SPURIOUS RETURN TEST START (R77)
R0195    79 LR SPURIOUS RETURN TEST STOP
R0196    80 UPDATE LEM STATE VECTOR
R0197    81 UPDATE CSM STATE VECTOR
R0198    82 REQUEST ORBIT PARAM DISPLAY (R30)
R0199    83 REQUEST REND  PARAM DISPLAY (R31)
R0200    84
R0201    85 DISPLAY RR LOS AZ AND ELEV
R0202    86
R0203    87
```

```
R0204    88
R0205    89 REQUEST RENDEZVOUS FINAL ATTITUDE ROUTINE (R63)
R0206    90 REQUEST RENDEZVOUS OUT OF PLANE DISPLAY ROUTINE (R36)
R0207    91 DISPLAY BANK SUM
R0208    92 OPERATE IMU PERFORMANCE TEST (P07)
R0209    93 ENABLE W MATRIX INITIALIZATION
R0210    94
R0211    95 NO UPDATE OF EITHER STATE VECTOR (P20 OR P22)
R0212    96 INTERRUPT INTEGRATION AND GO TC P00
R0213    97 PERFORM ENGINE FAIL PROCEDURE
R0214    98
R0215    99 PLEASE ENABLE ENGINE
```

```
L       ASSEMBLY AND OPERATION INFORMATION                                                   USER'S PAGE NO.    7       FO

R0216   IN THE FOLLOWING NOUN LIST THE :NO LOAD: RESTRICTION MEANS THE NOUN
R0217   CONTAINS AT LEAST ONE COMPONENT WHICH CANNOT BE LOADED, I.E. OF
R0218   SCALE TYPE L (MIN/SEC), PP (2 INTEGERS) OR TT (LANDING RADAR POSITION).
R0219   IN THIS CASE VERBS 24 AND 25 ARE NOT ALLOWED, BUT VERBS 21, 22 OR 23
R0220   MAY BE USED TO LOAD ANY OF THE NOUN:S COMPONENTS WHICH ARE NOT OF THE
R0221   ABOVE SCALE TYPES.
R0222   THE :DEC ONLY: RESTRICTION MEANS ONLY DECIMAL OPERATION IS ALLOWED ON
R0223   EVERY COMPONENT IN THE NOUN. (NOTE THAT :NO LOAD: IMPLIES :DEC ONLY:.)

R0224   NORMAL NOUNS                           COMPONENTS  SCALE AND DECIMAL POINT              RESTRICTIONS

R0226   00  NOT IN USE
R0227   01  SPECIFY MACHINE ADDRESS (FRACTIONAL)   3COMP    .XXXXX FOR EACH
R0228   02  SPECIFY MACHINE ADDRESS (WHOLE)        3COMP    XXXXX. FOR EACH
R0229   03  SPECIFY MACHINE ADDRESS (DEGREES)      3COMP    XXX.XX DEG FOR EACH
R0230   04  ANGULAR ERROR/DIFFERENCE               1COMP    XXX.XX DEG
R0231   05  ANGULAR ERROR/DIFFERENCE               1COMP    XXX.XX DEG
R0232   06  OPTION CODE                            3COMP    OCTAL ONLY FOR EACH
R0233   LOADING NOUN 07 WILL SET OR RESET SELECTED BITS IN ANY ERASABLE REGISTER
R0234   07  ECADR OF WORD TO BE MODIFIED           3COMP    OCTAL ONLY FOR EACH
R0235       ONES FOR BITS TO BE MODIFIED
R0236       1 TO SET OR 0 TO RESET SELECTED BITS
R0237   08  ALARM DATA                             3COMP    OCTAL ONLY FOR EACH
R0238   09  ALARM CODES                            3COMP    OCTAL ONLY FOR EACH
R0239   10  CHANNEL TO BE SPECIFIED                1COMP    OCTAL ONLY
R0240   11  TIG OF CSI                             3COMP    00XXX. HRS                       DEC ONLY
R0242                                                       000XX. MIN                       MUST LOAD 3 COMPS
R0244                                                       0XX.XX SEC
R0245   12  OPTION CODE                            2COMP    OCTAL ONLY FOR EACH
R0246        (USED BY EXTENDED VERBS ONLY)
R0247   13  TIG OF CDH                             3COMP    00XXX. HRS                       DEC ONLY
R0249                                                       000XX. MIN                       MUST LOAD 3 COMPS
R0251                                                       0XX.XX SEC
R0252   14  CHECKLIST                              3COMP    XXXXX. FOR EACH
R0253        (USED BY EXTENDED VERBS ONLY)
R0254        (NOUN 25 IS PASTED AFTER DISPLAY)
R0255   15  INCREMENT MACHINE ADDRESS              1COMP    OCTAL ONLY
R0256   16  TIME OF EVENT                          3COMP    00XXX. HRS                       DEC ONLY
R0258        (USED BY EXTENDED VERBS ONLY)                  000XX. MIN                       MUST LOAD 3 COMPS
R0260                                                       0XX.XX SEC
R0261   17  SPARE
R0262   18  AUTO MANEUVER BALL ANGLES              3COMP    XXX.XX DEG FOR EACH
R0263   19  SPARE
R0264   20  ICDU ANGLES                            3COMP    XXX.XX DEG FOR EACH
R0265   21  PIPAS                                  3COMP    XXXXX. PULSES FOR EACH
R0267   22  NEW ICDU ANGLES                        3COMP    XXX.XX DEG FOR EACH
R0268   23  SPARE
R0269   24  DELTA TIME FOR AGC CLOCK               3COMP    00XXX. HRS                       DEC ONLY
R0271                                                       000XX. MIN                       MUST LOAD 3 COMPS
R0273                                                       0XX.XX SEC
```

```
R0274    25  CHECKLIST                              3COMP   XXXXX. FOR EACH
R0275          (USED WITH PLEASE PERFORM ONLY)
R0276    26  PRIORITY/DELAY, ADRES, BBCON           3COMP   OCTAL ONLY FOR EACH
R0277    27  SELF TEST ON/OFF SWITCH                1COMP   XXXXX.
R0278    28  SPARE
R0279    29  SPARE
R0280    30  SPARE
R0281    31  SPARE
R0282    32  TIME FROM PERIGEE                      3COMP   00XXX. HRS                     DEC ONLY
R0284                                                       000XX. MIN                     MUST LOAD 3 COMPS
R0286                                                       0XX.XX SEC
R0287    33  TIME OF IGNITION                       3COMP   00XXX. HRS                     DEC ONLY
R0289                                                       000XX. MIN                     MUST LOAD 3 COMPS
R0291                                                       0XX.XX SEC
R0292    34  TIME OF EVENT                          3COMP   00XXX. HRS                     DEC ONLY
R0294                                                       000XX. MIN                     MUST LOAD 3 COMPS
R0296                                                       0XX.XX SEC
R0297    35  TIME FROM EVENT                        3COMP   00XXX. HRS                     DEC ONLY
R0299                                                       000XX. MIN                     MUST LOAD 3 COMPS
R0301                                                       0XX.XX SEC
R0302    36  TIME OF AGC CLOCK                      3COMP   00XXX. HRS                     DEC ONLY
R0304                                                       000XX. MIN                     MUST LOAD 3 COMPS
R0306                                                       0XX.XX SEC
R0307    37  TIG OF TPI                             3COMP   00XXX. HRS                     DEC ONLY
R0309                                                       000XX. MIN                     MUST LOAD 3 COMPS
R0311                                                       0XX.XX SEC
R0312    38  TIME OF STATE BEING INTEGRATED         3COMP   00XXX. HRS                     DEC ONLY
R0314                                                       000XX. MIN                     MUST LOAD 3 COMPS
R0316                                                       0XX.XX SEC
R0317    39  SPARE
```

```
L       ASSEMBLY AND OPERATION INFORMATION                                     USER'S PAGE NO.   9       F0

P0318   MIXED NOUNS                           COMPONENTS  SCALE AND DECIMAL POINT            RESTRICTIONS

R0320   40  TIME FROM IGNITION/CUTOFF            3COMP    XXBXX  MIN/SEC                     NO LOAD, DEC ONLY
R0322       VG,                                           XXXX.X FT/SEC
R0323       DELTA V (ACCUMULATED)                         XXXX.X FT/SEC
R0324   41  TARGET  AZIMUTH,                     2COMP    XXX.XX DEG                         (FOR SYSTEM TEST)
R0326               ELEVATION                             XX.XXX DEG
R0327   42  APOGEE,                              3COMP    XXXX.X NAUT MI                     DEC ONLY
R0329       PERIGEE,                                      XXXX.X NAUT MI
R0330       DELTA V (REQUIRED)                            XXXX.X FT/SEC
R0331   43  LATITUDE,                            3COMP    XXX.XX DEG                         DEC ONLY
R0333       LONGITUDE,                                    XXX.XX DEG
R0334       ALTITUDE                                      XXXX.X NAUT MI
R0335   44  APOGEE,                              3COMP    XXXX.X NAUT MI                     NO LOAD, DEC ONLY
R0337       PERIGEE,                                      XXXX.X NAUT MI
R0338       TFF                                           XXBXX  MIN/SEC
R0339   45  MARKS,                               3COMP    XXXXX.                             NO LOAD, DEC ONLY
R0341       TFI OF NEXT BURN                              XXBXX  MIN/SEC
R0342       MGA                                           XXX.XX DEG
R0343   46  AUTOPILOT CONFIGURATION              2COMP    OCTAL ONLY
R03431      CHANNEL BIT FAILURE PROTECTION WORD           OCTAL ONLY
R0344   47  LEM WEIGHT,                          2COMP    XXXXX. LBS                         DEC ONLY
R0346       CSM WEIGHT                                    XXXXX. LBS
R0347   48  GIMBAL PITCH TRIM,                   2COMP    XXX.XX DEG                         DEC ONLY
R0349       GIMBAL ROLL TRIM                              XXX.XX DEG
R0350   49  DELTA R,                             3COMP    XXX.XX NAUT MI                     DEC ONLY
R0352       DELTA V,                                      XXXX.X FT/SEC
R03521      RADAR DATA SOURCE CODE                        XXXXX.
R0353   50  SPARE
R0354   51  S-BAND ANTENNA ANGLES PITCH          2COMP    XXX.XX DEG                         DEC ONLY
R0356                             YAW                     XXX.XX DEG
R0357   52  CENTRAL ANGLE OF ACTIVE VEHICLE      1COMP    XXX.XX DEG
R0358   53  SPARE
R0359   54  RANGE,                               3COMP    XXX.XX NAUT MI                     DEC ONLY
R0361       RANGE RATE,                                   XXXX.X FT/SEC
R0362       THETA                                         XXX.XX DEG
R0363   55  NO. OF APSIDAL CROSSINGS             3COMP    XXXXX.                             DEC ONLY
R0365       ELEVATION ANGLE                               XXX.XX DEG
R0366       CENTRAL ANGLE OF PASSIVE VEHICLE              XXX.XX DEG
R0367   56  RR LOS AZIMUTH                       2COMP    XXX.XX DEG
R0368              ELEVATION                              XXX.XX DEG
R0369   57  SPARE
R0371   58  PERIGEE ALT (POST TPI)               3COMP    XXXX.X NAUT MI                     DEC ONLY
R0373       DELTA V TPI                                   XXXX.X FT/SEC
R0374       DELTA V TPF                                   XXXX.X FT/SEC
R0375   59  DELTA VELOCITY LOS                   3COMP    XXXX.X FT/SEC FOR EA.              DEC ONLY
R0377   60  FORWARD VELOCITY                     3COMP  XXXX.X FT/SEC                        DEC ONLY
R0379       ALTITUDE RATE                                 XXXX.X FT/SEC
R0380       COMPUTED ALTITUDE                             XXXXX. FEET
R0381   61  TIME TO GO IN BRAKING PHASE          3COMP    XXBXX  MIN/SEC                     NO LOAD, DEC ONLY
```

```
R0383         TIME FROM IGNITION                              XXBXX  MIN/SEC
R0384         CROSS RANGE DISTANCE                            XXXX.X NAUT MI
R0385    62   ABSOLUTE VALUE OF VELOCITY             3COMP    XXXX.X FT/SEC                       NO LOAD, DEC ONLY
R0387         TIME FROM IGNITION                              XXBXX  MIN/SEC
R0388         DELTA V (ACCUMULATED)                           XXXX.X FT/SEC
R0389    63   LR ALTITUDE MINUS COMPUTED ALTITUDE    3COMP    XXXXX. FEET                         DEC ONLY
R0391         ALTITUDE RATE                                   XXXX.X FT/SEC
R0392         COMPUTED ALTITUDE                               XXXXX. FEET
R0393    64   TIME LEFT FOR REDESIGNATION- LPD ANGLE 3COMP    XXBXX                               NO LOAD, DEC ONLY
R0395         ALTITUDE RATE                                   XXXX.X FT/SEC
R0396         COMPUTED ALTITUDE                               XXXXX. FEET
R0397    65   SAMPLED AGC TIME                       3COMP    00XXX. HRS                          DEC ONLY
R0399          (FETCHED IN INTERRUPT)                         000XX. MIN                          MUST LOAD 3 COMPS
R0401                                                         0XX.XX SEC
R0402    66   LR RANGE                               2COMP    XXXXX. FEET                         NO LOAD, DEC ONLY
R0404             POSITION                                    +0000X
R0405    67   LRVX                                   3COMP    XXXXX. FT/SEC
R0406         LRVY                                            XXXXX. FT/SEC
R0407         LRVZ                                            XXXXX. FT/SEC
R0408    68   SM Z-AXIS RANGE TO LANDING SITE        3COMP    XXXX.X NAUT MI                      NO LOAD, DEC ONLY
R0410         TIME TO GO IN BRAKING PHASE                     XXBXX  MIN/SEC
R0411         ABSOLUTE VALUE OF VELOCITY                      XXXX.X FT/SEC
R0412    69   LANDING SITE CORRECTION, Z-COMPONENT   3COMP    XXXXX. FEET                         DEC ONLY
R04121        LANDING SITE CORRECTION, Y-COMPONENT            XXXXX. FEET
R04122        LANDING SITE CORRECTION, X-COMPONENT            XXXXX. FEET
R0413    70   AOT DETENT CODE/STAR CODE              3COMP    OCTAL ONLY FOR EACH
R0414    71   AOT DETENT CODE/STAR CODE              3COMP    OCTAL ONLY FOR EACH
R0415    72   RR  360 - TRUNNION ANGLE               2COMP    XXX.XX DEG
R0416              SHAFT ANGLE                                XXX.XX DEG
R0417    73   NEW RR  360 - TRUNNION ANGLE           2COMP    XXX.XX DEG
R0418                   SHAFT ANGLE                           XXX.XX DEG
R0419    74   TIME FROM IGNITION                     3COMP    XXBXX  MIN/SEC                      NO LOAD, DEC ONLY
R0421         YAW AFTER VEHICLE RISE                          XXX.XX DEG
R0422         PITCH AFTER VEHICLE RISE                        XXX.XX DEG
R0423    75   DELTA ALTITUDE CDH                     3COMP    XXXX.X NAUT MI                      NO LOAD, DEC ONLY
R0425         DELTA TIME (CDH-CSI OR TPI-CDH)                 XXBXX  MIN/SEC
R0426         DELTA TIME (TPI-CDH OR TPI-NOMTPI)              XXBXX  MIN/SEC
R0427    76   DESIRED HORIZONTAL VELOCITY            3COMP    XXXX.X FT/SEC                       DEC ONLY
R0429         DESIRED RADIAL VELOCITY                         XXXX.X FT/SEC
R04291        CROSS-RANGE DISTANCE                            XXXX.X NAUT MI
R0430    77   TIME TO ENGINE CUTOFF                  3COMP    XXBXX  MIN/SEC                      NO LOAD, DEC ONLY
R0432         VGY (BODY)                                      XXXX.X FT/SEC
R04325        ABSOLUTE VALUE OF VELOCITY                      XXXX.X FT/SEC
R0433    78   RR RANGE                               3COMP    XXX.XX NAUT MI                      NO LOAD, DEC ONLY
R0434            RANGE RATE                                   XXXX.X FT/SEC
R04341        TIME FROM  IGNITION                             XXBXX  MIN/SEC
R0435    79   CURSOR ANGLE                           3COMP    XXX.XX DEG                          DEC ONLY
R0437         SPIRAL ANGLE                                    XXX.XX DEG
R0438         POSITION CODE                                   XXXXX.
R0439    80   DATA INDICATOR,                        2COMP    XXXXX.
```

```
R0440        OMEGA                                         XXX.XX DEG
R0441   81   DELTA V (LV)                           3COMP  XXXX.X FT/SEC FOR EACH            DEC ONLY
```

```
R0443    82  DELTA V (LV)                          3COMP    XXXX.X FT/SEC FOR EACH           DEC ONLY
R0445    83  DELTA V (BODY)                        3COMP    XXXX.X FT/SEC FOR EACH           DEC ONLY
R0447    84  DELTA V (OTHER VEHICLE)               3COMP    XXXX.X FT/SEC FOR EACH           DEC ONLY
R0449    85  VG (BODY)                             3COMP    XXXX.X FT/SEC FOR EACH           DEC ONLY
R0451    86  VG (LV)                               3COMP    XXXX.X FT/SEC FOR EACH           DEC ONLY
R0453    87  BACKUP OPTICS LOS AZIMUTH             2COMP    XXX.XX DEG
R0454                          ELEVATION                    XXX.XX DEG
R0455    88  HALF UNIT SUN OR PLANET VECTOR        3COMP    .XXXXX FOR EACH                  DEC ONLY
R0457    89  LANDMARK LATITUDE                     3COMP    XX.XXX DEG                       DEC ONLY
R0459                 LONGITUDE/2                           XX.XXX DEG
R0460                 ALTITUDE                              XXX.XX NAUT MI
R0461    90  Y                                     3COMP    XXX.XX NM                        DEC ONLY
R0463        Y DOT                                          XXXX.X FPS
R0464        PSI                                            XXX.XX DEG
R0465    91  ALTITUDE                              3COMP    XXXXXB. NAUT MI
R04651       VELOCITY                                       XXXXX.  FT/SEC
R04652       FLIGHT PATH ANGLE                              XXX.XX  DEG
R0466    92  PCT FTP(10,5KLB) AT PRESENT THRUST    3COMP    XXXXX.
R04661       ALTITUDE RATE                                  XXXX.X FT/SEC
R04662       COMPUTED ALTITUDE                              XXXXX.FEET
R0467    93  DELTA GYRO ANGLES                     3COMP    XX.XXX DEG FOR EACH
R0468    94  VGX (BODY)                            3COMP    XXXX.X FT/SEC                    NO LOAD, DEC ONLY
R04682       ALTITUDE RATE                                  XXXX.X FT/SEC
R04683       COMPUTED ALTITUDE                              XXXXX. FEET
R0469    95  SPARE
R0470    96  SPARE
R0471    97  SYSTEM TEST INPUTS                    3COMP    XXXXX. FOR EACH
R0472    98  SYSTEM TEST RESULTS AND INPUTS        3COMP    XXXXX.
R0473                                                       .XXXXX
R0474                                                       XXXXX.
R0475    99  RMS IN POSITION                       3COMP    XXXXX.FT                         DEC ONLY
R0477        RMS IN VELOCITY                                XXXX.X FT/SEC
R04771       RMS IN BIAS                                    XX.XXX RADIANS
```

```
P0478   REGISTERS AND SCALING  FOR NORMAL NOUNS

R0479   NOUN            REGISTER        SCALE TYPE

R0480   00       NOT IN USE
R0481   01       SPECIFY ADDRESS        B
R0482   02       SPECIFY ADDRESS        C
R0483   03       SPECIFY ADDRESS        D
R0484   04              DSPTEM1         H
R0485   05              DSPTEM1         H
R0486   06              OPTION1         A
R0487   07              XREG            A
R0488   08              ALMCADR         A
R0489   09              FAILREG         A
R0490   10       SPECIFY CHANNEL        A
R0491   11              TCSI            K
R0492   12              OPTIONX         A
R0493   13              TCDH            K
R0494   14              DSPTEMX         C
R0495   15       INCREMENT ADDRESS      A
R0496   16              DSPTEMX         K
R0497   17       SPARE
R0498   18              FDAIX           D
R0499   19       SPARE
R0500   20              CDUX            D
R0501   21              PIPAX           C
R0502   22              THETAD          D
R0503   23       SPARE
R0504   24              DSPTEM2 +1      K
R0505   25              DSPTEM1         C
R0506   26              DSPTEM1         A
R0507   27              SMODE           C
R0508   28       SPARE
R0509   29       SPARE
R0510   30       SPARE
R0511   31       SPARE
R0512   32              -TPER           K
R0513   33              TIG             K
R0514   34              DSPTEM1         K
R0515   35              TTOGO           K
R0516   36              TIME2           K
R0517   37              TTPI            K
R0518   38              TET             K
R0519   39       SPARE
```

```
P0520   REGISTERS AND SCALING FOR MIXED NOUNS

R0521   NOUN       COMP    REGISTER         SCALE TYPE

R0522   40         1       TTOGO            L
R0523              2       VGDISP           S
R0524              3       DVTOTAL          S
R0525   41         1       DSPTEM1          D
R0526              2       DSPTEM1 +1       F
R0527   42         1       HAPO             Q
R0528              2       HPER             Q
R0529              3       VGDISP           S
R0530   43         1       LAT              H
R0531              2       LONG             H
R0532              3       ALT              Q
R0533   44         1       HAPOX            Q
R0534              2       HPERX            Q
R0535              3       TFF              L
R0536   45         1       TRKMKCNT         C
R0537              2       TTOGO            L
R0538              3       +MGA             H
R0539   46         1       DAPDATR1         A
R05391             2       CHANBKUP         A
R0540   47         1       LEMMASS          KK
R0541              2       CSMMASS          KK
R0542   48         1       PITTIME          NN
R0543              2       ROLLTIME         NN
R0544   49         1       R22DISP          JJ
R0545              2       R22DISP +2       S
R05451             3       WHCHREAD         C
R0546   50         SPARE
R0547   51         1       ALPHASB          H
R0548              2       BETASB           H
R0549   52         1       ACTCENT          H
R0550   53         SPARE
R0551   54         1       RANGE            JJ
R0552              2       RRATE            S
R0553              3       RTHETA           H
R0554   55         1       NN               C
R0555              2       ELEV             H
R0556              3       CENTANG          H
R0557   56         1       RR-AZ            H
R0558              2       RR-ELEV          H
R0559   57         SPARE
R0560   58         1       POSTTPI          C
R0561              2       DELVTPI          S
R0562              3       DELVTPF          S
R0563   59         1       DVLOS            S
R0564              2       DVLOS +2         S
R0565              3       DVLOS +4         S
```

```
R0566   60      1      FORVEL          ZZ
R0567           2      HDOTDISP        S
R0568           3      HCALC1          RR
R0569   61      1      TTFDISP         L
R0570           2      TTOGO           L
R0571           3      OUTOFPLN        QQ
R0572   62      1      ABVEL           S
R0573           2      TTOGO           L
R0574           3      DVTOTAL         S
R0575   63      1      DELTAH          RR
R0576           2      HDOTDISP        S
R0577           3      HCALC1          RR
R0578   64      1      FUNNYDSP        PP
R0579           2      HDOTDISP        S
R0580           3      HCALC           RR
R0581   65      1      SAMPTIME        K
R0582           2      SAMPTIME        K
R0583           3      SAMPTIME        K
R0584   66      1      RSTACK +6       W
R0585           2      CHANNEL   33    TT
R0586   67      1      RSTACK          X
R0587           2      RSTACK +2       Y
R0588           3      RSTACK +4       Z
R0589   68      1      RANGEDSP        QQ
R0590           2      TTFDISP         L
R0591           3      ABVEL           S
R0592   69      1      DLANDZ          RR
R05921          2      DLANDY          RR
R05922          3      DLANDX          RR
R0593   70      1      AOTCODE         A
R0594           2      AOTCODE +1      A
R0595           3      AOTCODE +2      A
R0596   71      1      AOTCODE         A
R0597           2      AOTCODE +1      A
R0598           3      AOTCODE +2      A
R0599   72      1      CDUT            WW
R0600           2      CDUS            D
R0601   73      1      TANG            WW
R0602           2      TANG +1         D
R0603   74      1      TTOGO           L
R0604           2      YAW             H
R0605           3      PITCH           H
R0606   75      1      DIFFALT         Q
R0607           2      T1TOT2          L
R0608           3      T2TOT3          L
R0609   76      1      ZDOTD           S
R0610           2      RDOTD           S
R06101          3      XRANGE          C
R0611   77      1      TTOGO           L
R0612           2      VGBODY +2       S
```

```
R06125           3        ABVEL            S
R0613    78      1        DNRRANGE         U
R0614            2        DNRRDOT          V
R06141           3        TTOTIG           L
R0615    79      1        CURSOR           D
R0616            2        SPIRAL           D
R0617            3        POSCODE          C
R0618    80      1        DATAGOOD         C
R0619            2        OMEGAD           H
R0620    81      1        DELVLVC          S
R0621            2        DELVLVC  +2      S
R0622            3        DELVLVC  +4      S
R0623    82      1        DELVLVC          S
R0624            2        DELVLVC  +2      S
R0625            3        DELVLVC  +4      S
R0626    83      1        DELVIMU          S
R0627            2        DELVIMU  +2      S
R0628            3        DELVIMU  +4      S
R0629    84      1        DELVOV           S
R0630            2        DELVOV  +2       S
R0631            3        DELVOV  +4       S
R0632    85      1        VGBODY           S
R0633            2        VGBODY  +2       S
R0634            3        VGBODY  +4       S
R0635    86      1        DELVLVC          S
R0636            2        DELVLVC  +2      S
R0637            3        DELVLVC  +4      S
R0638    87      1        AZ               D
R0639            2        EL               D
R0640    88      1        STARAD           B
R0641            2        STARAD  +2       B
R0642            3        STARAD  +4       B
R0643    89      1        LANDLAT          G
R0644            2        LANDLONG         G
R0645            3        LANDALT          JJ
R0646    90      1        RANGE            JJ
R0647            2        RRATE            S
R0648            3        RTHETA           H
R0649    91      1        P21ALT           Q (MEMORY/100 TO DIPLAY TENS N.M.)
R06491           2        P21VEL           P
R06492           3        P21GAM           F
R0650    92      1        THRDISP          C
R06501           2        HDOTDISP         S
R06502           3        HCALC1           RR
R0651    93      1        OGC              G
R0652            2        OGC  +2          G
R0653            3        OGC  +4          G
R0654    94      1        VGBODY           S
R06542           2        HDOTDISP         S
R06543           3        HCALC            RR
```

```
R0655    95        SPARE
R0656    96        SPARE
R0657    97        1       DSPTEM1            C
R0658              2       DSPTEM1  +1        C
R0659              3       DSPTEM1  +2        C
R0660    98        1       DSPTEM2            C
R0661              2       DSPTEM2  +1        B
R0662              3       DSPTEM2  +2        C
R0663    99        1       WWPOS              XX
R0664              2       WWVEL              YY
R06641             3       WWBIAS             AAA
```

```
P0665   NOUN SCALES AND FORMATS

R0666   -SCALE TYPE-                      PRECISION
R0667   UNITS             DECIMAL FORMAT         -- AGC FORMAT
R0668   ------------      --------------         -- ----------

R0669   -A-
R0670   OCTAL             XXXXX                  SP OCTAL

R0671   -B-                                                  -14
R0672   FRACTIONAL        .XXXXX                 SP BIT 1 = 2    UNITS
R0673                     (MAX .99996)

R0674   -C-
R0675   WHOLE             XXXXX.                 SP BIT 1 = 1 UNIT
R0676                     (MAX 16383.)

R0677   -D-                                                      15
R0678   CDU DEGREES       XXX.XX DEGREES         SP BIT 1 = 360/2   DEGREES
R0679                     (MAX 359.99)              (USES 15 BITS FOR MAGNI-
R0680                                                TUDE AND 2-S COMP.)

R0681   -E-                                                     14
R0682   ELEVATION DEGREES XX.XXX DEGREES         SP BIT 1 = 90/2   DEGREES
R0683                     (MAX 89.999)

R0684   -F-                                                      14
R0685   DEGREES (180)     XXX.XX DEGREES         SP BIT 1 = 180/2   DEGREES
R0686                     (MAX 179.99)

R0687   -G-
R0688   DP DEGREES(90)    XX.XXX DEGREES         DP BIT 1 OF LOW REGISTER =
R0689                                                      28
R0690                                               360/2   DEGREES
R0691   -H-
R0692   DP DEGREES (360)  XXX.XX DEGREES         DP BIT 1 OF LOW REGISTER =
R0693                                                      28
R0694                     (MAX 359.99)              360/2   DEGREES
```

```
P0695  -K-
R0696  TIME (HR, MIN, SEC)   OOXXX. HR        DP BIT 1 OF LOW REGISTER =
R0697                        OOOXX. MIN           -2
R0698                        OXX.XX SEC         10   SEC
R0699                        (DECIMAL ONLY.
R0700                        MAX MIN COMP=59
R0701                        MAX SEC COMP=59.99
R0702                        MAX CAPACITY=745 HRS
R0703                                   39 MINS
R0704                                   14.55 SECS.
R0705                        WHEN LOADING, ALL 3
R0706                        COMPONENTS MUST BE
R0707                        SUPPLIED.)

R0708  -L-
R0709  TIME (MIN/SEC)        XXBXX MIN/SEC    DP BIT 1 OF LOW REGISTER =
R0710                        (B IS A BLANK        -2
R0711                        POSITION, DECIMAL  10   SEC
R0712                        ONLY, DISPLAY OR
R0713                        MONITOR ONLY. CANNOT
R0714                        BE LOADED.
R0715                        MAX MIN COMP=59
R0716                        MAX SEC COMP=59
R0717                        VALUES GREATER THAN
R0718                        59 MIN 59 SEC
R0719                        ARE DISPLAYED AS
R0720                        59 MIN 59 SEC.)

R0721  -M-                                                -2
R0722  TIME (SEC)            XXX.XX SEC       SP BIT 1 = 10   SEC
R0723                        (MAX 163.83)

R0724  -N-
R0725  TIME(SEC) DP          XXX.XX SEC       DP BIT 1 OF LOW REGISTER =
R0726                                             -2
R0727                                           10   SEC

R0728  -O-
R0729  VELOCITY 2            XXXXX. FEET/SEC  DP BIT 1 OF HIGH REGISTER =
R0730                        (MAX 41994.)        -7
R0731                                           2   METERS/CENTI-SEC

R0732  -Q-
R0733  POSITION 4            XXXX.X NAUTICAL MILES DP BIT 1 OF LOW REGISTER =
R0734                                           2 METERS

R0735  -S-
R0736  VELOCITY 3            XXXX.X FT/SEC    DP BIT 1 OF HIGH REGISTER =
R0737                                            -7
R0738                                           2   METERS/CENTI-SEC
```

```
R0739    -T-                                                 -2
R0740    G                      XXX.XX G              SP BIT 1 = 10   G
R0741                           (MAX 163.83)

R0742    -U-
R0743    RENDEZVOUS             XXX.XX NAUT MI        SP USES 15 BITS FOR UNSIGNED
R07433   RADAR RANGE            (DECIMAL ONLY.           MAGNITUDE.
R07436                          DISPLAY OR MONITOR       BIT 1 = 9.38 FEET
R07439                          ONLY. CANNOT BE
R0744                           LOADED.)

R0745    -V-
R0746    RENDEZVOUS             XXXX.X FEET/SEC       SP USES 15 BITS FOR UNSIGNED
R07461   RADAR RANGE RATE       (DECIMAL ONLY.           MAGNITUDE.
R07462                          DISPLAY OR MONITOR       BIT 1 = -.6278 FEET/SEC
R07463                          ONLY. CANNOT BE
R07464                          LOADED.
R07465                          BIAS OF 17000 COUNTS
R07466                          SUBTRACTED BEFORE
R0747                           DISPLAY.)

R0748    -W-
R0749    LANDING RADAR          XXXXX. FEET           DP LOW ORDER BIT OF LOW ORDER
R0750    ALTITUDE                                        WORD = 1.079 FEET

R0751    -X-
R0752    LANDING RADAR          XXXXX. FEET/SEC       DP LOW ORDER BIT OF LOW ORDER
R0753    VELX                                            WORD = -.6440 FEET/SEC

R0754    -Y-
R0755    LANDING RADAR          XXXXX. FEET/SEC       DP LOW ORDER BIT OF LOW ORDER
R0756    VELY                                            WORD = 1.212  FEET/SEC

R0757    -Z-
R0758    LANDING RADAR          XXXXX. FEET/SEC       DP LOW ORDER BIT OF LOW ORDER
R0759    VELZ                                            WORD = .8668  FEET/SEC

R0760    -AA-
R0761    INITIAL/FINAL          XXXXX. FEET           DP LOW ORDER BIT OF LOW ORDER
R0762    ALTITUDE                                        WORD = 2.345 FEET

R0763    -BB-
R0764    ALTITUDE RATE          XXXXX. FEET/SEC       SP LOW ORDER BIT = .5
R0765                           (MAX 08191.)             FEET/SEC

R0766    -CC-
R0767    FORWARD/LATERAL        XXXX.X FEET/SEC       SP LOW ORDER BIT = .5571
R0768    VELOCITY               (MAX 09126.)             FEET/SEC

R0769    -DD-
```

```
R0770    ROTATIONAL HAND        XXXXX. DEG/SEC         SP FRACTIONAL PART OF PI RAD
R0771    CONTROLLER ANGULAR     (MAX 00044.)                                  4  SEC
R0772    RATES

R0773    -EF-
R0774    OPTICAL TRACKER        XXX.XX DEG.            DP LOW ORDER BIT OF LOW ORDER
R0775    AZIMUTH ANGLE                                                    15
R0776                                                     WORD = 360/2    DEGREES

R0777    -JJ-
R0778    POSITION5              XXX.XX NAUT MI         DP BIT 1 OF LOW REGISTER =
R0779                                                     2 METERS
R0780    -KK-                                                                   16
R0781    WEIGHT2                XXXXX. LBS             SP FRACTIONAL PART OF 2    KG

R0782    -NN-
R0783    TRIM DEGREES 2         XXX.XX DEG             SP BIT 1=.01SEC(TIME)
R0784                           (MAX 032.76)

R0785    -PP-
R0786    2 INTEGERS             +XXBYY                 DP BIT 1 OF HIGH REGISTER =
R0787                           (B IS A BLANK              1 UNIT OF XX
R0788                           POSITION. DECIMAL         BIT 1 OF LOW REGISTER =
R0789                           ONLY, DISPLAY OR           1 UNIT OF YY
R0790                           MONITOR ONLY. CANNOT      (EACH REGISTER MUST
R0791                           BE LOADED.)               CONTAIN A POSITIVE INTEGER
R0792                           (MAX 99B99)                LESS THAN 100)

R0793    -QQ-
R0794    POSITION7              XXXX.X NAUT MI         DP BIT 1 OF LOW REGISTER =
R0795                           (MAX 9058.9)                -4
R0796                                                     2    METERS

R0797    -RR-
R0798    COMPUTED ALTITUDE      XXXXX. FEET            DP BIT 1 OF LOW REGISTER =
R0799                                                       -4
R0800                                                     2    METERS

R0801    -SS-
R0802    DP DEGREES             XXXX.X DEGREES         DP BIT 1 OF HIGH REGISTER =
R0803                                                     1 DEGREE

R0804    -TT-
R0805    LANDING RADAR          +0000X                 CHANNEL 33,BIT 6=NOT POSIT. 1
R0806    POSITION               (DECIMAL ONLY.         CHANNEL 33,BIT 7=NOT POSIT. 2
R0807                           DISPLAY OR MONITOR     X = 1 FOR LR POSITION 1
R0808                           ONLY. CANNOT BE        X = 2 FOR LR POSITION 2
R0809                           LOADED.)

R0810    -WW-                                                              15
```

```
R0811    360-CDU DEGREES         XXX.XX DEGREES          SP BIT 1 = 360 - (360/2  )
R0812                            (MAX 359.99)               DEGREES
R0813                                                       (USES 15 BITS FOR MAGNI-
R0814                                                        TUDE AND 2-S COMP.)

R0815    -XX-
R0816    POSITION 9              XXXXX. FEET             DP BIT 1 OF LOW REGISTER =
R0817                                                        -9
R0818                                                       2    METERS

R0819    -YY-
R0820    VELOCITY 4              XXXX.X FEET/SEC         DP FRACTIONAL PART OF
R08201                           (MAX 328.0)                METERS/CENTI-SEC

R08202   -ZZ-
R08203   VELOCITY5               XXXX.X FT/SEC           DP BIT 1 OF HIGH REGISTER =
R08204                                                       -9
R08205                                                      2    METERS/CENTI-SEC

R0821    -AAA-
R08211   RADIANS                 XX.XXX RADIANS          DP BIT 1 OF HIGH REGISTER =
R08212                           (MAX 31.999)                -9
R08213                                                      2    RADIANS

R0822    THAT-S ALL ON THE NOUNS.
```

```
P0823            ALARM CODES FOR LUMINARY

R0824   *9       *18                                       *60    COLUMN

R0825   CODE   * TYPE                                      SET BY

R0828   00111    MARK MISSING                              AOTMARK
R0829   00112    MARK OR MARK REJECT NOT BEING ACCEPTED    AOTMARK
R0830   00113    NO INBITS                                 AOTMARK
R0832   00115    NO MARKS IN LAST PAIR TO REJECT           AOTMARK
R0833   00206    ZERO ENCODE NOT ALLOWED WITH COARSE ALIGN IMU MODE SWITCHING
R0834   00206     + GIMBAL LOCK.
R0835   00207    ISS TURNON REQUEST NOT PRESENT FOR 90 SEC T4RUPT
R0836   00210    IMU NOT OPERATING                         IMU MODE SWITCH, IMU-2, R02, P51, P57
R0838   00211    COARSE ALIGN ERROR                        IMU MODE SWITCH
R0839   00212    PIPA FAIL BUT PIPA IS NOT BEING USED      IMU MODE SWITCH,T4RPT
R0840   00213    IMU NOT OPERATING WITH TURN-ON REQUEST    T4RUPT
R0841   00214    PROGRAM USING IMU WHEN TURNED OFF         T4RUPT
R0842   00217    BAD RETURN FROM IMUSTALL                  P51,P52,P57
R0843   00220    IMU NOT ALIGNED - NO REFSMMAT             R02,R47
R0844   00401    DESIRED GIMBAL ANGLE YIELDS GIMBAL LOCK   INF ALIGN, IMU-2,
R0845                                                      FINDCDUW
R0846   00402    FINDCDUW NOT CONTROLLING ATTITUDE         FINDCDUW
R0847   00404    TWO STARS NOT AVAILABLE IN ANY DETENT     R59, LUNAR SURFACE
R0848   00405    TWO STARS NOT AVAILABLE                   P52
R0849   00421    W-MATRIX OVERFLOW                         INTEGRV
R0850   00501  P RADAR ANTENNA OUT OF LIMITS               R23
R0851   00502    BAD RADAR GIMBAL ANGLE INPUT              V41N72
R0852   00503  P RADAR ANTENNA DESIGNATE FAIL              R21, NON-P IN V41N72
R0853   00510    RADAR AUTO DESCRETE NOT PRESENT           R25
R0854   00511    LR ANTENNA MOVED AND NOT REPOSITIONED     SERVICER
R0855   00514  P RR GOES OUT OF AUTO MODE WHILE IN USE     P20
R0856   00515    RR CDU FAIL DISCRETE PRESENT              R25
R0857   00520    RADAR RUPT NOT EXPECTED AT THIS TIME      RADAR READ
R0859   00522    LANDING RADAR POSITION CHANGE             R04
R0860   00523    LR ANTENNA DIDN'T ACHIEVE POSITION 2      V59                    IN V60)
R0862   00525  P DELTA THETA GREATER THAN 3 DEGREES        R22
R0863   00526    RANGE GREATER THAN 400 NAUTICAL MILES     P20
R0864   00527  P LOS NOT IN MODE II COVERAGE WHILE ON      R21,R24
R0865            LUNAR SURFACE
R0866            OR VEHICLE MANEUVER REQUIRED              R24 (20)
R08665  00530  P LOS NOT IN MODE2 COVERAGE                 R21
R08666           ON LUNAR SURFACE AFTER 600 SECS.
R0867   00600    IMAGINARY ROOTS ON FIRST ITERATION        P32, P72
R0868   00601    PERIGEE ALTITUDE CSI LT PMIN1             P32,P72,
R0869   00602    PERIGEE ALTITUDE CDH LT PMIN2             P32,P72,
R0870   00603    CSI TO CDH TIME LT TMIN12                 P32,P72,P33,P73
R0871   00604    CDH TO TPI TIME LT TMIN23                 P32,P72,
R0872   OR COMPUTED CDH TIME GREATER THAN INPUT TPI TIME
R0873   00605    NUMBER OF ITERATIONS EXCEEDS LOOP MAXIMUM P32, P72
```

```
L        ASSEMBLY AND OPERATION INFORMATION                                            USER'S PAGE NO.  24       E0

R0874   00606    DV EXCEEDS MAXIMUM                           P32,P72,
R0875   00611    NO TIG FOR GIVEN ELEV ANGLE                  P34,P74
R0876   00701    ILLEGAL OPTION CODE SELECTED                 P57
R0877   00777    PIPA FAIL CAUSED THE ISS WARNING             T4RUPT
R0878   01102    AGC SELF TEST ERROR                          SELF CHECK
R0881   01105    DOWNLINK TOO FAST                            T4RUPT
R0882   01106    UPLINK TOO FAST                              T4RUPT
R0883   01107    PHASE TABLE FAILURE.  ASSUME                 RESTART
R0884            ERASABLE MEMORY IS SUSPECT.                  RESTART
R0895   01301    ARCSIN-ARCCOS ARGUMENT TOO LARGE             INTERPRETER
R0897   01406    BAD RETURN FROM ROOTPSRS                     DESCENT GUIDANCE EQS.
R0898   01407    VG INCREASING (DELTA-V ACCUMULATED           S40.8
R0899            .GT. 90 DEGREES AWAY FROM DESIRED THRUST     S40.8
R08995           VECTOR.)                                     S40.8
R0900   01410    UNINTENTIONAL OVERFLOW IN GUIDANCE           DESCENT GUIDANCE EQS.
R0901   01412    DESCENT IGNALG NOT CONVERGING                P63
R0903   01466    INSUF. THROTTLINGS BETWEEN SKIPPED THROTS    P66
R0905   01520    V37 REQUEST NOT PERMITTED AT THIS TIME       V37
R0906   01600    OVERFLOW IN DRIFT TEST                       IMU 4
R0907   01601    BAD IMU TORQUE                               OPT PRE ALIGN CALIB
R0908   01601                                                 IMU 4 (LEM)
R0909   01703    IGNITION TIME SLIPPED                        MIDTOAVE
R0910   01706    INCORRECT PROGRAM REQUESTED FOR VEHICLE
R0911            CONFIGURATION                                P40, P42
R0913   02001    JET FAILURES HAVE DISABLED Y-Z TRANS.        DAP
R0914   02002    JET FAILURES HAVE DISABLED X TRANSLATION     DAP
R0915   02003    JET FAILURES HAVE DISABLED P-ROTATION        DAP
R0916   02004    JET FAILURES HAVE DISABLED U-V ROTATION      DAP
R0917   03777    ICDU FAIL CAUSED THE ISS WARNING             T4RUPT
R0918   04777    ICDU , PIPA FAILS CAUSED THE ISS WARNING     T4RUPT
R0919   07777    IMU FAIL CAUSED THE ISS WARNING              T4RUPT
R0920   10777    IMU , PIPA FAILS CAUSED THE ISS WARNING      T4RUPT
R0921   13777    IMU , ICDU  FAILS CAUSED THE ISS WARNING     T4RUPT
R0922   14777    IMU,ICDU,PIPA FAILS CAUSED ISS WARNING       T4RUPT

R0923   THE FOLLOWING CODES INDICATE THE MORE SERIOUS POODOO ABORTS THAT RESULT
R0924   IN THE PROGRAM GOING TO R00.

R0925   20105    AOTMARK SYSTEM IN USE                        AOTMARK
R0926   20430    ACCELERATION OVERFLOW IN INTEGRATION         ORBITAL INTEGRATION
R0927   20607    NO SOLN FROM TIME-THETA OR TIME-RADIUS       TIMETHET, TIMERAD
R0928   21103    UNUSED CCS BRANCH EXECUTED                   ABORT
R0929   21204    WAITLIST, VARDELAY, FIXDELAY, OR LONGCALL      WAITLIST ROUTINES
R0930              CALLED WITH ZERO OR NEGATIVE DELTA-TIME
R0933   21302    SQRT CALLED WITH NEGATIVE ARGUMENT           INTERPRETER
R0934   21406    BAD RETURN FROM ROOTPSRS                     IGNITION ALGORITHMN
R0935   21501    KEYBOARD AND DISPLAY ALARM DURING            PINBALL
R0936              INTERNAL USE(NVSUB).ABORT
R0938   THE FOLLOWING CODES INDICATE A BAILOUT ABORT THAT RESULTS IN A SOFTWARE
R0939   RESTART
```

```
R0940   31104    DELAY ROUTINE BUSY                         EXEC
R0941   31201    EXECUTIVE OVERFLOW-NO VAC AREAS            EXEC
R0942   31202    EXECUTIVE OVERFLOW-NO CORE SETS            EXEC
R0943   31203    WAITLIST OVERFLOW-TOO MANY TASKS           WAITLIST
R09434  31206    SECOND JOB ATTEMPTS TO GO TO SLEEP VIA     PINBALL
R09436             KEYBOARD AND DISPLAY PROGRAM
R0944   31207    NO VAC AREAS FOR MARKS                     AOTMARK
R0945   31210    TWO PROGRAMS USING DEVICE AT SAME TIME     MODE SWITCHING
R0946   31211    ILLEGAL INTERRUPT OF EXTENDED VERB         AOTMARK
R09464  31502    TWO PRIO DISPLAYS WAITING                  DSP INTRFCE
R0947   32000    DAP STILL IN PROGRESS AT NEXT TIME5 RUPT   DAP
```

```
P0948             CHECKLIST CODES FOR LUMINARY

R0949   *9      *17      *26                                           *9   COLUMN

R0951   R1CODE             ACTION TO BE EFFECTED                       PROGRAM

R0953   00013   KEY IN   NORMAL OR GYRO TORQUE COARSE ALIGN            P52
R0955   00014   PROCEED  DO IMU FINE ALIGN ROUTINE                     R51,P63,P57
R0957   00014   ENTER    DO LANDING SITE  DETERMINATION(N89DISP)       P57OPTION2
R0960   00015   PERFORM  CELESTIAL BODY ACQUISITION
R09601  00016   PROCEED  DO IMU ALIGN WITH NON-REJECTED DATA      R53  R51,P51
R0962   00062   SWITCH   AGC POWER DOWN                                P06
R0964   00201   SWITCH   RR MODE TO AUTOMATIC                          P20,P22,P04
R0966   00203    SWITCH  GUID CONTROL TO GNC, MODE TO AUTO...          P12,P42,P71
R0968                    ALSO THR CONT TO AUTO                         P40,P63,P70
R0970   00205   PERFORM  MANUAL ACQUISITION OF RR                      R23
R0972   00500   SWITCH   LR ANTENNA TO POSITION 1                      P63
R0974
R0975                      SWITCH DENOTES CHANGE POSITION OF A CONSOLE SWITCH
R0976                      PERFORM DENOTES START OR END OF A TASK
R0977                      KEY IN DENOTES KEY IN OF DATA THRU THE DSKY
```

```
P0978             OPTION CODES FOR LUMINARY

R0979   THE SPECIFIED OPTION CODES WILL BE FLASHED IN COMPONENT R1 IN
R0980   CONJUNCTION WITH V04N06 OR V04N12 (FOR EXTENDED VERBS) TO REQUEST THE
R0981   ASTRONAUT TO LOAD INTO COMPONENT R2 THE OPTION HE DESIRES.

R0982   *9      *17                                 *52                          *11             *25   COLUMN

R0984   OPTION
R0985   CODE    PURPOSE                             INPUT FOR COMPONENT 2        PROGRAM(S)      APPLICABILITY

R0987   00001   SPECIFY IMU ORIENTATION             1=PREF 2=NOM 3=REFSMMAT      P52             ALL
R0989                                               4=LAND SITE
R0990   00002   SPECIFY VEHICLE                     1=THIS 2=OTHER               P21,R30         ALL
R0992   00003   SPECIFY TRACKING ATTITUDE           1=PREFERRED 2=OTHER          R63             ALL
R0994   00004   SPECIFY RADAR                       1=RR 2=LR                    R04             SUNDANCE + LUMINARY
R0996   00005   SPECIFY SOR PHASE                   1=FIRST 2=SECOND             P38             COLOSSUS + LUMINARY
R0998   00006   SPECIFY RR COARSE ALIGN OPTION      1=LOCKON 2=CONTINUOUS DESIG. V41N72          SUNDANCE + LUMINARY
R1000   00010   SPECIFY ALIGNMENT MODE              0=ANY TIME 1=REFSMMAT +G     P57             LUMINARY
R1002                                               2=TWO BODIES 3=ONE BODY + G
R1003   00012   SPECIFY CSM ORBIT OPTION            1=NO ORBIT CHANGE 2=CHANGE   P22             LUMINARY
R1005                                               ORBIT TO PASS OVER LM
```

```
 0001    REF    1                                             COUNT  BANKSUM
R0002              MODULE 1 CONTAINS BANKS 0 THROUGH 5

 0003                           4000                          BLOCK  02
 0004                           4000              RADARFF     EQUALS
 0005                           4000              FFTAG1      EQUALS
 0006                           4000              FFTAG2      EQUALS
 0007                           4000              FFTAG3      EQUALS
 0008                           4000              FFTAG4      EQUALS
 0009                           4000              FFTAG7      EQUALS
 0010                           4000              FFTAG8      EQUALS
 0011                           4000              FFTAG9      EQUALS
 0012                           4000              FFTAG10     EQUALS
 0013                           4000              FFTAG11     EQUALS
 0014                           4000              FFTAG12     EQUALS
 0015                           4000              FFTAG13     EQUALS
 0016      6 WORDS LEFT         5771    05771 0               BNKSUM 02
 0016                           5772    05772 0


 0017                           6000                          BLOCK  03
 0018                           6000              FFTAG5      EQUALS
 0019                           6000              FFTAG6      EQUALS
 0020      0 WORDS LEFT         6000  NO NEED                 BNKSUM 03


 0021                        00,2000                          BANK   00
 0022                        00,2000              DLAYJOB     EQUALS
 0023      2 WORDS LEFT      00,3775    03775 1               BNKSUM 00
 0023                        00,3776    03776 1


 0024                        01,2000                          BANK   01
 0025                        01,2000              RESTART     EQUALS
 0026                        01,2000              LOADDAP1    EQUALS
 0027      2 WORDS LEFT      01,3775    03775 1               BNKSUM 01
 0027                        01,3776    03776 1


 0028                        04,2000                          BANK   04
 00285                       04,2000              ORBITAL3    EQUALS
 0029                        04,2000              R02         EQUALS
 0030                        04,2000              VERB37      EQUALS
 00305                       04,2000              EPHEM2      EQUALS
 0031                        04,2000              PINBALL4    EQUALS
 0032                        04,2000              CONICS1     EQUALS
 0033                        04,2000              KEYRUPT     EQUALS
 0034                        04,2000              R36LM       EQUALS
 0035                        04,2000              UPDATE2     EQUALS
 0036                        04,2000              E/PROG      EQUALS
 00365                     04,2000            ACTMARK2 EQUALS
 0037     4 WORDS LEFT     04,3773   03773 1           BNKSUM 04
 0037                      04,3774   03774 0


 0038                      05,2000                     BANK   05
 0039                      05,2000            FRANDRES EQUALS
 0040                      05,2000            DOWNTELM EQUALS
 0041                      05,2000            ABORTS1  EQUALS
 0042                      05,2000            EPHEM1   EQUALS
 00425                     05,2000            ASENT3   EQUALS
 0043     1 WORDS LEFT     05,3776   03776 1           BNKSUM 05


R0044          MODULE 2 CONTAINS BANKS 6 THROUGH 13

 0045                      06,2000                     BANK   06
 0046                      06,2000            IMUCOMP  EQUALS
 0047                      06,2000            T4RUP    EQUALS
 0048                      06,2000            RCSMONT  EQUALS
 00486                     06,2000            EARTHLOC EQUALS
 00487                     06,2000            ACTMARK3 EQUALS
 0049     1 WORDS LEFT     06,3776   03776 1           BNKSUM 06


 0050                      07,2000                     BANK   07
 0051                      07,2000            ACTMARK1 EQUALS
 0052                      07,2000            MODESW   EQUALS
 00525                     07,2000            ASENT2   EQUALS
 0053     8 WORDS LEFT     07,3767   03767 1           BNKSUM 07
 0053                      07,3770   03770 1


 0054                      10,2000                     BANK   10
 0055                      10,2000            RTBCODES EQUALS
 0056                      10,2000            DISPLAYS EQUALS
 0057                      10,2000            PHASETAB EQUALS
 0058                      10,2000            FLESHLOC EQUALS
 00585                     10,2000            SLCTMU   EQUALS
 0059     4 WORDS LEFT     10,3773   03773 1           BNKSUM 10
 0059                      10,3774   03774 0


 0060                      11,2000                     BANK   11
 0061                      11,2000            ORBITAL  EQUALS
 0062                      11,2000            F2DPS*11 EQUALS
 0063                      11,2000            INTVEL   EQUALS
 0065     1 WORDS LEFT     11,3776   03776 1           BNKSUM 11
 0066                         12,2000                        BANK    12
 0067                         12,2000             CONICS     EQUALS
 00675                        12,2000             ORBITAL1   EQUALS
 00676                        12,2000             INTPRET2   EQUALS
 0068      2 WORDS LEFT       12,3775   03775 1              BNKSUM 12
 0068                         12,3776   03776 1


 0069                         13,2000                        BANK    13
 0070                         13,2000             LATLONG    EQUALS
 0071                         13,2000             INTINIT    EQUALS
 0072                         13,2000             LEMGEOM    EQUALS
 0073                         13,2000             P76LOC     EQUALS
 0074                         13,2000             ORBITAL2   EQUALS
 00746                        13,2000             P50S2      EQUALS
 0075      2 WORDS LEFT       13,3775   03775 1              BNKSUM 13
 0075                         13,3776   03776 1
```

```
P0076            MODULE 3 CONTAINS BANKS 14 THROUGH 21

 0077                        14,2000                     BANK    14
 0078                        14,2000           P50S1     EQUALS
 00785                       14,2000           PHASTAB1  EQUALS
 0079                        14,2000           STARTAB   EQUALS
 00795                       14,2000           ASENT4    EQUALS
 00796                       14,2000           RTBCODE1  EQUALS
 0080        0 WORDS LEFT    14,2000  NO NEED            BNKSUM  14

 0081                        15,2000                     BANK    15
 0082                        15,2000           P50S      EQUALS
 00825                       15,2000           R02BNK15  EQUALS
 0083                        15,2000           EPHEM     EQUALS
 00835                       15,2000           RRLEADIN  EQUALS
 0084        0 WORDS LEFT    15,2000  NO NEED            BNKSUM  15

 0085                        16,2000                     BANK    16
 0086                        16,2000           DAPS1     EQUALS
 0087        4 WORDS LEFT    16,3773   03773 1           BNKSUM  16
 0087                        16,3774   03774 0

 0088                        17,2000                     BANK    17
 0089                        17,2000           DAPS2     EQUALS
 00895                       17,2000           C13BANK   EQUALS
 0090        0 WORDS LEFT    17,2000  NO NEED            BNKSUM  17

 0091                        20,2000                     BANK    20
 0092                        20,2000           DAPS3     EQUALS
 0093                        20,2000           LOADDAP   EQUALS
 0094       22 WORDS LEFT    20,3751   03751 1           BNKSUM  20
 0094                        20,3752   03752 1

 0095                        21,2000                     BANK    21
 0096                        21,2000           DAPS4     EQUALS
 0097                        21,2000           ABTFLGS   EQUALS
 0098                        21,2000           R10       EQUALS
 0099                        21,2000           R11       EQUALS
 00991                       21,2000           MANUR     EQUALS
 00995                       21,2000           P50S3     EQUALS
 00996                       21,2000           MIDDGIM1  EQUALS
 00997                       21,2000           ORBITAL5  EQUALS
 0100       39 WORDS LEFT    21,3730   03730 0           BNKSUM  21
 0100                        21,3731   03731 1
```

```
P0101              MODULE 4 CONTAINS BANKS 22 THROUGH 27

 0102                       22,2000                          BANK    22
 0103                       22,2000             KALCMON1 EQUALS
 0104                       22,2000             KALCMON2 EQUALS
 0105                       22,2000             R30LOC   EQUALS
 0106                       22,2000             RENDEZ   EQUALS
 01065                      22,2000             SERV2    EQUALS
 01066                      22,2000             LANDCNST EQUALS
 01067                      22,2000             MIDDGIM  EQUALS
 0107      3 WORDS LEFT     22,3774   03774 0            BNKSUM 22
 0107                       22,3775   03775 1


 0108                       23,2000                          BANK    23
 0109                       23,2000             POWFLITE EQUALS
 0110                       23,2000             POWFLIT1 EQUALS
 0111                       23,2000             INELIGHT EQUALS
 0112                       23,2000             APOPERI  EQUALS
 0113                       23,2000             R61      EQUALS
 0114                       23,2000             R62      EQUALS
 0115                       23,2000             INTPRET1 EQUALS
 0116                       23,2000             MEASINC  EQUALS
 0117                       23,2000             MEASINC1 EQUALS
 0118                       23,2000             EXTVB1   EQUALS
 01185                      23,2000             P12A     EQUALS
 01186                      23,2000             NORMLIZ  EQUALS
 01187                      23,2000             ASENT7   EQUALS
 01188                      23,2000             RODTRAP  EQUALS
 0119     14 WORDS LEFT     23,3761   03761 1            BNKSUM 23
 0119                       23,3762   03762 1


 0120                       24,2000                          BANK    24
 0121                       24,2000             PLANTIN  EQUALS
 0122                       24,2000             P20S     EQUALS
 01222                      24,2000             S40BNK   EQUALS
 01223                      24,2000             ORBITAL4 EQUALS
 0123      0 WORDS LEFT     24,2000  NO NEED             BNKSUM 24


 0124                       25,2000                          BANK    25
 0125                       25,2000             P20S1    EQUALS
 0126                       25,2000             P20S2    EQUALS
 0127                       25,2000             RADARUPT EQUALS
 0128                       25,2000             DRSAMP   EQUALS
 01295                      25,2000             PLANTIN3 EQUALS
 0130      6 WORDS LEFT     25,3771   03771 0            BNKSUM 25
 0130                       25,3772   03772 0
```

```
0131                       26,2000                    BANK   26
0132                       26,2000           P20S3    EQUALS
0133                       26,2000           BAWLANGS EQUALS
0134                       26,2000           MANUVER  EQUALS
0135                       26,2000           MANUVER1 EQUALS
01355                      26,2000           PLANTIN1 EQUALS
01356                      26,2000           PLANTIN2 EQUALS
0136      2 WORDS LEFT     26,3775   03775 1          BNKSUM 26
0136                       26,3776   03776 1

0137                       27,2000                    BANK   27
0138                       27,2000           TOF-FF   EQUALS
0139                       27,2000           TOF-FF1  EQUALS
0140                       27,2000           P40S1    EQUALS
0141                       27,2000           VECPT    EQUALS
0142                       27,2000           ASENT1   EQUALS
01425                      27,2000           SERV3    EQUALS
0143      2 WORDS LEFT     27,3775   03775 1          BNKSUM 27
0143                       27,3776   03776 1
```

```
P0144            MODULE 5 CONTAINS BANKS 30 THROUGH 35

 0145                          30,2000                           BANK   30
 0146                          30,2000               LOWSUPER EQUALS
 0147                          30,2000               P12      EQUALS
 0148                          30,2000               ASENT    EQUALS
 0149                          30,2000               FCDUW    EQUALS
 01495                         30,2000               FLOGSUB  EQUALS
 01496                         30,2000               VB67A    EQUALS
 01497                         30,2000               ASENT5   EQUALS
 0150     14 WORDS LEFT        30,3761   03761 1              BNKSUM 30
 0150                          30,3762   03762 1


 0151                          31,2000                        BANK   31
 0152                          31,2000               FTHROT   EQUALS
 0153                          31,2000               F2DPS*31 EQUALS
 0154                          31,2000               VB67     EQUALS
 0155      4 WORDS LEFT        31,3773   03773 1              BNKSUM 31
 0155                          31,3774   03774 0


 0156                          32,2000                        BANK   32
 0157                          32,2000               P20S4    EQUALS
 0158                          32,2000               F2DPS*32 EQUALS
 0159                          32,2000               ABORTS   EQUALS
 0160                          32,2000               LRS22    EQUALS
 0161                          32,2000               P66LOC   EQUALS
 0163                          32,2000               R47      EQUALS
 01635                         32,2000               SERV     EQUALS
 01636                         32,2000               P40S4    EQUALS
 0164     49 WORDS LEFT        32,3716   03716 1              BNKSUM 32
 0164                          32,3717   03717 0


 0165                          33,2000                        BANK   33
 0166                          33,2000               SERVICES EQUALS
 0167                          33,2000               R29/SERV EQUALS
 01675                         33,2000               ASENT6   EQUALS
 0168    139 WORDS LEFT        33,3575   03575 0              BNKSUM 33
 0168                          33,3576   03576 0


 0169                          34,2000                        BANK   34
 0170                          34,2000               ASENT8   EQUALS
 0171                          34,2000               P30S1    EQUALS
 0172                          34,2000               CSI/CDH1 EQUALS
 0173                          34,2000               ASCFILT  EQUALS
 01735                         34,2000               R12STUFF EQUALS
 01736                         34,2000               SERV4    EQUALS
```

```
L        TAGS FOR RELATIVE SETLOC AND BLANK BANK CARDS                                   USER'S PAGE NO.   8      EO

 01737                       34,2000              F2DPS*34 EQUALS
 0174      74 WORDS LEFT     34,3665   C3665 1             BNKSUM 34
 0174                        34,3666   03666 1


 0175                        35,2000                       BANK   35
 0176                        35,2000              CSI/CDH  EQUALS
 0177                        35,2000              P30S     EQUALS
 0178                        35,2000              P40S3    EQUALS
 0179                        35,2000              P40S2    EQUALS
 0180      28 WORDS LEFT     35,3743   03743 1             BNKSUM 35
 0180                        35,3744   03744 0
```

```
P0181            MODULE 6 CONTAINS BANKS 36 THROUGH 43

 0182                          36,2000                       BANK   36
 0183                          36,2000            P40S       EQUALS
 0184      16 WORDS LEFT       36,3757   03757 1             BNKSUM 36
 0184                          36,3760   03760 0

 0185                          37,2000                       BANK   37
 0186                          37,2000            P05P06     EQUALS
 0187                          37,2000            IMU2       EQUALS
 0188                          37,2000            IMU4       EQUALS
 0189                          37,2000            R31        EQUALS
 0190                          37,2000            IMUSUPER   EQUALS
 0191                          37,2000            SERV1      EQUALS
 0192       4 WORDS LEFT       37,3773   03773 1             BNKSUM 37
 0192                          37,3774   03774 0

 0193                          40,2000                       BANK   40
 0194                          40,2000            PINBALL1   EQUALS
 0195                          40,2000            SELFSUPR   EQUALS
 01955                         40,2000            SBAND40    EQUALS
 0196                          40,2000            PINSUPER   EQUALS
 01965                         40,2000            R31LOC     EQUALS
 0197       8 WORDS LEFT       40,3767   03767 1             BNKSUM 40
 0197                          40,3770   03770 1

 0198                          41,2000                       BANK   41
 0199                          41,2000            PINBALL2   EQUALS
 0200       0 WORDS LEFT       41,2000  NO NEED              BNKSUM 41

 0201                          42,2000                       BANK   42
 0202                          42,2000            SBAND      EQUALS
 0203                          42,2000            PINBALL3   EQUALS
 0204       0 WORDS LEFT       42,2000  NO NEED              BNKSUM 42

 0205                          43,2000                       BANK   43
 0206                          43,2000            EXTVERBS   EQUALS
 0207                          43,2000            SELFCHEC   EQUALS

 0208      29 WORDS LEFT       43,3742   03742 0             BNKSUM 43
 0208                          43,3743   03743 1
```

```
L        TAGS FOR RELATIVE SETLOC AND BLANK BANK CARDS.                                     USER'S PAGE NO.  10       FO

 0209    REF    1                23,2504            HI6ZEROS EQUALS ZEROVECS         ZERO VECTOR ALWAYS IN HIGH MEMORY
 0210    REF    1                12,2006            LO6ZEROS EQUALS ZEROVEC          ZERO VECTOR ALWAYS IN LOW MEMORY
 0211    REF    1                23,2502            HIDPHALF EQUALS UNITX
 0212    REF    1                12,2004            LODPHALF EQUALS XUNIT
 0213    REF    1                23,2474            HIDP1/4  EQUALS DP1/4TH
 0214    REF    1                04,3037            LODP1/4  EQUALS D1/4             2DEC .25
 0215    REF    2  LAST     38   23,2502            HIUNITX  EQUALS UNITX
 0216    REF    1                23,2500            HIUNITY  EQUALS UNITY
 0217    REF    1                23,2476            HIUNITZ  EQUALS UNITZ
 0218    REF    2  LAST     38   12,2004            LOUNITX  EQUALS XUNIT            2DEC  .5
 0219    REF    1                12,2002            LOUNITY  EQUALS YUNIT            2DEC  0
 0220    REF    1                12,2000            LOUNITZ  EQUALS ZUNIT            2DEC  0
R0221


 0222    REF    1                22,3543            DELRSPL  EQUALS SPLRET           COL PGM, ALSO CALLED BY R30 IN LUMINARY
R0223    ROPE-SPECIFIC ASSIGNS OBVIATING NEED TO CHECK COMPUTER FLAG IN                DETERMINING INTEGRATION AREA ENTRIES.

 0225    REF    1                13,2772            ATOPTHIS EQUALS ATOPLEM
 0226    REF    1                13,2717            ATOPOTH  EQUALS ATOPCSM
 0227    REF    1                13,3101            OTHPREC  EQUALS CSMPREC
 0228    REF    1                   0174            MOONTHIS EQUALS LMOONFLG
 0229    REF    1                   0173            MOONOTH  EQUALS CMOONFLG
 0230    REF    1                13,3005            MOVATHIS EQUALS MOVEALEM
 0231    REF    1                12,2017            RMM         =      LODPMAX
 0232    REF    1                12,2021            RME         =      LODPMAX1
 0233    REF    1                13,3115            THISPREC EQUALS LEMPREC
 0234    REF    2  LAST     38   23,2476            THISAXIS =      UNITZ
 0235    REF    1                23,2476            NB1NB2   EQUALS THISAXIS         FOR R31
 0236    REF    1                   5002            ERASID   EQUALS BITS2-10         DOWNLINK ERASABLE DUMP ID
 0237    REF    1                   4743            DELAYNUM EQUALS TWO
```

```
L        CONTROLLED CONSTANTS                                                                USER'S PAGE NO.   1      F0

P0001    DPS AND APS ENGINE PARAMETERS


 0002    REF    1                  36,2000                        SETLOC P40S
 0003                              36,2000                        BANK
 0004    REF    1                                                 COUNT* $$/P40

R0005    *** THE ORDER OF THE FOLLOWING SIX CONSTANTS MUST NOT BE CHANGED ***

 0006                              36,2000   01056 0  FDPS     2DEC   4.3670 B-7      9817.5 LBS FORCE IN NEWTONS
 0006                              36,2001   37167 0
 0007                              36,2002   00457 1  MDOTDPS  2DEC   0.1480 B-3      32.62 LBS/SEC IN KGS/CS.
 0007                              36,2003   03250 0
 0008                              36,2004   77777 0  DTDECAY  2DEC   -38             40 PERCENT FTP-DPS TAILOFF FOR P40
 0008                              36,2005   77731 1
 0009                              36,2006   00307 0  FAPS     2DEC   1.5569 B-7      3500 LBS FORCE IN NEWTONS
 0009                              36,2007   11040 0
 0010                              36,2010   00151 1  MDOTAPS  2DEC   0.05135 B-3     11.32 LBS/SEC IN KGS/CS
 0010                              36,2011   05214 0
 0011                              36,2012   77777 0  ATDECAY  2DEC   -18             618 LB-SEC  TAILOFF FOR APS
 0011                              36,2013   77755 0
R0012    ************************************************************************

 00122                             36,2014   00003 1  100PCTTO 2DEC   24 B-17         100 PERCENT FTP-DPS TAILOFF FOR P70
 00122                             36,2015   00000 1
R00124   ************************************************************************

 0013                              36,2016   00026 0  FRCS4    2DEC   0.17792 B-7     400 LBS FORCE IN NEWTONS
 0013                              36,2017   30605 1
 0014                              36,2020   00013 0  FRCS2    2DEC   0.08896 B-7     200 LBS FORCE IN NEWTONS
 0014                              36,2021   14303 1
 0015    REF    1                  27,2000                        SETLOC P40S1
 0016                              27,2000                        BANK
 0017    REF    1                                                 COUNT* $$/P40

R0018    *** APS IMPULSE DATA FOR P42 ******************************************

 0019                              27,2000   00000 1  K1VAL    2DEC   140.12 B-23     3150 LB.SEC APS IMPULSE (WET)
 0019                              27,2001   10604 1
 0020                              27,2002   00000 1  K2VAL    2DEC   31.138 B-24     700  LB-SEC
 0020                              27,2003   00762 1
 0021                              27,2004   00030 1  K3VAL    2DEC   1.5569 B-10     FAPS ( 3500 LBS THRUST)
 0021                              27,2005   35104 1
R0022    ************************************************************************

 0023                              27,2006   00016 0  S40.136  2DEC   .4671 B-9       .4671 M NEWTONS (DPS)
 0023                              27,2007   36237 1
 0024                              27,2010   35711 0  S40.136_ 2DEC   .4671 B+1       S40.136 SHIFTED LEFT 10.
 0024                              27,2011   35663 1
 0025    REF    1                  27,2000                        SETLOC ASENT1
 0026                        27,2012                      8ANK
 0027   REF    1                                          COUNT* $$/P70

 0028                        27,2012   03631 0   (1/DV)A  2DEC   15.20 B-7       2 SECONDS WORTH OF INITIAL ASCENT
 0028                        27,2013   23146 0
A0029                                                                            STAGE ACCELERATION -- INVERTED (M/CS)
A0030                                                                            1) PREDICATED ON A LIFTOFF MASS OF
A0031                                                                               4869.9 KG (SNA-8-D-027  7/11/68)
A0032                                                                            2) PREDICATED ON A CONTRIBUTION TO VEH-
A0033                                                                               ICLE ACCELERATION FROM RCS THRUSTERS
A0034                                                                               EQUIV. TO 1 JET ON CONTINUOUSLY.
 0035                        27,2014   33226 1  K(1/DV)   2DEC   436.70 B-9      DPS ENGINE THRUST IN NEWTONS / 100 CS.
 0035                        27,2015   14632 0
 0036                        27,2016   05306 1   (AT)A    2DEC   3.2883 E-4 89   INITIAL ASC. STG. ACCELERATION ** M/CS.
 0036                        27,2017   15503 0
A0037                                                                            ASSUMPTIONS SAME AS FOR (1/DV)A.
 0038                        27,2020   26337 1   (TBUP)A  2DEC   91902 B-17      ESTIMATED BURN-UP TIME OF THE ASCENT STG
 0038                        27,2021   30000 1
A0039                                                                            ASSUMPTIONS SAME AS FOR (1/DV)A WITH THE
A0040                                                                            ADDITIONAL ASSUMPTION THAT NET MASS-FLOW
A0041                                                                            RATE = 5.299 KG/SEC = 5.135 (APS) +
A0042                                                                            .164 (1 RCS JET).
 0043   REF    1             30,2000                      SETLOC ASENT
 0044                        30,2000                      BANK
 0045   REF    1                                          COUNT* $$/ASENT
 0046                        30,2000   02445 0  AT/RCS    2DEC   .0000785 B+10   4 JETS IN A DRY LEM
 0046                        30,2001   00274 0
 0047   REF    1             33,2000                      SETLOC SERVICES
 0048                        33,2000                      8ANK
 0049   REF    1                                          COUNT* $$/SERV

R0050   *** THE ORDER OF THE FOLLOWING TWO CONSTANTS MUST NOT 8E CHANGED *******

 0051                        33,2000   41545 0  APSVEX    DEC    -3030 E-2 B-5   9942 FT/SEC IN M/CS.

 0052                        33,2001   42341 1  DPSVEX    DEC*   -2.95588868E+ 18-05*    VE (DPS)    +2.95588868F+ 3

R0053   ************************************************************************

 0054   REF    1             31,2000                      SETLOC F2DPS*31
 0055                        31,2000                      BANK
 0056   REF    1                                          COUNT* $$/F2DPS

 0057                        31,2000   00222 0  TRIMACCL  2DEC*  +3.50132708E- 58+08*    A (T)       +3.50132708E- 1
 0057                        31,2001   33316 0
```

```
P0058   THROTTLING AND THRUST DETECTION PARAMETERS


 0059   REF    2  LAST   39   36,2000                       SETLOC P40S
 0060                         36,2022                       BANK
 0061   REF    2 LAST    39 TO  39:    18     18*           COUNT* $$/P40

 0062                         36,2022   00030 1  THRESH1   DEC     24

 0063                         36,2023   00014 1  THRESH3   DEC     12

 0064   REF    1                 4730            HIRTHROT =        BIT13

 0065   REF    1                 6000                       SETLOC FFTAG5
 0066                            6000                       BANK
 0067   REF    1                                            COUNT* $$/P40

 0068                            6000   00464 1  THRESH2   DEC     308

 0069   REF    1              31,2000                       SETLOC FTHROT
 0070                         31,2002                       BANK
 0071   REF    1                                            COUNT* $$/THROT

 0072                         31,2002   07401 0  FMAXODD   DEC     +         3841              FSAT          +4.81454413E+ 4

 0073                         31,2003   06613 0  FMAXPOS   DEC     +         3467              FMAX          +4.34546769E+ 4

 0074                         31,2004   00010 0  THROTLAG DEC      +            8              TAU (TH)       +0.08 SECONDS
 00745                        31,2005   00307 0  SCALEFAC 2DEC*    +7.97959872E+ 2B-16*        BITPERF       +7.97959872E- 2
 00745                        31,2006   17534 0
 0075   REF    1              32,2000                       SETLOC F2DPS*32
 0076                         32,2000                       BANK
 0077   REF    1                                            COUNT* $$/F2DPS

 0078                         32,2000   00044 1  DPSTHRSH DEC      36               (THRESH1 + THRESH3 FOR P63)
```

```
L        CONTROLLED CONSTANTS                                                                          USER'S PAGE NO.   4      EO S3

P0082    LM HARDWARE-RELATED PARAMETERS


 0083    REF    1                 25,2000                            SETLOC RADARUPT
 0084                             25,2000                            BANK
 0085    REF    1                                                    COUNT* $$/RRUPT

 0086                             25,2000   47777 0  LVELBIAS DEC     -12288          LANDING RADAR BIAS FOR 153.6 KC.

 0087                             25,2001   00001 0  RDOTBIAS 2DEC    17000           BIAS COUNT FOR RR RANGE RATE.
 0087                             25,2002   01150 1

 0088    REF    1                 32,2000                            SETLOC LRS22
 0089                             32,2001                            BANK
 0090    REF    1                                                    COUNT* $$/LRS22

 0091                             32,2001   70123 0  RDOTCONV 2DEC    -.0019135344 B7 CONVERTS RR RDOT READING TO M/CS AT 2(7)
 0091                             32,2002   40702 0
 0092                             32,2003   13337 1  RANGCONV 2DEC    2.859024 B-3    CONVERTS RR RANGE READING TO M. AT 2(-29
 0092                             32,2004   10776 0
 0098    REF    2  LAST    40     33,2000                            SETLOC SERVICES
 0099                             33,2002                            BANK
 0100    REF    2 LAST    40 TO    40:      2      2*                 COUNT* $$/SERV

 0101                             33,2002   51102 0  HBEAMNB  2DEC    -0.7147168647   POS 1 ALT BEAM IN NAV BASE COORDINATES
 0101                             33,2003   42414 0
 0102                             33,2004   75522 0           2DEC    -0.0731086602
 0102                             33,2005   46002 1
 0103                             33,2006   51573 1           2DEC    -0.6955824372
 0103                             33,2007   62362 1

 0104                             33,2010   62770 0  VZBEAMNB 2DEC    -0.4067366430   POS 1 VZ  BEAM
 0104                             33,2011   40667 1
 0105                             33,2012   03034 0           2DEC    +0.0954915028
 0105                             33,2013   21031 0
 0106                             33,2014   35045 0           2DEC    +0.9085409600
 0106                             33,2015   21077 1

 0107                             33,2016   00000 1  VYBEAMNB 2DEC    +0.0            POS 1 VY  BEAM
 0107                             33,2017   00000 1
 0108                             33,2020   37646 1           2DEC    +0.9945218954
 0108                             33,2021   07712 1
 0109                             33,2022   74517 1           2DEC    -0.1045284632
 0109                             33,2023   54765 1

 0110                             33,2024   35167 1  VXBEAMNB 2DEC    +0.9135454576   POS 1 VX BEAM
 0110                             33,2025   20727 1
 0111                             33,2026   01270 0           2DEC    +0.0425155563
 0111                             33,2027   22313 0
 0112                             33,2030   14743 1           2DEC    +0.4045084971
 0112                             33,2031   16747 1
 0113                       33,2032   42001 0            2DEC     -0.9374036070   POS 2 ALT BEAM
 0113                       33,2033   62422 1
 0114                       33,2034   76653 0            2DEC     -0.0364014993
 0114                       33,2035   63102 1
 0115                       33,2036   64725 0            2DEC     -0.3463371311
 0115                       33,2037   63461 1

 0116                       33,2040   00000 1            2DEC     +0.0            POS 2 VZ  BEAM
 0116                       33,2041   00000 1
 0117                       33,2042   03260 0            2DEC     +0.1045284632
 0117                       33,2043   23012 0
 0118                       33,2044   37646 1            2DEC     +0.9945218954
 0118                       33,2045   07712 1

 0119                       33,2046   00000 1            2DEC     +0.0            POS 2 VY BEAM
 0119                       33,2047   00000 1
 0120                       33,2050   37646 1            2DEC     +0.9945218954
 0120                       33,2051   07712 1
 0121                       33,2052   74517 1            2DEC     -0.1045284632
 0121                       33,2053   54765 1

 0122                       33,2054   37777 1            2DEC     +0.9999999999   POS 2 VX  BEAM
 0122                       33,2055   37777 1
 0123                       33,2056   00000 1            2DEC     +0.0
 0123                       33,2057   00000 1
 0124                       33,2060   00000 1            2DEC     +0.0
 0124                       33,2061   00000 1


 0125                       33,2062   65363 1  HSCAL     2DEC     -.3288792       SCALES 1.079 FT/BIT TO 2(22)M.
 0125                       33,2063   64451 0
R0126      ***** THE SEQUENCE OF THE FOLLOWING CONSTANTS MUST BE PRESERVED ********

 0127                       33,2064   21241 0  VZSCAL    2DEC     +.5410829105    SCALES .8668 FT/SEC/BIT TO 2(18) M/CS.
 0127                       33,2065   03216 1

 0128                       33,2066   30153 0  VYSCAL    2DEC     +.7565672446    SCALES 1.212 FT/SEC/BIT TO 2(18) M/CS.
 0128                       33,2067   23101 0

 0129                       33,2070   63105 0  VXSCAL    2DEC     -.4020043770    SCALES -.644 FT/SEC/BIT TO 2(18) M/CS.
 0129                       33,2071   61733 1

R0130      ************************************************************************

 0131                       33,2072   01507 1  KPIP      DEC      .0512           SCALES DELV TO UNITS OF 2(5) M/CS.
 0132                       33,2073   00321 1  KPIP1     2DEC     .0128           SCALES DELV TO UNITS OF 2(7) M/CS.
 0132                       33,2074   26706 1
 0133                       33,2075   00150 0  KPIP2     2DEC     .0064           SCALES DELV TO UNITS OF 2(8) M/CS.
 0133                       33,2076   33343 0
 0136      REF    1         21,2000                      SETLOC R10
 0137                          21,2000                          BANK
 0138    REF    1                                               COUNT* $$/R10

 0139                          21,2000   01507 1  LANAKPIP DEC      .0512            SCALES PIPAS TO UNITS OF 2(5) M/CS

 0140                          21,2001   00466 0  MAXVEL   OCT      00466            198.645 F/S IN UNITS OF 2(5) M/CS

 0141                          21,2002   01034 1  MAXDBITS OCT      01034            ABOUT 300 F/S

 0142                          21,2003   01115 0  VELCONV  DEC      .03594           SCALES VEL AT ONE M/CS TO .5571 F/S/BIT

 0143                          21,2004   05101 1  ALTRCONV DEC      .16020           SCALES ALTR AT 2(2) M/CS TO .5 F/S/BIT

 0144                          21,2005   26305 0  ALTCONV  DEC      .69954           SCALES ALTITUDE AT 2(15) M TO 9.38 F/BIT

 0145    REF    1              20,2000                          SETLOC DAPS3
 0146                          20,2000                          BANK
 0147    REF    1                                               COUNT* $$/DAPAD

 0148                          20,2000   01150 1  TORKJET1 DEC      .03757           550 / .2 SCALED AT (+16) 64 / 180
```

```
P0149   PARAMETERS RELATING TO MASS, INERTIA, AND VEHICLE DIMENSTIONS

 0150   REF    1                05,2000                        SETLOC FRANDRES
 0151                           05,2000                        BANK
 0152   REF    1                                               COUNT* $$/START

 0153                           05,2000   02357 1  FULLAPS     DEC     5050 B-16       NOMINAL FULL ASCENT MASS -- 2(16) KG.

 0154   REF    1                01,2000                        SETLOC LOADDAP1
 0155                           01,2000                        BANK
 0156   REF    1                                               COUNT* $$/R03

 0157                           01,2000   75675 1  MINLMD      DEC     -4360 B-16      MIN. UNSTAGED MASS (6560 KG) - MINMINLM
A01571                                                                                   2(16) KG.
 0158                           01,2001   76731 0  MINMINLM    DEC     -2200 B-16      MIN ASCENT STAGE MASS -- 2(16) KG.

 0159   REF    1                   4732            MINCSM      =       BIT11           MIN CSM MASS (OK FOR 1/ACCS)  = 9050 LBS

 0160   REF    2  LAST    44    20,2000                        SETLOC DAPS3
 0161                           20,2001                        BANK
 0162   REF    2 LAST    44 TO   45:      1     1*             COUNT* $$/DAPAO

 0163                           20,2001   01046 1  LOASCENT    DEC     2200 B-16       MIN ASCENT LEM MASS -- 2(16) KG.

 0164                           20,2002   10117 1  HIDESCNT    DEC     16700 B-16      MAX DESCENT LEM MASS -- 2(16) KG.
 0165                           20,2003   01174 1  LODESCNT    DEC     2542 B-16       MIN DESCENT STAGE (ALONE) -- 2(16) KG
```

```
L        CONTROLLED CONSTANTS                                                                USER'S PAGE NO.   8      E0 S3

P0166    PHYSICAL CONSTANTS ( TIME - INVARIANT )


 0167    REF    1                 37,2000                             SETLOC IMU2
 0168                             37,2000                             BANK
 0169    REF    1                                                     COUNT* $$/P07

 0170                             37,2000   07623 1  OMEG/MS  2DEC    .24339048
 0170                             37,2001   26552 1
 0171    REF    1                 22,2000                             SETLOC R30LOC
 0172                             22,2000                             BANK
 0173    REF    1                                                     COUNT* $$/R30

R0174    *** THE ORDER OF THE FOLLOWING TWO CONSTANTS MUST BE PRESERVED *********

 0175                             22,2000   27533 1  1/RTMUM  2DEC*  .45162595 E-4 B14*
 0175                             22,2001   07571 0
 0176                             22,2002   25004 1  1/RTMUE  2DEC*  .50087529 E-5 B17*
 0176                             22,2003   06702 1
P0177    *************************************************************************

 0178    REF    2  LAST   39      27,2000                             SETLOC P40S1
 0179                             27,2022                             BANK
 0180    REF    1                                                     COUNT* $$/S40.9

 0181                             27,2022   55340 0  EARTHMU  2DEC*  -3.986032 E10 B-36*            M(3)/CS(2)
 0181                             27,2023   61710 0
 0182    REF    2  LAST   39      27,2000                             SETLOC ASENT1
 0183                             27,2024                             BANK
 0184    REF    1                                                     COUNT* $$/P12

 0185                             27,2024   00072 1  MUM(-37) 2DEC*  4.9027780 E8 B-37*
 0185                             27,2025   16206 1
 0186                             27,2026   00344 1  MOONRATE 2DEC*  .26616994890062991 E-7 B+19*  RAD/CS.
 0186                             27,2027   24331 0
 0187    REF    3  LAST   42      33,2000                             SETLOC SERVICES
 0188                             33,2077                             BANK
 0189    REF    3 LAST    42 TO    44:      61     63*                COUNT* $$/SERV

R0190    *** THE ORDER OF THE FOLLOWING TWO CONSTANTS MUST BE PRESERVED *********

 0191                             33,2077   61377 0  -MUDT    2DEC*  -7.9720645 E+12 B-44*
 0191                             33,2100   55754 1
 0192                             33,2101   77644 1  -MUDT1   2DEC*  -9.8055560 E+10 B-44*
 0192                             33,2102   65556 1
R0193    *************************************************************************

 0194                             33,2103   64453 1  -MUDTMUN 2DEC*  -9.8055560 E+10 B-38*
 0194                             33,2104   55670 0
 0195                             33,2105   00002 0  RESQ     2DEC*  40.6809913 E12 B-58*
 0195                             33,2106   11777 0
 0196                           33,2107   01023 1  20J       2DEC    3.24692010 E-2
 0196                           33,2110   37155 1
 0197                           33,2111   00065 1  2J        2DEC    3.24692010 E-3
 0197                           33,2112   06244 0
 0198      REF    1             14,2000                      SETLOC  P50S1
 0199                           14,2000                      BANK
 0200      REF    1                                          COUNT*  $$/LOSAM

 0201                           14,2000   26723 0  RSUBEM    2DEC    384402000 B-29
 0201                           14,2001   00450 0
 0202                           14,2002   00065 1  RSUBM     2DEC    1738090 B-29
 0202                           14,2003   01265 1
 0203                           14,2004   00302 0  RSUBE     2DEC    6378166 B-29
 0203                           14,2005   24533 1
 0204                           14,2006   00052 0  ROE       2DEC    .00257125
 0204                           14,2007   04047 0
 0205      REF    1             04,2000                      SETLOC  CONICS1
 0206                           04,2000                      BANK
 0207      REF    1                                          COUNT*  $$/LT-LG

 0208                           04,2000   00302 0  ERAD      2DEC    6373338 B-29     PAD RADIUS
 0208                           04,2001   17755 0
 0209                           04,2002   00065 1  504RM     2DEC    1738090 B-29     METERS B-29 (EQUATORIAL MOON RADIUS)
 0209                           04,2003   01265 1
 0210      REF    2  LAST   47  04,2000                      SETLOC  CONICS1
 0211                           04,2004                      BANK
 0212      REF    1                                          COUNT*  $$/CONIC

R0213      *** THE ORDER OF THE FOLLOWING CONSTANTS MUST BE PRESERVED *************

 0214                           04,2004   22437 1  MUTABLE   2DEC*   3.986032 E10 B-36* MUE
 0214                           04,2005   16067 1
 0215                           04,2006   15625 1            2DEC*   .25087606 E-10 B+34*      1/MUE
 0215                           04,2007   21042 1
 0216                           04,2010   30276 1            2DEC*   1.99650495 E5 B-18*       SQRT(MUE)
 0216                           04,2011   04773 0
 0217                           04,2012   25004 1            2DEC*   .50087529 E-5 B+17*       1/SQRT(MUE)
 0217                           04,2013   06702 1


 0218                           04,2014   16471 1            2DEC*   4.902778 E8 B-30*         MUM
 0218                           04,2015   01352 1
 0219                           04,2016   21412 0            2DEC*   .203966 E-8 B+28*         1/MUM
 0219                           04,2017   20500 0
 0220                           04,2020   25477 1            2DEC*   2.21422176 E4 B-15*       SQRT(MUM)
 0220                           04,2021   03367 0
 0221                           04,2022   27533 1            2DEC*   .45162595 E-4 B+14*       1/SQRT(MUM)
 0221                           04,2023   07571 0
R0222      ************************************************************************
```

```
0223   REF    1             13,2000                     SETLOC INTINIT
0224                        13,2000                     BANK
0225   REF    1                                         COUNT* $$/INTIN

0226                        13,2000   07112 1  OMEGMOON 2DEC*  2.66169947 E-8 B+23*
0226                        13,2001   06620 0
0227   REF    1             13,2000                     SETLOC ORBITAL2
0228                        13,2002                     BANK
0229   REF    1                                         COUNT* $$/ORBIT

R0230  *** THE ORDER OF THE FOLLOWING CONSTANTS MUST NOT BE CHANGED ***********

0231                        13,2002   27446 1           2DEC*  1.32715445 E16 B-54*       S
0231                        13,2003   14620 0
0232                        13,2004   16471 1  MUM      2DEC*  4.9027780 E8 B-30*         M
0232                        13,2005   01352 1
0233                        13,2006   22437 1  MUEARTH  2DEC*  3.986032 E10 B-36*
0233                        13,2007   16067 1
0234                        13,2010   00000 1           2DEC   0
0234                        13,2011   00000 1
0235                        13,2012   02302 1  J4REQ/J3 2DEC*  .4991607391 E7 B-26*
0235                        13,2013   24736 0
0236                        13,2014   77651 0           2DEC   -176236.02 B-25
0236                        13,2015   76237 0
0237                        13,2016   77776 1  2J3RE/J2 2DEC*  -.1355426363 E5 B-27*
0237                        13,2017   53032 0
0238                        13,2020   10407 0           2DEC*  .3067493316 E18 B-60*
0238                        13,2021   05344 1
0239                        13,2022   13710 0  J2REQSQ  2DEC*  1.75501139 E21 B-72*
0239                        13,2023   35320 0
0240                        13,2024   12160 0  3J22R2MU 2DEC*  9.20479048 E16 B-58*
0240                        13,2025   12124 0
R0241  *************************************************************************

0242   REF    1             27,2000                     SETLOC TOF-FF1
0243                        27,2030                     BANK
0244   REF    1                                         COUNT* $$/TFF

0245                        27,2030   24775 1  1/RTMU   2DEC*  .5005750271 E-5 B17*    MODIFIED EARTH MU
0245                        27,2031   30424 0
0246   REF    1             42,2000                     SETLOC SBAND
0247                        42,2000                     BANK
0248   REF    1                                         COUNT* $$/R05

0249                        42,2000   26723 0  REMDIST  2DEC   384402000 B-29  MEAN DISTANCE BETWEEN EARTH AND MOON.
0249                        42,2001   00450 0
```

```
P0250    PHYSICAL CONSTANTS (TIME - VARIANT)
 0251    REF   1                14,2000                          SETLOC STARTAB
 0252                           14,2010                          BANK
 0253    REF   1                                                 COUNT* $$/STARS

 0254                           14,2010   15264 0               2DEC    +.8345006310 B-1    STAR 37     X
 0254                           14,2011   07253 1
 0255                           14,2012   74133 0               2DEC    -.2388718657 B-1    STAR 37     Y
 0255                           14,2013   45130 1
 0256                           14,2014   70034 1               2DEC    -.4965369357 B-1    STAR 37     Z
 0256                           14,2015   53644 1
 0257                           14,2016   15015 1               2DEC    +.8141988673 B-1    STAR 36     X
 0257                           14,2017   35262 1
 0258                           14,2020   67072 0               2DEC    -.5553601830 B-1    STAR 36     Y
 0258                           14,2021   57521 0
 0259                           14,2022   02552 1               2DEC    +.1692786800 B-1    STAR 36     Z
 0259                           14,2023   27310 0
 0260                           14,2024   07210 0               2DEC    +.4542117996 B-1    STAR 35     X
 0260                           14,2025   34714 1
 0261                           14,2026   67300 0               2DEC    -.5390337930 B-1    STAR 35     Y
 0261                           14,2027   47414 0
 0262                           14,2030   13262 0               2DEC    +.7093195408 B-1    STAR 35     Z
 0262                           14,2031   27671 1
 0263                           14,2032   05101 1               2DEC    +.3205423120 B-1    STAR 34     X
 0263                           14,2033   34175 0
 0264                           14,2034   70717 1               2DEC    -.4434583652 B-1    STAR 34     Y
 0264                           14,2035   46031 1
 0265                           14,2036   62467 0               2DEC    -.8370169081 B-1    STAR 34     Z
 0265                           14,2037   45023 1
 0266                           14,2040   10655 0               2DEC    +.5524232365 B-1    STAR 33     X
 0266                           14,2041   16340 1
 0267                           14,2042   63237 1               2DEC    -.7930716636 B-1    STAR 33     Y
 0267                           14,2043   45012 0
 0268                           14,2044   73711 1               2DEC    -.2566435348 B-1    STAR 33     Z
 0268                           14,2045   62337 1
 0269                           14,2046   07207 0               2DEC    +.4540867784 B-1    STAR 32     X
 0269                           14,2047   34100 1
 0270                           14,2050   61751 0               2DEC    -.8777450759 B-1    STAR 32     Y
 0270                           14,2051   60311 1
 0271                           14,2052   02344 0               2DEC    +.1528685033 B-1    STAR 32     Z
 0271                           14,2053   11437 1
 0272                           14,2054   03243 1               2DEC    +.2074286490 B-1    STAR 31     X
 0272                           14,2055   10132 0
 0273                           14,2056   62031 1               2DEC    -.8718956797 B-1    STAR 31     Y
 0273                           14,2057   55616 0
 0274                           14,2060   70716 0               2DEC    -.4435890882 B-1    STAR 31     Z
 0274                           14,2061   43617 0
 0275                           14,2062   01747 1               2DEC    +.1219537054 B-1    STAR 30     X
 0275                           14,2063   01335 0
 0276                           14,2064   63532 0               2DEC    -.7702168243 B-1    STAR 30     Y
 0276                           14,2065   54217 1
 0277                         14,2066   12010 0          2DEC     +.6260138474 B-1     STAR 30     Z
 0277                         14,2067   11614 1
 0278                         14,2070   76152 0          2DEC     -.1120382967 B-1     STAR 29     X
 0278                         14,2071   45651 1
 0279                         14,2072   60371 1          2DEC     -.9695442116 B-1     STAR 29     Y
 0279                         14,2073   57632 1
 0280                         14,2074   03370 0          2DEC     +.2177876068 B-1     STAR 29     Z
 0280                         14,2075   03556 1
 0281                         14,2076   76127 1          2DEC     -.1142900725 B-1     STAR 28     X
 0281                         14,2077   67425 0
 0282                         14,2100   72436 0          2DEC     -.3400201762 B-1     STAR 28     Y
 0282                         14,2101   61577 0
 0283                         14,2102   61041 0          2DEC     -.9334474056 B-1     STAR 28     Z
 0283                         14,2103   46271 1
 0284                         14,2104   72303 1          2DEC     -.3511952476 B-1     STAR 27     X
 0284                         14,2105   40213 0
 0285                         14,2106   62637 1          2DEC     -.8242322268 B-1     STAR 27     Y
 0285                         14,2107   74356 1
 0286                         14,2110   70711 1          2DEC     -.4441881743 B-1     STAR 27     Z
 0286                         14,2111   46567 1
 0287                         14,2112   67366 0          2DEC     -.5324545035 B-1     STAR 26     X
 0287                         14,2113   44175 1
 0288                         14,2114   64424 1          2DEC     -.7163035719 B-1     STAR 26     Y
 0288                         14,2115   41241 0
 0289                         14,2116   07156 1          2DEC     +.4510004372 B-1     STAR 26     Z
 0289                         14,2117   23036 0
 0290                         14,2120   63330 1          2DEC     -.7860186221 B-1     STAR 25     X
 0290                         14,2121   75735 1
 0291                         14,2122   67512 0          2DEC     -.5221457573 B-1     STAR 25     Y
 0291                         14,2123   62476 0
 0292                         14,2124   05227 0          2DEC     +.3309660611 B-1     STAR 25     Z
 0292                         14,2125   10611 0
 0293                         14,2126   64757 0          2DEC     -.6895375091 B-1     STAR 24     X
 0293                         14,2127   51701 0
 0294                         14,2130   71233 0          2DEC     -.4185354938 B-1     STAR 24     Y
 0294                         14,2131   53334 0
 0295                         14,2132   66425 1          2DEC     -.5910719617 B-1     STAR 24     Z
 0295                         14,2133   76017 0
 0296                         14,2134   66546 0          2DEC     -.5812217481 B-1     STAR 23     X
 0296                         14,2135   64151 0
 0297                         14,2136   73256 1          2DEC     -.2911759648 B-1     STAR 23     Y
 0297                         14,2137   65757 1
 0298                         14,2140   14120 1          2DEC     +.7598669864 B-1     STAR 23     Z
 0298                         14,2141   32444 1
 0299                         14,2142   61251 0          2DEC     -.9168160791 B-1     STAR 22     X
 0299                         14,2143   56124 0
 0300                         14,2144   72307 0          2DEC     -.3506241694 B-1     STAR 22     Y
 0300                         14,2145   65764 1
 0301                         14,2146   74742 0          2DEC     -.1910784362 B-1     STAR 22     Z
 0301                         14,2147   65735 0
 0302                          14,2150   70607 1          2DEC    -.4521486548 B-1    STAR 21     X
 0302                          14,2151   77742 0
 0303                          14,2152   77151 1          2DEC    -.0495728431 B-1    STAR 21     Y
 0303                          14,2153   74615 0
 0304                          14,2154   61600 0          2DEC    -.8905639377 B-1    STAR 21     Z
 0304                          14,2155   60003 1
 0305                          14,2156   60605 1          2DEC    -.9524366380 B-1    STAR 20     X
 0305                          14,2157   64345 1
 0306                          14,2160   77026 0          2DEC    -.0597677121 B-1    STAR 20     Y
 0306                          14,2161   54200 1
 0307                          14,2162   73160 1          2DEC    -.2988181236 B-1    STAR 20     Z
 0307                          14,2163   42475 1
 0308                          14,2164   60430 0          2DEC    -.9657334280 B-1    STAR 19     X
 0308                          14,2165   66614 1
 0309                          14,2166   00653 1          2DEC    +.0521664164 B-1    STAR 19     Y
 0309                          14,2167   13072 0
 0310                          14,2170   04042 0          2DEC    +.2542392790 B-1    STAR 19     Z
 0310                          14,2171   27232 1
 0311                          14,2172   62162 0          2DEC    -.8610673209 B-1    STAR 18     X
 0311                          14,2173   44274 0
 0312                          14,2174   07322 0          2DEC    +.4632386329 B-1    STAR 18     Y
 0312                          14,2175   33165 0
 0313                          14,2176   03265 0          2DEC    +.2096974909 B-1    STAR 18     Z
 0313                          14,2177   32741 1
 0314                          14,2200   63467 1          2DEC    -.7745052221 B-1    STAR 17     X
 0314                          14,2201   50064 0
 0315                          14,2202   11655 1          2DEC    +.6149043688 B-1    STAR 17     Y
 0315                          14,2203   11373 0
 0316                          14,2204   75477 1          2DEC    -.1484394758 B-1    STAR 17     Z
 0316                          14,2205   77366 1
 0317                          14,2206   70425 0          2DEC    -.4661511162 B-1    STAR 16     X
 0317                          14,2207   51217 1
 0318                          14,2210   07505 0          2DEC    +.4772744503 B-1    STAR 16     Y
 0318                          14,2211   32504 1
 0319                          14,2212   13726 0          2DEC    +.7449243154 B-1    STAR 16     Z
 0319                          14,2213   15341 0
 0320                          14,2214   72157 1          2DEC    -.3613649782 B-1    STAR 15     X
 0320                          14,2215   66255 0
 0321                          14,2216   11142 0          2DEC    +.5745656444 B-1    STAR 15     Y
 0321                          14,2217   32737 0
 0322                          14,2220   64200 1          2DEC    -.7343634472 B-1    STAR 15     Z
 0322                          14,2221   43016 1
 0323                          14,2222   71316 0          2DEC    -.4122762536 B-1    STAR 14     X
 0323                          14,2223   64201 0
 0324                          14,2224   16400 1          2DEC    +.9063680102 B-1    STAR 14     Y
 0324                          14,2225   36737 1
 0325                          14,2226   01364 1          2DEC    +.0923326629 B-1    STAR 14     Z
 0325                          14,2227   14350 1
 0326                          14,2230   75051 1          2DEC    -.1824340636 B-1    STAR 13     X
 0326                          14,2231   60001 0
 0327                            14,2232   17027 1          2DEC      +.9404062129 B-1     STAR 13      Y
 0327                            14,2233   31661 1
 0328                            14,2234   73321 0          2DEC      -.2869738089 B-1     STAR 13      Z
 0328                            14,2235   43422 1
 0329                            14,2236   77007 0          2DEC      -.0616090080 B-1     STAR 12      X
 0329                            14,2237   51442 1
 0330                            14,2240   11514 1          2DEC      +.6031289258 B-1     STAR 12      Y
 0330                            14,2241   32502 1
 0331                            14,2242   63215 1          2DEC      -.7952608559 B-1     STAR 12      Z
 0331                            14,2243   47106 0
 0332                            14,2244   02140 0          2DEC      +.1367280274 B-1     STAR 11      X
 0332                            14,2245   02335 0
 0333                            14,2246   12716 1          2DEC      +.6814364033 B-1     STAR 11      Y
 0333                            14,2247   12356 1
 0334                            14,2250   13401 0          2DEC      +.7189922632 B-1     STAR 11      Z
 0334                            14,2251   37404 0
 0335                            14,2252   03154 1          2DEC      +.2007345455 B-1     STAR 10      X
 0335                            14,2253   15267 0
 0336                            14,2254   17403 0          2DEC      +.9691236271 B-1     STAR 10      Y
 0336                            14,2255   01743 0
 0337                            14,2256   75552 1          2DEC      -.1431958012 B-1     STAR 10      Z
 0337                            14,2257   76050 0
 0338                            14,2260   05465 0          2DEC      +.3502769546 B-1     STAR  9      X
 0338                            14,2261   17001 0
 0339                            14,2262   16221 1          2DEC      +.8927907521 B-1     STAR  9      Y
 0339                            14,2263   27572 1
 0340                            14,2264   04420 0          2DEC      +.2832502918 B-1     STAR  9      Z
 0340                            14,2265   14273 1
 0341                            14,2266   06440 1          2DEC      +.4101921571 B-1     STAR  8      X
 0341                            14,2267   11323 0
 0342                            14,2270   07767 0          2DEC      +.4989947555 B-1     STAR  8      Y
 0342                            14,2271   30366 1
 0343                            14,2272   14155 0          2DEC      +.7633784305 B-1     STAR  8      Z
 0343                            14,2273   23047 0
 0344                            14,2274   13176 0          2DEC      +.7028937840 B-1     STAR  7      X
 0344                            14,2275   03307 0
 0345                            14,2276   13247 1          2DEC      +.7078988678 B-1     STAR  7      Y
 0345                            14,2277   03342 1
 0346                            14,2300   01070 1          2DEC      +.0694227718 B-1     STAR  7      Z
 0346                            14,2301   26607 1
 0347                            14,2302   10557 1          2DEC      +.5448995598 B-1     STAR  6      X
 0347                            14,2303   32115 0
 0348                            14,2304   10404 0          2DEC      +.5317389073 B-1     STAR  6      Y
 0348                            14,2305   00124 0
 0349                            14,2306   65500 1          2DEC      -.6483349473 B-1     STAR  6      Z
 0349                            14,2307   72703 0
 0350                            14,2310   00151 1          2DEC      +.0128995818 B-1     STAR  5      X
 0350                            14,2311   25431 0
 0351                            14,2312   00077 1          2DEC      +.0078096205 B-1     STAR  5      Y
 0351                            14,2313   37176 0
 0352                       14,2314   17777 0          2DEC    +.9998862988 B-1    STAR  5    Z
 0352                       14,2315   02143 0
 0353                       14,2316   07675 1          2DEC    +.4918322686 B-1    STAR  4    X
 0353                       14,2317   02702 0
 0354                       14,2320   03420 1          2DEC    +.2207092653 B-1    STAR  4    Y
 0354                       14,2321   01470 0
 0355                       14,2322   62414 1          2DEC    -.8422520048 B-1    STAR  4    Z
 0355                       14,2323   50541 1
 0356                       14,2324   07506 0          2DEC    +.4773424940 B-1    STAR  3    X
 0356                       14,2325   14361 0
 0357                       14,2326   01674 0          2DEC    +.1168141178 B-1    STAR  3    Y
 0357                       14,2327   36075 0
 0358                       14,2330   15736 1          2DEC    +.8709182540 B-1    STAR  3    Z
 0358                       14,2331   21775 1
 0359                       14,2332   16745 0          2DEC    +.9342466124 B-1    STAR  2    X
 0359                       14,2333   13112 1
 0360                       14,2334   02620 1          2DEC    +.1739271769 B-1    STAR  2    Y
 0360                       14,2335   31757 0
 0361                       14,2336   73011 0          2DEC    -.3113400137 B-1    STAR  2    Z
 0361                       14,2337   60052 0
 0362                       14,2340   15776 0          2DEC    +.8747608555 B-1    STAR  1    X
 0362                       14,2341   01237 0
 0363                       14,2342   00330 1          2DEC    +.0264803244 B-1    STAR  1    Y
 0363                       14,2343   35521 1
 0364                       14,2344   07573 1          2DEC    +.4838307948 B-1    STAR  1    Z
 0364                       14,2345   21256 0
 0365                       14,2346   16004 1 CATLOG   DEC     7172
R0366    ************************************************************************


 0367    REF   1            05,2000                    SETLOC EPHEM1
 0368                       05,2001                    BANK
 0369    REF   1                                       COUNT* $$/EPHEM

 0370                       05,2001   20000 0 KONMAT   2DEC    1.0 B-1                     ************
 0370                       05,2002   00000 1
 0371                       05,2003   00000 1          2DEC    0                                       *
 0371                       05.2004   00000 1
 0372                       05,2005   00000 1          2DEC    0                                       *
 0372                       05,2006   00000 1
 0373                       05,2007   00000 1          2DEC    0                                       *
 0373                       05,2010   00000 1
 0374                       05,2011   16533 0          2DEC*   .917456380 B-1*   K1 = COS (OBL)
 0374                       05,2012   31537 1
 0375                       05,2013   77333 1          2DEC*   -.035679339 B-1*  K2 = SIN (OBL) SIN (IM) (-1)
 0375                       05,2014   66677 1
 0376                       05,2015   00000 1          2DEC    0                                       *
 0376                       05,2016   00000 1
 0377                       05,2017   06273 1          2DEC*   .397836387  B-1*  K3 = SIN (OBL)
 0377                       05,2020   02330 0
 0378                          05,2021    01242 1              2DEC*   .082280652   B-1*   K4 = COS (OBL) SIN (IM)
 0378                          05,2022    01302 1
 03785   REF    1              15,2000                         SETLOC  EPHEM
 03786                         15,2000                         BANK
 0379                          15,2000    00040 0   CSTDDAY    2DEC    8640000 B-32                                        * NOTE            *
 0379                          15,2001    36540 0
 0380                          15,2002    00002 0   RCB-13     OCT     00002                                               * TABLES CONTAIN  *
 0381                          15,2003    00000 1              OCT     00000                                               * CONSTANTS FOR   *
 03815   REF    1              04,2000                         SETLOC  EPHEM2
 03816                         04,2024                         BANK
 0382                          04,2024    22572 1   RATESP     2DEC*   .036600997   B+4*   LOMR
 0382                          04,2025    27325 0
 0383                          04,2026    01315 1              2DEC*   .002737803   B+4*   LOSR
 0383                          04,2027    26266 1
 0384                          04,2030    77731 1              2DEC*   -.00014720   B+4*   LONR
 0384                          04,2031    55144 0
 0385                          04,2032    21056 1              2DEC    .534104635          LOMO
 0385                          04,2033    30515 0
 0386                          04,2034    10576 1              2DEC    .273331484          LOSO
 0386                          04,2035    10326 1
 0387                          04,2036    34076 1              2DEC    .878830860          LONO
 0387                          04,2037    30363 1
 03872   REF    2  LAST    53  05,2000                         SETLOC  EPHEM1
 03873                         05,2023                         BANK
 0388                          05,2023    01076 1   VAL67      2DEC*   .017519236   B+1*   AMOD
 0388                          05,2024    02200 1
 0389                          05,2025    00621 1              2DEC    .024523430          AARG
 0389                          05,2026    31256 1
 0390                          05,2027    02245 0              2DEC*   .036291713   B+1*   1/27
 0390                          05,2030    06475 1
 0391                          05,2031    00161 1              2DEC*   .003473642   B+1*   BMOD
 0391                          05,2032    32301 1
 0392                          05,2033    21230 0              2DEC    .540564756          BARG
 0392                          05,2034    23473 0
 0393                          05,2035    02000 0              2DEC*   .031250000   B+1*   1/32
 0393                          05,2036    00000 1
 0394                          05,2037    00256 0              2DEC*   .005320572   B+1*   CMOD
 0394                          05,2040    13014 0
 0395                          05,2041    77500 1              2DEC    -.011706923         CARG
 0395                          05,2042    46146 0
 0396                          05,2043    00131 1              2DEC*   .002737925   B+1*   1/365
 0396                          05,2044    26730 1
R0397    ****************************************************************************


 0398    REF    1              26,2000                         SETLOC  PLANTIN2
 0399                          26,2000                         BANK
 0400    REF    1                                              COUNT*  $$/LUROT

 0401                          26,2000    17775 1   COSI       2DEC*   9.996417320 E-1 B-1*     COS (5521.5 SEC.)
 0401                          26,2001    02052 1
```

```
0402                        26,2002   00333 1  SINI      2DEC*  2.676579050 E-2 B-1*     SIN (5521.5 SEC.)
0402                        26,2003   10374 0
0403                        26,2004   77665 1  NODDOT    2DEC*  -1.703706128 E-11 B28*       REV/CSEC
0403                        26,2005   42175 1
0404                        26,2006   22211 0  FDOT      2DEC*  4.253263471 E-9  B27*          REV/CSEC
0404                        26,2007   00636 1
0405                        26,2010   77777 0  BDOT      2DEC*  -1.145531390 E-16 B28*       REV/CSEC
0405                        26,2011   77767 1
0406                        26,2012   34076 1  NODIO     2DEC*  8.788308600 E-1  B 0*         REV
0406                        26,2013   30363 1
0407                        26,2014   24760 0  FSUBO     2DEC*  6.552737750 E-1  B 0*         REV
0407                        26,2015   00133 0
0408                        26,2016   02052 1  BSUBO     2DEC*  6.511941688 E-2  B 0*         REV
0408                        26,2017   35250 0
0409                        26,2020   37116 0  WEARTH    2DEC*  1.160576171 E-7  B23*          REV/CSEC
0409                        26,2021   32631 1
0410                        26,2022   30576 0  AZO       2DEC*  7.733314844 E-1  B 0*         REVS
0410                        26,2023   10326 1
```

```
A000001
R000002      ***  CHANNEL DESCRIPTIONSF WORDS ARE ALLOCATED IN ERASABLE ASSIGNMENTS ***


R000005           CHANNEL 1     IDENTICAL TO COMPUTER REGISTER L (0001)
A0001

R0002             CHANNEL 2     IDENTICAL TO COMPUTER REGISTER Q (0002)
A0003

R0004             CHANNEL 3     HISCALAR; INPUT CHANNEL; MOST SIGNIFICANT 14 BITS FROM 33 STAGE BINARY COUNTER. SCALE
R0006                           FACTOR IS B23 IN CSEC, SO MAX VALUE ABOUT 23.3 HOURS AND LEAST SIGNIFICANT BIT 5.12 SECS.
A0008

R0009             CHANNEL 4     LOSCALAR; INPUT CHANNEL; NEXT MOST SIGNIFICANT 14 BITS FROM THE 33 STAGE BINARY COUNTER
R0011                           ASSOCIATED WITH CHANNEL 3. SCALE FACTOR IS B9 IN  CSEC. SO MAX VAL IS 5.12 SEC AND LEAST
R0013                           SIGNIFICANT BIT IS 1/3200 SEC. SCALE FACTOR OF D.P. WORD WITH CHANNEL 3 IS B23 CSEC.
A0015

R0016             CHANNEL 5     PYJETS; OUTPUT CHANNEL; PITCH RCS JET CONTROL.   (REACTION CONTROL SYSTEM) USES BITS 1-8.
A0018

R0019             CHANNEL 6     ROLLJETS; OUTPUT CHANNEL; ROLL RCS JET CONTROL.   (REACTION CONTROL SYSTEM) USES BIT 1-8.
A0021

R0022             CHANNEL 7     SUPERBNK; OUTPUT CHANNEL; NOT RESET BY RESTART;   FIXED EXTENSION BITS USED TO SELECT THE
R0024                           APPROPRIATE FIXED MEMORY BANK IF FBANK IS 30 OCTAL OR MORE. USES BITS 5-7.
A0026

R0027             CHANNEL 10    OUT0; OUTPUT CHANNEL; REGISTER USED TO TRANSMIT   LATCHING-RELAY DRIVING INFORMATION FOR
R0029                           THE DISPLAY SYSTEM. BITS 15-12 ARE SET TO THE ROW NUMBER (1-14 OCTAL) OF THE RELAY TO BE
R0031                           CHANGED AND BITS 11-1 CONTAIN THE REQUIRED SETTINGS FOR THE RELAYS IN THE ROW.
A0033

R0034             CHANNEL 11    DSALMOUT; OUTPUT CHANNEL; REGISTER WHOSE BITS ARE USED FOR ENGINE ON-OFF CONTROL AND TO
R0036                           DRIVE INDIVIDUAL INDICATORS OF THE DISPLAY SYSTEM. BITS 1-7 ARE A RELAYS.
A0038
R0039               BIT 1       ISS WARNING
A0040
R0041               BIT 2       LIGHT COMPUTER ACTIVITY LAMP
A0042
R0043               BIT 3       LIGHT UPLINK ACTIVITY LAMP
A0044
R0045               BIT 4       LIGHT TEMP CAUTION LAMP
A0046
R0047               BIT 5       LIGHT KEYBOARD RELEASE LAMP
A0048
R0049               BIT 6       FLASH VERB AND NOUN LAMPS
A0050
R0051               BIT 7       LIGHT OPERATOR ERROR LAMP
```

```
L        INPUT/OUTPUT CHANNEL BIT DESCRIPTIONS                                       USER'S PAGE NO.   2        E0 S4

A0052
R0053                BIT 8       SPARE
A0054
R0055                BIT 9       TEST CONNECTOR OUTBIT
A0056
R0057                BIT 10      CAUTION RESET
A0058
R0059                BIT 11      SPARE
A0060
R0061                BIT 12      SPARE
A0062
R0063                BIT 13      ENGINE ON
A0064
R0065                BIT 14      ENGINE OFF
A0066
R0067                BIT 15      SPARE
A0068

R0069              CHANNEL 12    CHAN12; OUTPUT CHANNEL; BITS USED TO DRIVE NAVIGATION AND SPAECRAFT HARDWARE
A0071
R0072                BIT 1       ZERO RR CDU; CDU'S GIVE RRADAR INFORMATION FOR LM
A0073
R0074                BIT 2       ENABLE CDU RADAR ERROR COUNTERS
A0075
R0076                BIT 3       NOT USED
A0077
R0078                BIT 4       COARSE ALIGN ENABLE OF IMU
A0079
R0080                BIT 5       ZERO IMU CDU'S
A0081
R0082                BIT 6       ENABLE IMU ERROR COUNTER, CDU ERROR COUNTER.
A0083
R0084                BIT 7       SPARE
A0085
R0086                BIT 8       DISPLAY INERTIAL DATA
A0087
R0088                BIT 9       -PITCH GIMBAL TRIM (BELL MOTION) DESCENT ENGINE
A0089
R0090                BIT 10      +PITCH GIMBAL TRIM (BELL MOTION) DESCENT ENGINE
A0091
R0092                BIT 11      -ROLL  GIMBAL TRIM (BELL MOTION) DESCENT ENGINE
A0093
R0094                BIT 12      +ROLL  GIMBAL TRIM (BELL MOTION) DESCENT ENGINE
A0095
R0096                BIT 13      LR POSITION 2 COMMAND
A0097
R0098                BIT 14      ENABLE RENDESVOUS RADAR LOCK-ON;AUTO ANGLE TRACK'G
A0099
R0100                BIT 15      ISS TURN ON DELAY COMPLETE
A0101
```

```
R0102             CHANNEL 13   CHAN13; OUTPUT CHANNEL
A0103
R0104               BIT 1      RADAR C         PROPER SETTING OF THE A,B,C MATRIX
R0105               BIT 2      RADAR B         SELECTS CERTAIN RADAR
R0106               BIT 3      RADAR A         PARAMETERS TO BE READ.
A0107
R0108               BIT 4      RADAR ACTIVITY
A0109
R0110               BIT 5      NOT USED (CONNECTS AN ALTERNATE INPUT TO UPLINK)
A0111
R0112               BIT 6      SPARE
A0113
R0114               BIT 7      DOWNLINK TELEMETRY WORD ORDER CODE BIT
A0115
R0116               BIT 8      RHC COUNTER ENABLE (READ HAND CONTROLLER ANGLES)
A0117
R0118               BIT 9      START RHC READ INTO COUNTERS IF BIT 8 SET
A0119
R0120               BIT 10     TEST ALARMS, TEST DSKY LIGHTS
A0121
R0122               BIT 11     ENABLE STANDBY
A0123
R0124               BIT 12     RESET TRAP 31-A     ALWAYS APPEAR TO BE SET TO 0
A0125
R0126               BIT 13     RESET TRAP 31-B     ALWAYS APPEAR TO BE SET TO 0
A0127
R0128               BIT 14     RESET TRAP 32       ALWAYS APPEAR TO BE SET TO 0
A0129
R0130               BIT 15     ENABLE T6 RUPT
A0131

R0132             CHANNEL 14   CHAN14; OUTPUT CHANNEL; USED TO CONTROL COMPUTER  COUNTER CELLS (CDU,GYRO,SPACECRAFT FUNC.
A0134
R0135               BIT 1      OUTLINK ACTIVITY (NOT USED)
A0136
R0137               BIT 2      ALTITUDE RATE OR ALTITUDE SELECTOR
A0138
R0139               BIT 3      ALTITUDE METER ACTIVITY
A0140
R0141               BIT 4      THRUST DRIVE ACTIVITY FOR DESCENT ENGINE
A0142
R0143               BIT 5      SPARE
A0144
R0145               BIT 6      GYRO ENABLE POWER FOR PULSES
A0146
R0147               BIT 7      GYRO SELECT B    PAIR OF BITS IDENTIFIES AXIS OF -
R0148               BIT 8      GYRO SELECT A    GYRO SYSTEM TO BE TORQUED.
A0149
R0150               BIT 9      GYRO TORQUING COMMAND IN NEGATIVE DIRECTION
A0151
```

```
R0152             BIT 10      GYRO ACTIVITY
A0153
R0154             BIT 11      DRIVE CDU S
A0155
R0156             BIT 12      DRIVE CDU T
A0157
R0158             BIT 13      DRIVE CDU Z
A0159
R0160             BIT 14      DRIVE CDU Y
A0161
R0162             BIT 15      DRIVE CDU X
A0163

R0164         CHANNEL 15      MNKEYIN; INPUT CHANNEL;KEY CODE INPUT FROM KEYBOARD OF DSKY, SENSED BY PROGRAM WHEN
R0166                         PROGRAM INTERRUPT #5 IS RECEIVED. USES BITS 5-1
A0167

R0168         CHANNEL 16      NAVKEYIN; INPUT CHANNEL; OPTICS MARK INFORMATION AND NAVIGA ION PANEL DSKY (CM) OR THRUST
R0170                         CONTROL (LM) SENSED BY PROGRAM WHEN PROGRAM INTER-RUPT #6 IS RECEIVED. USES BITS 3-7 ONLY.
A0172
R0173             BIT 1       NOT ASSIGNED
A0174
R0175             BIT 2       NOT ASSIGNED
A0176
R0177             BIT 3       OPTICS X-AXIS MARK SIGNAL FOR ALIGN OPTICAL TSCOPE
A0178
R0179             BIT 4       OPTICS Y-AXIS MARK SIGNAL FOR AOT
A0180
R0181             BIT 5       OPTICS MARK REJECT SIGNAL
A0182
R0183             BIT 6       DESCENT+ ; CREW DESIRED SLOWING RATE OF DESCENT
A0184
R0185             BIT 7       DESCENT- ; CREW DESIRED SPEEDING UP RATE OF D'CENT
A0186

R0187         NOTE: ALL BITS IN CHANNELS 30-33 ARE INVERTED AS SENSED BY THE  PROGRAM, SO THAT A VALUE OF ZERO MEANS
R0189         THAT THE INDICATED SIGNAL IS PRESENT.
A0190

R0191         CHANNEL 30      INPUT CHANNEL
A0192
R0193             BIT 1       ABORT WITH DESCENT STAGE
A0194
R0195             BIT 2          UNUSED
A0196
R0197             BIT 3       ENGINE ARMED SIGNAL
A0198
R0199             BIT 4       ABORT WITH ASCENT ENGINE STAGE
A0200
R0201             BIT 5       AUTO THROTTLE; COMPUTER CONTROL OF DESCENT ENGINE
```

```
A0202
R0203              BIT 6        DISPLAY INERTIAL DATA
A0204
R0205              BIT 7        RR CDU FAIL
A0206
R0207              BIT 8        SPARE
A0208
R0209              BIT 9        IMU OPERATE WITH NO MALFUNCTION
A0210
R0211              BIT 10       LM COMPUTER (NOT AGS) HAS CONTROL OF LM
A0212
R0213              BIT 11       IMU CAGE COMMAND TO DRIVE IMU GIMBAL ANGLES TO 0.
A0214
R0215              BIT 12       IMU CDU FAIL (MALFUNCTION OF IMU CDU,S)
A0216
R0217              BIT 13       IMU FAIL (MALFUNCTION OF IMU STABILIZATION LOOPS)
A0218
R0219              BIT 14       ISS TURN ON REQUESTED
A0220
R0221              BIT 15       TEMPERATURE OF STABLE MEMBER WITHIN DESIGN LIMITS
A0222

R0223            CHANNEL 31     INPUT CHANNEL; BITS ASSOCIATED WITH THE ATTITUDE  CONTROLLER, TRANSLATIONAL CONTROLLER,
R0225                           AND SPACECRAFT ATTITUDE CONTROL; USED BY RCS DAP
A0226
R0227              BIT 1        ROTATION (BY RHC) COMMANDED IN POSITIVE PITCH DIRECTION; MUST BE IN MINIMUM IMPULSE MODE.
R0229                           ALSO POSITIVE ELEVATION CHANGE FOR LANDING POINT  DESIGNATOR
A0231
R0232              BIT 2        AS BIT 1 EXCEPT NEGATIVE PITCH AND ELEVATION
A0233
R0234              BIT 3        ROTATION (BY RHC) COMMANDED IN POSITIVE YAW DIRECTION; MUST BE IN MINUMUM IMPULSE MODE.
A0236
R0237              BIT 4        AS BIT 3 EXCEPT NEGATIVE YAW
A0238
R0239              BIT 5        ROTATION (BY RHC) COMMANDED IN POSITIVE ROLL DIRECTION; MUST BE IN MINIMUM IMPULSE MODE.
R0241                           ALSO POSITIVE AZIMUTH CHANGE FOR LANDING POINT DESIGNATOR
A0243
R0244              BIT 6        AS BIT 5 EXCEPT NEGATIVE ROLL AND AZIMUTH
A0245
R0246              BIT 7        TRANSLATION IN +X DIRECTION COMMANDED BY THC
A0247
R0248              BIT 8        TRANSLATION IN -X DIRECTION COMMANDED BY THC
A0249
R0250              BIT 9        TRANSLATION IN +Y DIRECTION COMMANDED BY THC
A0251
R0252              BIT 10       TRANSLATION IN -Y DIRECTION COMMANDED BY THC
A0253
R0254              BIT 11       TRANSLATION IN +Z DIRECTION COMMANDED BY THC
A0255
R0256              BIT 12       TRANSLATION IN -Z DIRECTION COMMANDED BY THC
```

```
A0257
R0258            BIT 13     ATTITUDE HOLD MODE ON SCS MODE CONTROL SWITCH
A0259
R0260            BIT 14     AUTO STABILIZATION OF ATTITUDE ON SCS MODE SWITCH
A0261
R0262            BIT 15     ATTITUDE CONTROL OUT OF DETENT (RHC NOT IN NEUTRAL
A0263

R0264         CHANNEL 32       INPUT CHANNEL.
A0265
R0266            BIT 1         THRUSTERS 2 & 4 DISABLED BY CREW
A0267
R0268            BIT 2         THRUSTERS 5 & 8 DISABLED BY CREW
A0269
R0270            BIT 3         THRUSTERS 1 & 3 DISABLED BY CREW
A0271
R0272            BIT 4         THRUSTERS 6 & 7 DISABLED BY CREW
A0273
R0274            BIT 5         THRUSTERS 14 & 16 DISABLED BY CREW
A0275
R0276            BIT 6         THRUSTERS 13 & 15 DISABLED BY CREW
A0277
R0278            BIT 7         THRUSTERS 9  & 12 DISABLED BY CREW
A0279
R0280            BIT 8         THRUSTERS 10 & 11 DISABLED BY CREW
A0281
R0282            BIT 9         DESCENT ENGINE GIMBALS DISABLED BY CREW
A0284
R0285            BIT 10        APPARENT DESCENT ENGINE GIMBAL FAILURE
A0286
R0287            BIT 14     INDICATES PROCEED KEY IS DEPRESSED
A0288

R0289         CHANNEL 33    CHAN33; INPUT CHANNEL; FOR HARDWARE STATUS AND COMMAND INFORMATION. BITS 15-11 ARE FLIP-
R0291                       FLOP BITS RESET BY A CHANNEL "WRITE" COMMAND THAT ARE RESET BY A RESTART & BY T4RUPT LOOP.
A0293
R0294            BIT 1      SPARE
A0295
R0296            BIT 2      RR AUTO-POWER ON
A0297
R0298            BIT 3      RR RANGE LOW SCALE
A0299
R0300            BIT 4      RR DATA GOOD
A0301
R0302            BIT 5      LR RANGE DATA GOOD
A0303
R0304            BIT 6      LR POS1
A0305
R0306            BIT 7      LR POS2
A0307
```

```
L       INPUT/OUTPUT CHANNEL BIT DESCRIPTIONS                                          USER'S PAGE NO.   7       EO S4

R0308                  BIT 8       LR VEL DATA GOOD
A0309
R0310                  BIT 9       LR RANGE LOW SCALE
A0311
R0312                  BIT 10      BLOCK UPLINK INPUT
A0313
R0314                  BIT 11      UPLINK TOO FAST
A0315
R0316                  BIT 12      DOWNLINK TOO FAST
A0317
R0318                  BIT 13      PIPA FAIL
A0319
R0320                  BIT 14      WARNING OF REPEATED ALARMS: RESTART,COUNTER FAIL, VOLTAGE FAIL,AND SCALAR DOUBLE.
A0322
R0323                  BIT 15      LGC OSCILLATOR STOPPED
A0324

R0325              CHANNEL 34   DNT M1; OUTPUT CHANNEL; DOWNLINK 1  FIRST OF TWO WORDS SERIALIZATION.
R0328              CHANNEL 35   DNT M2; OUTPUT CHANNEL DOWNLINK 2 SOCOND OF TWO   WORDS SERIALIZATION.
A0330
```

```
L        FLAGWORD ASSIGNMENTS                                                  USER'S PAGE NO.   1        FO S4

A0001


R0002              FLAGWORDS 0-11 ARE DOWNLINKED AND CAN BE SET AND CLEARED BY UP-FLAG AND DOWN-FLAG INSTRUCTIONS IN THE
R0004                             INTERPRETER. THESE WERE PREVIOUSLY LISTED UNDER "INTERPRETIVE SWITCH BIT ASSIGNMENTS" IN
R0006                             THE ERASABLE LOG SECTION. FLAGWORDS 12 & 13 WEREPREVIOUSLY RADMODES AND DAPBOOLS AND
R0008                             ARE STILL DOWNLINKED UNDER THOSE NAMES.


A0009

R0010              ALPHABETICAL LIST OF FLAGWORDS


R00105  9               25               41                   61        COLUMN NO.
R0011   FLAGWORD        DEC. NUMBER      BIT AND FLAG         BIT NAME

R00111  ABTTGFLG        143              BIT 7 FLAG 9         ABTTGBIT
R0012   ACCOKFLG        207              BIT 3  FLAG 13       ACCSOKAY
R0013   ACC4-2FL        199              BIT 11 FLAG 13       ACC4OR2X
R0014   ACMODFLG        032              BIT 13 FLAG 2        ACMODBIT
R0015   ALTSCALE        186              BIT 9  FLAG 12       ALTSCBIT
R0016   ANTENFLG        183              BIT 12 FLAG 12       ANTENBIT
R0017   AORBSFLG        085              BIT 5 FLAG 5         AORBSYST
R0018   AORBTFLG        200              BIT 10 FLAG 13       AORBTRAN
R0019   APSLSW          130              BIT 5  FLAG 8        APSESBIT
R0020   APSFLAG         152              BIT 13 FLAG 10       APSFLBIT
R0021   ASTNFLAG        108              BIT 12 FLAG 7        ASTNBIT
R0022   ATTFLAG         104              BIT 1  FLAG 6        ATTFLBIT
R0023   AUTOMODE        193              BIT 2  FLAG 12       AUTOMBIT
R0024   AUTR1FLG        209              BIT 1  FLAG 13       AUTRATE1
R0025   AUTR2FLG        208              BIT 2  FLAG 13       AUTRATE2
R0026   AUXFLAG         103              BIT 2  FLAG 6        AUXFLBIT
R0027   AVEGFLAG        115              BIT 5  FLAG 7        AVEGFBIT
R0028   AVEMIDSW        149              BIT 1  FLAG 9        AVEMDBIT
R0029   AVFLAG          040              BIT 5  FLAG 2        AVFLBIT
R0030   CALCMAN2        043              BIT 2  FLAG 2        CALC2BIT
R0031   CALCMAN3        042              BIT 3  FLAG 2        CALC3BIT
R0032   CDESFLAG        180              BIT 15 FLAG 12       CDESBIT
R0033   CMOONFLG        123              BIT 12 FLAG 8        CMOONBIT
R0034   COGAFLAG        131              BIT 4  FLAG 8        COGAFBIT
R0035   CONTRLFL        163              BIT2  FLAG 10        CONTRLBT
R0037   CSMDKFLG        197              BIT 13 FLAG 13       CSMDOCKD
R0038   CULTFLAG        053              BIT 7  FLAG 3        CULTBIT
R0040   DAPBOOLS                         FLGWRD13
R0041   DBSELFLG        206              BIT 4  FLAG 13       DBSELECT
R00411  DBSL2FLG        205              BIT 5 FLAG 13        DBSLECT2
R0042   DESIGFLG        185              BIT 10 FLAG 12       DESIGBIT
R0043   DIDFLAG         016              BIT 14 FLAG 1        DIDFLBIT
R0044   DIMOFLAG        059              BIT 1  FLAG 3        DIMOBIT
```

```
L        FLAGWORD ASSIGNMENTS                                                       USER'S PAGE NO.   2       FO S4

R0045    DMENFLG            081              BIT 9   FLAG 5        DMENFBIT
R0046    DRIFTDFL           202              BIT 3   FLAG 13       DRIFTBIT
R0047    DRIFTFLG           030              BIT 15  FLAG 2        DRFTBIT
R0048    DSKYFLAG           075              BIT 15  FLAG 5        DSKYFBIT
R0049    D6OR9FLG           058              BIT 2   FLAG 3        D6OR9BIT
R0050    ENGONFLG           083              BIT 7   FLAG 5        ENGONBIT
R0051    ERADFLAG           017              BIT 13  FLAG 1        ERADFBIT
R0052    ETPIFLAG           038              BIT 7   FLAG 2        ETPIBIT
R0054    FINALFLG           039              BIT 6   FLAG 2        FINALBIT
R0056    FLAGWRD0           (000-014)        (STATE +0)
R0057    FLAGWRD1           (015-029)        (STATE +1)
R0058    FLAGWRD2           (030-044)        (STATE +2)
R0059    FLAGWRD3           (045-059)        (STATE +3)
R0060    FLAGWRD4           (060-074)        (STATE +4)
R0061    FLAGWRD5           (075-089)        (STATE +5)
R0062    FLAGWRD6           (090-104)        (STATE +6)
R0063    FLAGWRD7           (105-119)        (STATE +7)
R0064    FLAGWRD8           (120-134)        (STATE +8D)
R0065    FLAGWRD9           (135-149)        (STATE +9D)
R0066    FLAP               142              BIT 8   FLAG 9        FLAPBIT
R0067    FLGWRD10           (150-164)        (STATE +10D)
R0068    FLGWRD11           (165-179)        (STATE +11D)
R0069    FLGWRD12           (180-194)        (STATE +12D)
R0070    FLGWRD13           (195-209)        (STATE +13D)
R0071    FLPC               138              BIT 12  FLAG 9        FLPCBIT
R0072    FLPI               139              BIT 11  FLAG 9        FLPIBIT
R0073    FLRCS              149              BIT 10  FLAG 9        FLRCSBIT
R00735   FLT59FLG           146              BIT 4 FLAG 9          FLT59BIT
R0074    FLUNDISP           125              BIT 10  FLAG 8        FLUNDBIT
R0075    FLVR               136              BIT 14  FLAG 9        FLVRBIT
R0077    FREEFLAG           012              BIT 3   FLAG 0        FREEFBIT
R00773   FRSTIME            026              BIT 4 FLAG 1          FRSTMBIT
R00775   FSPASFLG           005              BIT 10  FLAG 0        FSPASBIT
R0078    GLOKFAIL           046              BIT 14  FLAG 3        GLOKFBIT
R0079    GMBDRVSW           095              BIT 10  FLAG 6        GMBDRBIT
R0080    GUESSW             028              BIT 2   FLAG 1        GUESSBIT
R00805   HFAILFLG           167              BIT 13  FLAG 11       HFAILBIT
R0081    HFLSHFLG           179              BIT 1   FLAG 11       HFLSHBIT
R0082    IDLEFLAG           113              BIT 7   FLAG 7        IDLEFBIT
R0083    IGNFLAG            107              BIT 13  FLAG 7        IGNFLBIT
R0084    IMPULSW            036              BIT 9   FLAG 2        IMPULBIT
R0085    IMUSE              007              BIT 8   FLAG 0        IMUSEBIT
R0086    INFINFLG           128              BIT 7   FLAG 8        INFINBIT
R0087    INITALGN           133              BIT 2   FLAG 8        INITABIT
R0088    INTFLAG            151              BIT 14  FLAG 10       INTFLBIT
R0089    INTYPFLG           056              BIT 4   FLAG 3        INTYPBIT
R0090    ITSWICH            105              BIT 15  FLAG 7        ITSWBIT
R0091    JSWITCH            001              BIT 14  FLAG 0        JSWCHBIT
R0092    LETABORT           141              BIT 9   FLAG 9        LETABBIT
R0093    LMOONFLG           124              BIT 11  FLAG 8        LMOONBIT
```

```
R0094    LOKONSW          010                BIT 5   FLAG 0       LOKONBIT
R0095    LOSCMFLG         033                BIT 12  FLAG 2       LOSCMBIT
R0096    LRALTFLG         190                BIT 5   FLAG 12      LRALTBIT
R0097    LRBYPASS         165                BIT 15  FLAG 11      LRBYBIT
R0098    LRINH            172                BIT 8   FLAG 11      LRINHBIT
R0099    LRPOSFLG         189                BIT 6   FLAG 12      LRPOSBIT
R0100    LRVELFLG         187                BIT 8   FLAG 12      LRVELBIT
R0101    LUNAFLAG         048                BIT 12  FLAG 3       LUNABIT
R0102    MANUFLAG         106                BIT 14  FLAG 7       MANUFBIT
R0103    MGLVFLAG         088                BIT 2   FLAG 5       MGLVFBIT
R0104    MIDAVFLG         148                BIT 2   FLAG 9       MIDAVBIT
R0105    MIDFLAG          002                BIT 13  FLAG 0       MIDFLBIT
R0106    MID1FLAG         147                BIT 3   FLAG 9       MID1BIT
R0107    MKOVFLAG         072                BIT 3   FLAG 4       MKOVBIT
R0108    MOONFLAG         003                BIT 12  FLAG 0       MOONBIT
R0109    MRKIDFLG         060                BIT 15  FLAG 4       MRKIDBIT
R0110    MRKNVFLG         066                BIT 9   FLAG 4       MRKNVBIT
R0111    MRUPTFLG         070                BIT 5 FLAG 4         MRUPTBIT
R0112    MUNFLAG          097                BIT 8 FLAG 6         MUNFLBIT
R0113    MWAITFLG         064                BIT 11  FLAG 4       MWAITBIT
R0114    NEEDLFLG         011                BIT 4   FLAG 0       NEEDLBIT
R01141   NEED2FLG         000                BIT 15  FLAG 0       NEED2BIT
R0115    NEWIFLG          122                BIT 13  FLAG 8       NEWIBIT
R0116    NJETSFLG         015                BIT 15  FLAG 1       NJETSBIT
R0117    NODOFLAG         044                BIT 1   FLAG 2       NODOBIT
R01175   NODOP07          049                BIT 11  FLAG 3       NOP07BIT
R0118    NOLRREAD         170                BIT 10  FLAG 11      NOLRRBIT
R0119    NORMSW           110                BIT 10  FLAG 7       NORMSBIT
R0120    NORRMON          086                BIT 4   FLAG 5       NORRMBIT
R01215   NOTERFLG         019                BIT 11  FLAG 1       NOTERBIT
R0122    NOTHROTL         078                BIT 12  FLAG 5       NOTHRBIT
R0123    NOUPFLAG         024                BIT 6   FLAG 1       NOUPFBIT
R01235   NPGNCSFL         164                BIT  1 FLAG 10       NPGNCSBT
R0124    NRMNVFLG         067                BIT 8   FLAG 4       NRMNVBIT
R0125    NRMIDFLG         062                BIT 13  FLAG 4       NRMIDBIT
R0126    NRUPTFLG         071                BIT 4   FLAG 4       NRUPTBIT
R0127    NTARGFLG         102                BIT 3   FLAG 6       NTARGBIT
R0128    NWAITFLG         065                BIT 10  FLAG 4       NWAITBIT
R0132    ORBWFLAG         054                BIT 6   FLAG 3       ORBWFBIT
R0133    ORDERSW          129                BIT 6   FLAG 8       ORDERBIT
R0134    OURRCFLG         198                BIT 12  FLAG 13      OURRCBIT
R0135    PDSPFLAG         076                BIT 14  FLAG 5       PDSPFBIT
R0136    PFRATFLG         041                BIT 4   FLAG 2       PFRATBIT
R0137    PINBRFLG         069                BIT 6   FLAG 4       PINBRBIT
R01375   POOHFLAG         045                BIT 15  FLAG 3       POOHBIT
R0139    PRECIFLG         052                BIT 8   FLAG 3       PRECIBIT
R0140    PRIODFLG         061                BIT 14  FLAG 4       PRIODBIT
R0141    PRONVFLG         068                BIT 7   FLAG 4       PRONVBIT
R0142    PSTHIGAT         169                BIT 11  FLAG 11      PSTHIBIT
R0143    PULSEFLG         195                BIT 15  FLAG 13      PULSES
```

```
L        FLAGWORD ASSIGNMENTS                                                         USER'S PAGE NO.   4        EO S4

R01432  P21FLAG         004          BIT 11 FLAG 0       P21FLBIT
R0144   P25FLAG         006          BIT 9  FLAG 0       P25FLBIT
R01445  P66PROFL        014D         BIT 1 FLAG 0        P66PROBT
R0145   P7071FLG        137          BIT 13 FLAG 9       P7071BIT
R0146   QUITFLAG        145          BIT 5  FLAG 9       QUITBIT
R0147   RADMODES                     FLGWRD12
R0148   RASFLAG                      FLGWRD10
R0149   RCDUFAIL        188          BIT 7  FLAG 12      RCDUFBIT
R0150   RCDUOFLG        182          BIT 13 FLAG 12      RCDUOBIT
R0155   REDFLAG         099          BIT 6  FLAG 6       REDFLBIT
R0156   REFSMFLG        047          BIT 13 FLAG 3       REFSMBIT
R0157   REINTFLG        158          BIT 7  FLAG 10      REINTBIT
R0158   REMODFLG        181          BIT 14 FLAG 12      REMODBIT
R0159   RENDWFLG        089          BIT 1  FLAG 5       RENDWBIT
R0160   REPOSMON        184          BIT 11 FLAG 12      REPOSBIT
R0161   RHCSCFLG        203          BIT 7  FLAG 13      RHCSCALE
R0162   RNDVZFLG        008          BIT 7  FLAG 0       RNDVZBIT
R0163   RNGEDATA        176          BIT 4  FLAG 11      RNGEDBIT
R0164   RNGSCFLG        080          BIT 10 FLAG 5       RNGSCBIT
R01642  RODFLAG         018          BIT 12 FLAG 1       RODFLBIT
R01644  ROTFLAG         144          BIT  6 FLAG 9       ROTFLBIT
R0165   RPQFLAG         120          BIT 15 FLAG 8       RPQFLBIT
R0166   RRDATAFL        191          BIT 4  FLAG 12      RRDATABT
R0167   RRNBSW          009          BIT 6 FLAG 0        RRNBBIT
R0168   RRRSFLAG        192          BIT 3  FLAG 12      RRRSBIT
R0169   RVSW            111          BIT 9  FLAG 7       RVSWBIT
R0170   R04FLAG         051          BIT 9  FLAG 3       R04FLBIT
R0172   R10FLAG         013          BIT 2  FLAG 0       R10FLBIT
R01725  R12RDFLG        177D         BIT 3  FLAG 11      R12RDBIT
R0173   R61FLAG         020          BIT 10 FLAG 1       R61FLBIT
R0174   R77FLAG         079          BIT 11 FLAG 5       R77FLBIT
R0176   SLOPESW         027          BIT 3  FLAG 1       SLOPEBIT
R0177   SNUFFER         077          BIT 13 FLAG 5       SNUFFBIT
R0178   SOLNSW          087          BIT 3  FLAG 5       SOLNSBIT
R0179   SRCHOPTN        031          BIT 14 FLAG 2       SRCHOBIT
R0180   STATEFLG        055          BIT 5  FLAG 3       STATEBIT
R0181   STEERSW         034          BIT 11 FLAG 2       STEERBIT
R0182   SURFFLAG        127          BIT 8  FLAG 8       SURFFBIT
R0183   SWANDISP        109          BIT 11 FLAG 7       SWANDBIT
R0184   S32.1F1         090          BIT 15 FLAG 6       S32BIT1
R0185   S32.1F2         092          BIT 14 FLAG 6       S32BIT2
R0186   S32.1F3A        092          BIT 13 FLAG 6       S32BIT3A
R0187   S32.1F3B        093          BIT 12 FLAG 6       S32BIT3B
R0188   TFFSW           119          BIT 1  FLAG 7       TFFSWBIT
R0189   TRACKFLG        025          BIT 5  FLAG 1       TRACKBIT
R0190   TURNONFL        194          BIT 1  FLAG 12      TURNONBT
R0191   ULLAGFLG        204          BIT 6  FLAG 13      ULLAGER
R0192   UPDATFLG        023          BIT 7  FLAG 1       UPDATBIT
R0193   UPLOCKFL        116          BIT 4  FLAG 7       UPLOCBIT
R0194   USEQRFLG        196          BIT 14 FLAG 13      USEQRJTS
```

```
R0195   VEHUPFLG        022             BIT 8  FLAG 1      VEHUPBIT
R0196   VELDATA         173             BIT 7  FLAG 11     VELDABIT
R0197   VERIFLAG        117             BIT 3  FLAG 7      VERIFBIT
R01975  VFAILFLG        166             BIT 14 FLAG 11     VFAILBIT
R0198   VFLAG           050             BIT 10 FLAG 3      VFLAGBIT
R0199   VFLSHFLG        178             BIT 2  FLAG 11     VFLSHBIT
R0200   VINTFLAG        057             BIT 3  FLAG 3      VINTFBIT
R0201   VXINH           168             BIT 12 FLAG 11     VXINHBIT
R0202   V37FLAG         114             BIT 6  FLAG 7      V37FLBIT
R0203   V67FLAG         112             BIT 8  FLAG 7      V67FLBIT
R0204   V82EMFLG        118             BIT 2  FLAG 7      V82EMBIT
R0205   XDELVFLG        037             BIT 8  FLAG 2      XDELVBIT
R0206   XDSPFLAG        074             BIT 1  FLAG 4      XDSPBIT
R0207   XORFLG          171             BIT 9  FLAG 11     XORFLBIT
R0208   XOVINFLG        201             BIT 9  FLAG 13     XOVINHIB
R0209   ZOOMFLAG        082             BIT 8  FLAG 5      ZOOMBIT
R0210   3AXISFLG        084             BIT 6 FLAG 5       3AXISBIT
R0211   360SW           134             BIT 1  FLAG 8      360SWBIT
A0212


R0213           ASSIGNMENT AND DESCRIPTION OF FLAGWORDS


 0214   REF   1              0074          FLAGWRD0 =     STATE +0        (000-014)

A0215                                                                     (SET)              (RESET)

A0216                                                     BIT 15 FLAG 0   (S)
 0217                        0000          NFED2FLG =     000D            DISPLAY DAP RATES  CHECK BIT 4 OF THIS
 0218   REF   1              4726          NFED2BIT =     BIT15           ON FDAI NEEDLES.   WORD FOR DISPLAY
A0219                                                                                        MODES (1 OR 2).

A0220                                                     BIT 14 FLAG 0   (S)
 0221                        0001          JSWITCH  =     001D            INTEGRATION OF W   INTEGRATION OF STATE
 0222   REF   1              4727          JSWCHBIT =     BIT14           MATRIX             VECTOR
A0223

A0224                                                     BIT 13 FLAG 0   (S)
 0225                        0002          MIDFLAG  =     002D            INTEGRATION WITH   INTEGRATION WITHOUT
A0226                                                                     SECONDARY BODY AND SOLAR PERTURBATIONS
 0227   REF   2  LAST   41   4730          MIDFLBIT =     BIT13           SOLAR PERTURBATIONS
A0228

A0229                                                     BIT 12 FLAG 0   (L)
 0230                        0003          MOONFLAG =     003D            MOON IS SPHERE OF  EARTH IS SPHERE OF
 0231   REF   1              4731          MOONBIT  =     BIT12           INFLUENCE          INFLUENCE
A0232

A0233                                                     BIT 11 FLAG 0
```

```
 0234                         0004          P21FLAG   =      004D            USE BASE VECTORS     1ST PASS -- CALC-
 0235   REF   2  LAST   45    4732          P21FLBIT  =      BIT11           ALREADY CALCULATED   ULATE BASE VECTORS
A0236

A0237                                                        BIT 10 FLAG 0
 0238                         0005          FSPASFLG  =      005D            FIRST PASS THROUGH   NOT FIRST PASS THRU
 0239   REF   1               4733          FSPASBIT  =      BIT10           REPOSITION ROUTINE   REPOSITION ROUTINE
A0240

A0241                                                        BIT 9 FLAG 0    (S)
 0242                         0006          P25FLAG   =      006D            P25 OPERATING        P25 NOT OPERATING
 0243   REF   1               4734          P25FLBIT  =      BIT9
A0244

A0245                                                        BIT 8 FLAG 0    (S)
 0246                         0007          IMUSE     =      007D            IMU IN USE           IMU NOT IN USE
 0247   REF   1               4735          IMUSEBIT  =      BIT8
A0248

A0249                                                        BIT 7 FLAG 0    (S)
 0250                         0010          RNDVZFLG  =      008D            P20 RUNNING (RADAR   P20 NOT RUNNING
 0251   REF   1               4736          RNDVZBIT  =      BIT7            IN USE)
A0252

A0253                                                        BIT 6 FLAG 0    (S)
 0254                         0011          RRNBSW    =      009D            RADAR TARGET IN      RADAR TARGET IN
 0255   REF   1               4737          RRNBBIT   =      BIT6            NB COORDINATES       SM COORDINATES
A0256

A0257                                                        BIT 5 FLAG 0    (S)
 0258                         0012          LOKONSW   =      010D            RADAR LOCK-ON        RADAR LOCK-ON NOT
 0259   REF   1               4740          LOKONBIT  =      BIT5            DESIRED              DESIRED
A0260

A0261                                                        BIT 4 FLAG 0    (S)
 0262                         0013          NEEDLFLG  =      011D            TOTAL ATTITUDE       A/P FOLLOWING
 0263   REF   1               4741          NEEDLBIT  =      BIT4            ERROR DISPLAYED      ERROR DISPLAYED
A0264

A0265                                                        BIT 3 FLAG 0
 0266                         0014          FREEFLAG  =      012D            (USED BY P51-53 TEMP IN MANY DIFFERENT
A0267                                                                        ROUTINES & BY LUNAR + SOLAR EPHEMERIDES)
 0268   REF   1               4742          FREEFBIT  =      BIT3
A0269

A0270                                                        BIT 2 FLAG 0
 0271                         0015          R10FLAG   =      013D            R10 OUTPUTS DATA TO  BESIDES OUTPUT WHEN
 0272   REF   1               4743          R10FLBIT  =      BIT2            ALTITUDE & ALTITUDE  SET, R10 ALSO OUTPUT
A0273                                                                        RATE METERS ONLY     TO FORWARD & LATERAL
A0274                                                                                             VELOCITY CROSSPOINTR
```

```
A0275

A0276
 0277                       0016        P66PROFL =      014D        CONTINUE P66         STOP P66
 0278  REF  1               4744        P66PROBT =      BIT1        HORIZONTAL           HORIZONTAL VEL
A0279                                                               VELOCITY NULLING     NULLING
A02791


 0280  REF   2 LAST   67    0075        FLAGWRD1 =      STATE +1    (015-029)

A0281                                                               (SET)                (RESET)

A0282                                                   BIT 15 FLAG 1  (S)
 0283                       0017        NJETSFLG =      015D        TWO JET RCS BURN     FOUR JET RCS BURN
 0284  REF   2 LAST   67    4726        NJETSBIT =      BIT15
A0285

A0286                                                   BIT 14 FLAG 1  (L)
 0287                       0020        DIDFLAG  =      016D        INERTIAL DATA IS     PERFORM DATA DISPLAY
 0288  REF   2 LAST   67    4727        DIDFLBIT =      BIT14       AVAILABLE            INITIALIZATION FUNCS
A0289

A0290                                                   BIT 13 FLAG 1  (S)
 0291                       0021        ERADFLAG =      017D        COMPUTE REARTH       USE CONSTANT REARTH
 0292  REF   3 LAST   67    4730        ERADFBIT =      BIT13       FISCHER ELLIPSOID    PAD RADIUS
A0293

A0294                                                   BIT12 FLAG 1
 0295                       0022        RODFLAG  =      018D        IF IN P66, NORMAL    IF IN P66, RE-INIT-
 0296  REF   2 LAST   67    4731        RODFLBIT =      BIT12       OPERATION CONTINUES. IALIZATION IS PER-
A0297                                                               RESTART CLEARS FLAG  FORMED AND FLAG IS
A02975

A0298                                                   BIT 11 FLAG 1
 0299                       0023        NOTERFLG =      19D         TERRAIN MODEL        TERRAIN MODEL
 02995 REF   3 LAST   68    4732        NOTERBIT =      BIT11       INHIBITED            PERMITTED
A02996

A0300                                                   BIT 10 FLAG 1  (L)
 0301                       0024        R61FLAG  =      020D        RUN P61 LEM          RUN R65 LEM
 0302  REF   2 LAST   68    4733        R61FLBIT =      BIT10
A0303

A0304                                                   BIT 9 FLAG 1
A0305                                            =      021D
A0306                                            =      BIT9
A0307

A0308                                                   BIT 8 FLAG 1   (S)
```

```
 0309                          0026        VEHUPFLG =     022D          CSM STATE VECTOR     LEM STATE VECTOR
 0310  REF   2  LAST   68      4735        VEHUPBIT =     BIT8          BEING UPDATED        BEING UPDATED
A0311

A0312                                                     BIT 7 FLAG 1  (S)
 0313                          0027        UPDATFLG =     023D          UPDATING BY MARKS    UPDATING BY MARKS
 0314  REF   2  LAST   68      4736        UPDATBIT =     BIT7          ALLOWED              NOT ALLOWED
A0315

A0316                                                     BIT 6 FLAG 1  (S)
 0317                          0030        NOUPFLAG =     024D          NEITHER CSM          EITHER STATE
A0318                                                                   NOR LM STATE VECTOR  VECTOR MAY BE
 0319  REF   2  LAST   68      4737        NOUPFBIT =     BIT6          MAY BE UPDATED       UPDATED
A0320

A0321                                                     BIT 5 FLAG 1  (S)
 0322                          0031        TRACKFLG =     025D          TRACKING ALLOWED     TRACKING NOT ALLOWED
 0323  REF   2  LAST   68      4740        TRACKBIT =     BIT5
A0324

A0325                                                     BIT 4 FLAG 1
 0326                          0032        FRSTIME  =     26D           FIRST TIME THRU      NOT FIRST TIME THRU
 0327  REF   2  LAST   68      4741        FRSTIMBIT =    BIT4          PREPOSITION          PREPOSITION
A0328

A0329                                                     BIT 3 FLAG 1  (S)
 0330                          0033        SLOPESW  =     027D          ITERATE WITH BIAS    ITERATE WITH REGULAR
A0331                                                                   METHOD IN ITERATOR   FALSI METHOD IN
 0332  REF   2  LAST   68      4742        SLOPEBIT =     BIT3                               ITERATOR
A0333

A0334                                                     BIT 2 FLAG 1  (S)
 0335                          0034        GUESSW   =     028D          NO STARTING VALUE    STARTING VALUE FOR
 0336  REF   2  LAST   68      4743        GUESSBIT =     BIT2          FOR ITERATION        ITERATION EXISTS
A0337

A0338                                                     BIT 1 FLAG 1
A0339                                               =.    029D
A0340

 0341  REF   3  LAST   69      0076        FLAGWRD2 =     STATE +2      (030-044)

A0342                                                                   (SET)                (RESET)

A0343                                                     BIT 15 FLAG 2 (S)
 0344                          0036        DRIFTFLG =     030D          T3RUPT CALLS GYRO    T3RUPT DOES NO GYRO
 0345  REF   3  LAST   69      4726        DRFTBIT  =     BIT15         COMPENSATION         COMPENSATION
A0346

A0347                                                     BIT 14 FLAG 2 (S)
```

```
 0348                           0037         SRCHOPTN =     031D          RADAR IN AUTOMATIC  RADAR NOT IN AUTO-
 0349  REF   3  LAST   69       4727         SRCHOBIT =     BIT14         SEARCH OPTION(R24)  MATIC SEARCH OPTION
A0350

A0351                                                       BIT 13 FLAG 2  (S)
 0352                           0040         ACMODFLG =     032D          MANUAL ACQUISITION  AUTO ACQUISITION
 0353  REF   4  LAST   69       4730         ACMODBIT =     BIT13         BY RENDESVOUS RADAR BY RENDESVOUS RADAR
A0354

A0355                                                       BIT 12 FLAG 2  (S)
 0356                           0041         LOSCMFLG =     033D          LINE OF SIGHT BEING LINE OF SIGHT NOT
A0357                                                                     COMPUTED (R21)      BEING COMPUTED
 0358  REF   3  LAST   69       4731         LOSCMBIT =     BIT12
A0360

A0361                                                       BIT 11 FLAG 2  (S)
 0362                           0042         STEERSW  =     034D          SUFFICIENT THRUST   INSUFFICIENT THRUST
 0363  REF   4  LAST   69       4732         STEERBIT =     BIT11         IS PRESENT          IS PRESENT
A0364

A0365                                                       BIT 10 FLAG 2  (S)
A0368

A0369                                                       BIT 9 FLAG 2   (S)
 0370                           0044         IMPULSW  =     036D          MINIMUM IMPULSE     STEERING BURN (NO
A0371                                                                     BURN (CUTOFF TIME   CUTOFF TIME YET
 0372  REF   2  LAST   68       4734         IMPULBIT =     BIT9          SPECIFIED)          AVAILABLE)
A0373

A0374                                                       BIT 8 FLAG 2   (S)
 0375                           0045         XDELVFLG =     037D          EXTERNAL DELTAV VG  LAMBERT (AIMPOINT)
 0376  REF   3  LAST   70       4735         XDELVBIT =     BIT8          COMPUTATION         VG COMPUTATION
A0377

A0378                                                       BIT 7 FLAG 2   (S)
 0379                           0046         ETPIFLAG =     038D          ELEVATION ANGLE     TPI TIME SUPPLIED
A0380                                                                     SUPPLIED FOR        FOR P34,74 TO COMPUT
 0381  REF   3  LAST   70       4736         ETPIBIT  =     BIT7          P34,74              ELEVATION
A0382

A0387                                                       BIT 6 FLAG 2   (S)
 0388                           0047         FINALFLG =     039D          LAST PASS THROUGH   INTERIM PASS THROUGH
A0389                                                                     RENDEZVOUS PROGRAM  RENDEZVOUS PROGRAM
 0390  REF   3  LAST   70       4737         FINALBIT =     BIT6          COMPUTATIONS        COMPUTATIONS
A0391

A0392                                                       BIT 5 FLAG 2   (S)
 0393                           0050         AVFLAG   =     040D          LEM IS ACTIVE       CSM IS ACTIVE
 0394  REF   3  LAST   70       4740         AVFLBIT  =     BIT5          VEHICLE             VEHICLE
A0395
```

```
A0396                                                       BIT 4 FLAG 2      (S)
 0397                       0051          PFRATFLG =        041D              PREFERRED ATTITUDE    PREFERRED ATTITUDE
 0398  REF   3  LAST   70   4741          PFRATBIT =        BIT4              COMPUTED              NOT COMPUTED
A0399

A0400                                                       BIT 3 FLAG 2      (S)
 0401                       0052          CALCMAN3 =        042D              NO FINAL ROLL         FINAL ROLL IS
 0402  REF   3  LAST   70   4742          CALC3BIT =        BIT3                                    NECESSARY
A0403

A0404                                                       BIT 2 FLAG 2      (S)
 0405                       0053          CALCMAN2 =        043D              PERFORM MANEUVER      BYPASS STARTING
 0406  REF   3  LAST   70   4743          CALC2BIT =        BIT2              STARTING PROCEDURE    PROCEDURE
A0407

A0408                                                       BIT 1 FLAG 2      (S)
 0409                       0054          NODOFLAG =        044D              V37 NOT PERMITTED     V37 PERMITTED
 0410  REF   2  LAST   69   4744          NODOBIT  =        BIT1
A0411

 0412  REF   4  LAST   70   0077          FLAGWRD3 =        STATE +3          (045-059)

A0413                                                                         (SET)                 (RESET)

A0414                                                       BIT 15 FLAG 3
 0415                       0055          POOHFLAG =        045D              INHIBIT BACKWARDS     ALLOW BACKWARDS
 0416  REF   4  LAST   70   4726          POOHBIT  =        BIT15             INTEGRATION           INTEGRATION
A04165

A0417                                                       BIT 14 FLAG 3     (S)
 0418                       0056          GLOKFAIL =        046D              GIMBAL LOCK HAS       NOT IN GIMBAL LOCK
 0419  REF   4  LAST   71   4727          GLOKFBIT =        BIT14             OCCURRED
A0420

A0421                                                       BIT 13 FLAG 3     *** PROTECTED FROM FRESH START ***
 0422                       0057          REFSMFLG =        047D              REFSMMAT GOOD         REFSMMAT NO GOOD
 0423  REF   5  LAST   71   4730          REFSMBIT =        BIT13
A0424

A0425                                                       BIT 12 FLAG 3     (S)
 0426                       0060          LUNAFLAG =        048D              LUNAR LAT-LONG        EARTH LAT-LONG
 0427  REF   4  LAST   71   4731          LUNABIT  =        BIT12
A0428

A0429                                                       BIT 11 FLAG 3     (L)
 0430                       0061          NODOP07  =        049D              SYSTEM TESTS          SYSTEM TESTS
 0431  REF   5  LAST   71   4732          NOP07BIT =        BIT11             NOT ALLOWED           ALLOWED
A0432

A0433                                                       BIT 10 FLAG 3     (S)
```

```
 0434                          0062            VFLAG    =       050D            LESS THAN TWO STARS TWO STARS IN FIELD
 0435   REF   3  LAST   69     4733            VFLAGBIT =       BIT10           IN FIELD OF VIEW    OF VIEW
A0436

A0437                                                           BIT 9 FLAG 3    (S)
 0438                          0063            R04FLAG  =       051D            R04 RUNNING         R04 NOT RUNNING
 0440   REF   3  LAST   71     4734            R04FLBIT =       BIT9
A0441

A0446                                                           BIT 8 FLAG 3    (S)
 0447                          0064            PRECIFLG =       052D            NORMAL INTEGRATION  ENGAGES 4-TIME STEP
A0448                                                                           IN P00              (P00) LOGIC IN INTE-
 0449   REF   4  LAST   71     4735            PRECIBIT =       BIT8                                GRATION
A0450

A0451                                                           BIT 7 FLAG 3    (S)
 0452                          0065            CULTFLAG =       053D            STAR OCCULTED       STAR NOT OCCULTED
 0453   REF   4  LAST   71     4736            CULTBIT  =       BIT7
A0454

A0455                                                           BIT 6 FLAG 3    (S)
 0456                          0066            ORBWFLAG =       054D            W MATRIX VALID FOR  W MATRIX INVALID FOR
 0457   REF   4  LAST   71     4737            ORBWFBIT =       BIT6            ORBITAL NAVIGATION  ORBITAL NAVIGATION
A0458

A0459                                                           BIT 5 FLAG 3    (S)
 0460                          0067            STATEFLG =       055D            PERMANENT STATE     PERMANENT STATE
 0461   REF   4  LAST   71     4740            STATEBIT =       BIT5            VECTOR UPDATED      VECTOR NOT UPDATED
A0462

A0463                                                           BIT 4 FLAG 3    (S)
 0464                          0070            INTYPFLG =       056D            CONIC INTEGRATION   ENCKE INTEGRATION
 0465   REF   4  LAST   72     4741            INTYPBIT =       BIT4
A0466

A0467                                                           BIT 3 FLAG 3    (S)
 0468                          0071            VINTFLAG =       057D            CSM STATE VECTOR    LEM STATE VECTOR
 0469   REF   4  LAST   72     4742            VINTFBIT =       BIT3            BEING INTEGRATED    BEING INTEGRATED
A0470

A0471                                                           BIT 2 FLAG 3    (S)
 0472                          0072            D6OR9FLG =       058D            DIMENSION OF W IS 9 DIMENSION OF W IS 6
 0473   REF   4  LAST   72     4743            D6OR9BIT =       BIT2            FOR INTEGRATION     FOR INTEGRATION
A0474

A0475                                                           BIT 1 FLAG 3    (S)
 0476                          0073            DIMOFLAG =       059D            W MATRIX IS TO BE   W MATRIX IS NOT TO
 0477   REF   3  LAST   72     4744            DIMOBIT  =       BIT1            USED                BE USED
A0478
```

```
L         FLAGWORD ASSIGNMENTS                                                                   USER'S PAGE NO.  12        EO S4

 0479  REF   5  LAST   72       0100          FLAGWRD4 =        STATE +4          (060-074)
 A0480                                                                            (SET)                 (RESET)

 A0481                                                          BIT 15 FLAG 4     (S)
 0482                           0074          MRKIDFLG =        060D              MARK DISPLAY IN       NO MARK DISPLAY IN
 0483  REF   5  LAST   72       4726          MRKIDBIT =        BIT15             ENDIDLE               ENDIDLE
 A0484

 A0485                                                          BIT 14 FLAG 4     (S)
 0486                           0075          PRIODFLG =        061D              PRIORITY DISPLAY IN NO PRIORITY DISPLAY
 0487  REF   5  LAST   72       4727          PRIODBIT =        BIT14             ENDIDLE               IN ENDIDLE
 A0488

 A0489                                                          BIT 13 FLAG 4     (S)
 0490                           0076          NRMIDFLG =        062D              NORMAL DISPLAY IN     NO NORMAL DISPLAY
 0491  REF   6  LAST   72       4730          NRMIDBIT =        BIT13             ENDIDLE               IN ENDIDLE
 A0492

 A0493                                                          BIT 12 FLAG 4     (S)
 A0494                                        CODE IN    =      063D
 A0495                                        DISPLAY  AREA     REFERS TO THIS BIT; CHANGES NEEDED IF USED IN FUTURE.
 A0498

 A0499                                                          BIT 11 FLAG 4     (S)
 0500                           0100          MWAITFLG =        064D              HIGHER PRIORITY       NO HIGHER PRIORITY
 A0501                                                                            DISPLAY OPERATING     DISPLAY OPERATING
 0502  REF   6  LAST   72       4732          MWAITBIT =        BIT11             WHEN MARK DISPLAY     WHEN MARK DISPLAY
 A0503                                                                            INITIATED             INITIATED

 A0504                                                          BIT 10 FLAG 4     (S)
 0505                           0101          NWAITFLG =        065D              HIGHER PRIORITY       NO HIGHER PRIORITY
 A0506                                                                            DISPLAY OPERATING     DISPLAY OPERATING
 0507  REF   4  LAST   73       4733          NWAITBIT =        BIT10             WHEN NORMAL           WHEN NORMAL DISPLAY
 A0508                                                                            DISPLAY INITIATED     INITIATED

 A0509                                                          BIT 9 FLAG 4      (S)
 0510                           0102          MRKNVFLG =        066D              ASTRONAUT USING       ASTRONAUT NOT USING
 A0511                                                                            KEYBOARD WHEN MARK    KEYBOARD WHEN MARK
 0512  REF   4  LAST   73       4734          MRKNVBIT =        BIT9              DISPLAY INITIATED     DISPLAY INITIATED
 A0513

 A0514                                                          BIT 8 FLAG 4      (S)
 0515                           0103          NRMNVFLG =        067D              ASTRONAUT USING       ASTRONAUT NOT USING
 A0516                                                                            KEYBOARD WHEN         KEYBOARD WHEN
 0517  REF   5  LAST   73       4735          NRMNVBIT =        BIT8              NORMAL DISPLAY        NORMAL DISPLAY
 A0518                                                                            INITIATED             INITIATED

 A0519                                                          BIT 7 FLAG 4      (S)
 0520                           0104          PRONVFLG =        068D              ASTRONAUT USING       ASTRONAUT NOT USING
```

(53)

```
L       FLAGWORD ASSIGNMENTS                                                          USER'S PAGE NO.  13        E0 S4

A0521                                                                  KEYBOARD WHEN          KEYBOARD WHEN
 0522   REF   5  LAST   73       4736         PRONVBIT =       BIT7             PRIORITY DISPLAY       PRIORITY DISPLAY
A0523                                                                  INITIATED              INITIATED

A0524                                                   BIT 6 FLAG 4     (S)
 0525                            0105         PINBRFLG =       069D             ASTRONAUT HAS          ASTRONAUT HAS NOT
A0526                                                                  INTERFERED WITH        INTERFERED WITH
 0527   REF   5  LAST   73       4737         PINBRBIT =       BIT6             EXISTING DISPLAY       EXISTING DISPLAY
A0528

A0529                                                   BIT 5 FLAG 4     (S)
 0530                            0106         MRUPTFLG =       070D             MARK DISPLAY           MARK DISPLAY NOT
A0531                                                                  INTERRUPTED BY         INTERRUPTED BY
 0532   REF   5  LAST   73       4740         MRUPTBIT =       BIT5             PRIORITY DISPLAY       PRIORITY DISPLAY
A0533

A0534                                                   BIT 4 FLAG 4     (S)
 0535                            0107         NRUPTFLG =       071D             NORMAL DISPLAY         NORMAL DISPLAY NOT
A0536                                                                  INTERRUPTED BY         INTERRUPTED BY
 0537   REF   5  LAST   73       4741         NRUPTBIT =       BIT4             PRIORITY OR MARK       PRIORITY OR MARK
A0538                                                                  DISPLAY                DISPLAY

A0539                                                   BIT 3 FLAG 4     (S)
 0540                            0110         MKOVFLAG =       072D             MARK DISPLAY OVER      NO MARK DISPLAY OVER
 0541   REF   5  LAST   73       4742         MKOVBIT  =       BIT3             NORMAL                 NORMAL
A0542

A0543                                                   BIT 2 FLAG 4
A0544                                                  =       073D

A0545

A0546                                                   BIT 1 FLAG 4     (S)
 0547                            0112         XDSPFLAG =       074D             MARK DISPLAY NOT       NO SPECIAL MARK
 0548   REF   4  LAST   73       4744         XDSPBIT  =       BIT1             TO BE INTERRUPTED      INFORMATION
A0549

 0550   REF   6  LAST   74       0101         FLAGWRD5 =       STATE +5         (075-089)
A0551                                                                  (SET)                  (RESET)

A0552                                                   BIT 15 FLAG 5    (S)
 0553                            0113         DSKYFLAG =       075D             DISPLAYS SENT TO       NO DISPLAYS TO DSKY
 0554   REF   6  LAST   74       4726         DSKYFBIT =       BIT15            DSKY
A0555

A0556                                                   BIT 14 FLAG 5
 0557                            0114         PDSPFLAG =       076D             R60 DOES PRIO DSP.     R60 DOES NORMAL DSP.
 0558   REF   6  LAST   74       4727         PDSPFBIT =       BIT14            AND IS PESTART         AND IS NOT RESTORTED
A05581                                                                 PROTECTED.
A0559
```

```
A0560                                                          BIT 13 FLAG 5    (S,L)
 0561                          0115            SNUFFER  =      077D            U,V JETS DISABLED   U,V JETS ENABLED
A0562                                                                          DURING DPS          DURING DPS
 0563   REF   7  LAST   74     4730            SNUFFBIT =      BIT13           BURNS (V65)         BURNS (V75)
A0564

A0565                                                          BIT 12 FLAG 5    (S)
 0566                          0116            NOTHROTL =      078D            INHIBIT FULL        PERMIT FULL THROTTLE
 0567   REF   5  LAST   72     4731            NOTHRBIT =      BIT12           THROTTLE
A0568

A0569                                                          BIT 11 FLAG 5    (S,L)
 0570                          0117            R77FLAG  =      079D            R77 IS ON,         R77 IS NOT ON.
A0571                                                                          SUPPRESS ALL RADAR
A0572                                                                          ALARMS AND TRACKER
 0573   REF   7  LAST   74     4732            R77FLBIT =      BIT11           FAILS
A0574

A0575                                                          BIT 10 FLAG 5    (S)
 0576                          0120            RNGSCFLG =      080D            SCALE CHANGE HAS    NO SCALE CHANGE HAS
A0577                                                                          OCCURRED DURING     OCCURRED DURING
 0578   REF   5  LAST   74     4733            RNGSCBIT =      BIT10           RR READING          RR READING
A0579

A0580                                                          BIT 9 FLAG 5     (S)
 0581                          0121            DMENFLG  =      081D            DIMENSION OF W IS 9 DIMENSION OF W IS 6
 0582   REF   5  LAST   74     4734            DMENFBIT =      BIT9            FOR INCORPORATION   FOR INCORPORATION
A0583

A0584                                                          BIT 8 FLAG 5     (S)
 0585                          0122            ZOOMFLAG =      082D            THROTTLE-UP HAS     THROTTLE-UP HAS NOT
 0586   REF   6  LAST   74     4735            ZOOMBIT  =      BIT8            OCCURRED IN P63.    YET OCCURRED IN P63.
A0587

A0588                                                          BIT 7 FLAG 5     (S)
 0589                          0123            ENGONFLG =      083D            ENGINE TURNED ON    ENGINE TURNED OFF
 0590   REF   6  LAST   75     4736            ENGONBIT =      BIT7
A0591

A0592                                                          BIT 6 FLAG 5     (S)
 0593                          0124            3AXISFLG =      084D            MANEUVER SPECIFIED  MANEUVER SPECIFIED
A0594                                                                          BY THREE AXES       BY ONE AXIS; R60
 0595   REF   6  LAST   75     4737            3AXISBIT =      BIT6                                CALLS VECPOINT.
A0596

A0597                                                          BIT 5 FLAG 5
 0598                          0125            AORBSFLG =      085D            PREFER PAXIS JET    PREFER PAXIS JET
 0599   REF   6  LAST   75     4740            AORBSYST =      BIT5            PAIRS 7,15 AND 8,16  PAIRS 4,12 AND 3,11
A05995
```

```
A0600                                                            BIT 4 FLAG 5    (S)
 0601                           0126            NORRMON   =      086D            BYPASS RR GIMBAL    PERFORM
 0602   REF   6  LAST   75      4741            NORRMBIT  =      BIT4            MONITOR             RR GIMBAL MONITOR
A0603

A0604                                                            BIT 3 FLAG 5    (S)
 0605                           0127            SOLNSW    =      087D            LAMBERT DOES NOT    LAMBERT CONVERGES OR
A0606                                                                            CONVERGE,OR TIME-RADTIME-RADIUS NON
 0607   REF   6  LAST   75      4742            SOLNSBIT  =      BIT3            NEARLY CIRCULAR     CIRCULAR
A0608

A0609                                                            BIT 2 FLAG 5    (S)
 0610                           0130            MGLVFLAG  =      088D            LOCAL VERTICAL      MIDDLE GIMBAL ANGLE
A0611                                                                            COORDINATES         COMPUTED
 0612   REF   5  LAST   73      4743            MGLVFBIT  =      BIT2            COMPUTED
A0613

A0614                                                            BIT 1 FLAG 5    (S)
 0615                           0131            RENDWFLG  =      089D            W MATRIX VALID      W MATRIX INVALID
A0616                                                                            FOR RENDEZVOUS      FOR RENDEZVOUS
 0617   REF   5  LAST   75      4744            RENDWBIT  =      BIT1            NAVIGATION          NAVIGATION
A0618

 0619   REF   7  LAST   75      0102            FLAGWRD6  =      STATE +6        (090-104)

A0620                                                                            (SET)               (RESET)

A0621                                                            BIT 15 FLAG 6   (S)
 0622                           0132            S32.1F1   =      090D            DELTA V AT CSI TIME  DVT1 LESS THEN MAX
 0623   REF   7  LAST   75      4726            S32BIT1   =      BIT15           ONE EXCEEDS MAX
A0624

A0625                                                            BIT 14 FLAG 6   (S)
 0626                           0133            S32.1F2   =      091D            FIRST PASS OF       REITERATION OF
 0627   REF   7  LAST   75      4727            S32BIT2   =      BIT14           NEWTON ITERATION    NEWTON
A0628

A0629                                                            BIT 13 FLAG 6   (S)
 0630                           0134            S32.1F3A  =      092D            BIT 13 AND BIT 12 FUNCTION AS AN ORDERED
 0631   REF   8  LAST   76      4730            S32BIT3A  =      BIT13           PAIR (13,12) INDICATING THE POSSIBLE OC-
A0632                                                                            CURRANCE OF 2NEWTON ITERATIONS FOR S32.1
A0633                                                                            IN THE PROGRAM IN THE FOLLOWING ORDER:
A0634                                                            BIT 12 FLAG 6   (0,1) (I.E.BIT 13 RESET,BIT 12 SET)
 0635                           0135            S32.1F3B  =      093D                 = FIRST NEWTON ITERATION BEING DONE
 0636   REF   6  LAST   76      4731            S32BIT3B  =      BIT12           (0,0)= FIRST PASS OF SECOND NEWT.ITERAT.
A0637                                                                            (1,1)= 50 FT/SEC STAGE OF SEC. NEWT.ITER
A0638                                                                            (1,0)= REMAINDER OF SECOND NEWTON ITERA.
A0639

A0640                                                            BIT 11 FLAG 6   (S)
```

```
A0643

A0644                                                           BIT 10 FLAG 6   (S)
 0645                           0137            GMBDRVSW =      095D            TRIMGIMB OVER       TRIMGIMB NOT OVER
 0646   REF   6  LAST    76     4733            GMBDRBIT =      BIT10
A0647

A0648                                                           BIT 9 FLAG 6
A0649                                                    =      096D
A0650                                                    =      BIT9
A0651

A0654                                                           BIT 8 FLAG 6    (S)
 0655                           0141            MUNFLAG  =      097D            SERVICER CALLS      SERVICER CALLS
 0656   REF   7  LAST    76     4735            MUNFLBIT =      BIT8            MUNRVG              CALCRVG
A0657

A0658                                                           BIT 7 FLAG 6    (L)
 0659                           0142                     =      098D
 0660   REF   7  LAST    76     4736                     =      BIT7
A0661

A0662                                                           BIT 6 FLAG 6    (L)
 0663                           0143            REDFLAG  =      099D            LANDING SITE        LANDING SITE
A0664                                                                           REDESIGNATION       REDESIGNATION NOT
 0665   REF   7  LAST    76     4737            REDFLBIT =      BIT6            PERMITTED           PERMITTED
A0666

A0667                                                           BIT 5 FLAG 6
A0668                                                    =      100D
A0669

A0670                                                           BIT 4 FLAG 6
A0671                                                    =      101D

A0672                                                           BIT 3 FLAG 6    (S)
 0673                           0146            NTARGFLG =      102D            ASTRONAUT DID       ASTRONAUT DID NOT
A0674                                                                           OVERWRITE DELTA     OVERWRITE DELTA
 0675   REF   7  LAST    77     4742            NTARGBIT =      BIT3            VELOCITY AT TPI     VELOCITY
A0676                                                                           OR TPM (P34,35)

A0677                                                           BIT 2 FLAG 6
 0678                           0147            AUXFLAG  =      103D            PROVIDING IDLEFLAG  SERVICER WILL SKIP
 0679   REF   6  LAST    77     4743            AUXFLBIT =      BIT2            IS NOT SET, SERV-   DVMON ON ITS NEXT
A0680                                                                           ICER WILL EXERCISE  PASS EVEN IF THE
A0681                                                                           DVMON ON ITS NEXT   IDLEFLAG IS NOT SET.
A0682                                                                           PASS.               IT WILL THEN SET
A0683                                                                                               AUXFLAG.

A0684                                                           BIT 1 FLAG 6    (L)
```

```
 0685                        0150        ATTFLAG  =     104D            LEM ATTITUDE EXISTS NO LEM ATTITUDE
A0686                                                                   IN MOON-FIXED       AVAILABLE IN MOON-
 0687   REF   6  LAST   77   4744        ATTFLBIT =     BIT1            COORDINATES         FIXED COORDINATES
A0688

 0689   REF   8  LAST   77   0103        FLAGWRD7 =     STATE +7        (105-119)

A0690                                                                   (SET)               (RESET)

A0691                                                   BIT 15 FLAG 7   (S)
 0692                        0151        ITSWICH  =     105D            P34;TPI TIME TO BE  TPI HAS BEEN
 0693   REF   8  LAST   77   4726        ITSWBIT  =     BIT15           COMPUTED            COMPUTED
A0694

A0695                                                   BIT 14 FLAG 7   (S)
 0696                        0152        MANUFLAG =     106D            ATTITUDE MANEUVER   NO ATTITUDE MANEUVER
A0697                                                                   GOING DURING RR     DURING RR SEARCH
 0698   REF   8  LAST   77   4727        MANUFBIT =     BIT14           SEARCH
A0699

A0700                                                   BIT 13 FLAG 7   (S)
 0701                        0153        IGNFLAG  =     107D            TIG HAS ARRIVED     TIG HAS NOT ARRIVED
 0702   REF   9  LAST   77   4730        IGNFLBIT =     BIT13
A0703

A0704                                                   BIT 12 FLAG 7   (S)
 0705                        0154        ASTNFLAG =     108D            ASTRONAUT HAS       ASTRONAUT HAS NOT
 0706   REF   7  LAST   77   4731        ASTNBIT  =     BIT12           OKAYED IGNITION     OKAYED IGNITION
A0707

A0708                                                   BIT 11 FLAG 7   (L)
 0709                        0155        SWANDISP =     109D            LANDING ANALOG      LANDING ANALOG
 0710   REF   8  LAST   76   4732        SWANDBIT =     BIT11           DISPLAYS ENABLED    DISPLAYS SUPPRESSED
A0711

A0712                                                   BIT 10 FLAG 7   (S)
 0713                        0156        NORMSW   =     110D            UNIT NORMAL INPUT   LAMBERT COMPUTES ITS
 0714   REF   7  LAST   78   4733        NORMSBIT =     BIT10           TO LAMBERT          OWN UNIT NORMAL
A0715

A0716                                                   BIT 9 FLAG 7    (S)
 0717                        0157        RVSW     =     111D            DO NOT COMPUTE      COMPUTE FINAL STATE
A0718                                                                   FINAL STATE VECTOR  VECTOR IN TIME-THETA
 0719   REF   6  LAST   76   4734        RVSWBIT  =     BIT9            IN TIME-THETA
A0720

A0721                                                   BIT 8 FLAG 7    (S)
 0722                        0160        V67FLAG  =     112D            ASTRONAUT OVERWRITE  ASTRONAUT DOES NOT
A0723                                                                   W-MATRIX INITIAL    OVERWRITE W-MATRIX
 0724   REF   8  LAST   78   4735        V67FLBIT =     BIT8            VALUES              INITIAL VALUES
```

```
L       FLAGWORD ASSIGNMENTS                                                                 USER'S PAGE NO.  18      EO S4

A0725

A0726                                                            BIT 7 FLAG 7     (S)
 0727                         0161            IDLEFLAG =         113D             NO DV MONITOR        CONNECT DV MONITOR
 0728   REF   8  LAST   78    4736            IDLEFBIT =         BIT7
A0729

A0730                                                            BIT 6 FLAG 7     (S)
 0731                         0162            V37FLAG  =         114D             AVERAGEG (SERVICER) AVERAGEG (SERVICER)
 0732   REF   8  LAST   78    4737            V37FLBIT =         BIT6             RUNNING              OFF
A0733

A0734                                                            BIT 5 FLAG 7     (S)
 0735                         0163            AVEGFLAG =         115D             AVERAGEG (SERVICER) AVERAGEG (SERVICER)
 0736   REF   7  LAST   76    4740            AVEGFBIT =         BIT5             DESIRED              NOT DESIRED
A0737

A0738                                                            BIT 4 FLAG 7     (S)
 0739                         0164            UPLOCKFL =         116D             K-KBAR-K FAIL        NO K-KBAR-K FAIL
 0740   REF   7  LAST   77    4741            UPLOCBIT =         BIT4
A0741

A0742                                                            BIT 3 FLAG 7     (S)
 0743                         0165            VERIFLAG =         117D             CHANGED WHEN V33E OCCURS AT END OF P27
 0744   REF   8  LAST   78    4742            VERIFBIT =         BIT3
A0745

A0746                                                            BIT 2 FLAG 7     (L,C)
 0747                         0166            V82EMFLG =         118D             MOON VICINITY        EARTH VICINITY
 0748   REF   7  LAST   78    4743            V82EMBIT =         BIT2
A0749

A0750                                                            BIT 1 FLAG 7     (S)
 0751                         0167            TFFSW    =         119D             CALCULATE TPERIGEE  CALCULATE TFF
 0752   REF   7  LAST   79    4744            TFFSWBIT =         BIT1
A0753

 0754   REF   9  LAST   79    0104            FLAGWRD8 =         STATE +8D        (120-134)

A0755                                                                             (SET)                (RESET)

A0756                                                            BIT 15 FLAG 8    (S)
 0757                         0170            RPQFLAG  =         120D             RPQ NOT COMPUTED     RPQ COMPUTED
A0758                                                                             (RPQ = VECTOR BE-
 0759   REF   9  LAST   79    4726            RPQFLBIT =         BIT15            TWEEN SECONDARY BODY
A0760                                                                             AND PRIMARY BODY
A0761

A0762                                                            BIT 14 FLAG 8
A0763                                                  =         121D
```

```
A0764                                             =        BIT14
A0765

A0766                                                      BIT 13 FLAG 8    (S)
 0767                     0172          NEWIFLG   =        122D             FIRST PASS THROUGH  SUCCEEDING ITERATION
 0768  REF  10  LAST  79  4730          NEWIBIT   =        BIT13            INTEGRATION         OF INTEGRATION
A0769

A0770                                                      BIT 12 FLAG 8    *** PROTECTED FROM FRESH START ***
 0771                     0173          CMOONFLG  =        123D             PERMANENT CSM STATE PERMANENT CSM STATE
 0772  REF   9  LAST  79  4731          CMOONBIT  =        BIT12            IN LUNAR SPHERE     IN EARTH SPHERE
A0773

A0774                                                      BIT 11 FLAG 8    *** PROTECTED FROM FRESH START ***
 0775                     0174          LMOONFLG  =        124D             PERMANENT LM STATE  PERMANENT LM STATE
 0776  REF   9  LAST  79  4732          LMOONBIT  =        BIT11            IN LUNAR SPHERE     IN EARTH SPHERE
A0777

A0778                                                      BIT 10 FLAG 8    (L)
 0779                     0175          FLUNDISP  =        125D             CURRENT GUIDANCE    CURRENT GUIDANCE
 0780  REF   8  LAST  79  4733          FLUNDBIT  =        BIT10            DISPLAYS INHIBITED  DISPLAYS PERMITTED
A0781

A0782                                                      BIT 9 FLAG 8     (L)
A0783                                             =        126D
A0784                                             =        BIT9
A0785

A0786                                                      BIT 8 FLAG 8     *** PROTECTED FROM FRESH START ***
 0787                     0177          SURFFLAG  =        127D             LM ON LUNAR SURFACE LM NOT ON LUNAR
 0788  REF   9  LAST  79  4735          SURFFBIT  =        BIT8                                 SURFACE
A0789

A0790                                                      BIT 7 FLAG 8     (S)
 0791                     0200          INFINFLG  =        128D             NO CONIC SOLUTION   CONIC SOLUTION
A0792                                                                       (CLOSURE THROUGH    EXISTS
 0793  REF   9  LAST  80  4736          INFINBIT  =        BIT7             INFINITY REQUIRED)
A0794

A0795                                                      BIT 6 FLAG 8     (S)
 0796                     0201          ORDERSW   =        129D             ITERATOR USES 2ND   ITERATOR USES 1ST
 0797  REF   9  LAST  80  4737          ORDERBIT  =        BIT6             ORDER MINIMUM MODE  ORDER STANDARD MODE
A0798

A0799                                                      BIT 5 FLAG 8     (S)
 0800                     0202          APSESW    =        130D             RDESIRED OUTSIDE    RDESIRED INSIDE
A0801                                                                       PERICENTER-APOCENTERPERICENTER-APOCENTER
 0802  REF   8  LAST  80  4740          APSESBIT  =        BIT5             RANGE IN TIME-RADI  RANGE IN TIME-RADIUS
A0803
```

```
A0804                                                   BIT 4 FLAG 8    (S)
 0805                         0203        COGAFLAG =    131D            NO CONIC SOLUTION - CONIC SOLUTION
A0806                                                                   TOO CLOSE TO RECTI- EXISTS(COGA DOES NOT
 0807   REF   8  LAST   80    4741        COGAFBIT =    BIT4            LINEAR(COGA OVRFLWS) OVERFLOW)
A0808

A0809                                                   BIT 3 FLAG 8
A0810                                              =    132D

A0811                                                   BIT 2 FLAG 8    (L)
 0812                         0205        INITALGN =    133D            INITIAL PASS THRU   SECOND PASS THRU P57
 0813   REF   8  LAST   80    4743        INITABIT =    BIT2            P57                (CHECK RESET-MILLARD)
A0814

A0815                                                   BIT 1 FLAG 8    (S)
 0816                         0206        360SW    =    134D            TRANSFER ANGLE NEAR TRANSFER ANGLE NOT
 0817   REF   8  LAST   80    4744        360SWBIT =    BIT1            360 DEGREES         NEAR 360 DEGREES
A0818

 0819   REF  10  LAST   80    0105        FLAGWRD9 =    STATE +9D       (135 - 149)

A0820                                                                   (SET)               (RESET)
A0821

A0822                                                   BIT 15 FLAG 9
A0823                                              =    135D
A08231                                             =    BIT15

A0824                                                   BIT 14 FLAG 9   (L)
 0825                         0210        FLVR     =    136D            VERTICAL RISE       NON-VERTICAL RISE
 0826   REF   9  LAST   79    4727        FLVRBIT  =    BIT14           (ASCENT GUIDANCE)
A0827

A0828                                                   BIT 13 FLAG 9
 0829                         0211        P7071FLG =    137D            P70 OR P71 IS USING  P12 IS USING THE
 08295  REF  11  LAST   81    4730        P7071BIT =    BIT13           ASCENT GUID. EQS.   ASCENT GUID. EQS.
A0830

A0831                                                   BIT 12 FLAG 9   (L)
 0832                         0212        FLPC     =    138D            NO POSITION CONTROL  POSITION CONTROL
 0833   REF   9  LAST   81    4731        FLPCBIT  =    BIT12           (ASCENT GUIDANCE)
A0834

A0835                                                   BIT 11 FLAG 9   (L)
 0836                         0213        FLPI     =    139D            PRE-IGNITION PHASE  REGULAR GUIDANCE
 0837   REF  10  LAST   81    4732        FLPIBIT  =    BIT11           (ASCENT GUIDANCE)
A0838

A0839                                                   BIT 10 FLAG 9   (L)
 0840                         0214        FLRCS    =    140D            RCS INJECTION MODE  MAIN ENGINE MODE
 0841   REF   9  LAST   81      4733          FLRCSBIT =      BIT10           (ASCENT GUIDANCE)
A0842

A0843                                                         BIT 9 FLAG 9    (L)
 0844                           0215          LETABORT =      1410            ABORT PROGRAMS       ABORT PROGRAMS
 0845   REF   7  LAST   79      4734          LETABBIT =      BIT9            ARE ENABLED          ARE NOT ENABLED
A0846

A0847                                                         BIT 8 FLAG 9    (L)
 0848                           0216          FLAP     =      1420            APS CONTINUED ABORT  APS ABORT IS NOT A
A0849                                                                         AFTER DPS STAGING    CONTINUATION
 0850   REF  10  LAST   81      4735          FLAPBIT  =      BIT8            (ASCENT GUIDANCE)
A0851

A0852                                                         BIT 7 FLAG 9    (L)
 0853                           0217          ABTTGFLG =      1430            J2,K2 PARAMETERS     J1,K1 PARAMETERS
 08535  REF  10  LAST   81      4736          ABTTGBIT =      BIT7            USED FOR ABORT       USED FOR ABORT
A08537                                                                        TARGETING            TARGETING

A0854                                                         BIT 6 FLAG 9    (L)
 0855                           0220          ROTFLAG  =      1440            P70 AND P71 WILL     P70 AND P71 WILL NOT
 0856   REF  10  LAST   81      4737          ROTFLBIT =      BIT6            FORCE VEHICLE        FORCE VEHICLE
A0857                                                                         ROTATION IN THE      ROTATION IN THE
A0858                                                                         PREFERRED DIRECTION. PREFERRED DIRECTION

A0859                                                         BIT 5 FLAG 9    (S)
 0860                           0221          QUITFLAG =      1450            DISCONTINUE INTEGR.  CONTINUE INTEGRATION
 0861   REF   9  LAST   81      4740          QUITBIT  =      BIT5
A0862

A0863                                                         BIT 4 FLAG 9
 0864                           0222          FLT59FLG =      1460            LUNAR SURFACE MARK   NORMAL MARKING TO BE
 0865   REF   9  LAST   82      4741          FLT59BIT =      BIT4            PROCEDURE USED       USED DURING INFLITE
A0866                                                                         DURING INFLITE ALGN  ALIGNMENT
A0867                                                         BIT 3 FLAG 9    (L)
 0868                           0223          MID1FLAG =      1470            INTEGRATE TO TDEC    INTEGRATE TO THE
 0869   REF   9  LAST   80      4742          MID1FBIT =      BIT3                                 THEN-PRESENT TIME
A0870

A0871                                                         BIT 2 FLAG 9    (L)
 0872                           0224          MIDAVFLG =      1480            INTEGRATION ENTERED  INTEGRATION WAS
A0873                                                                         FROM ONE OF MIDTOAV  NOT ENTERED VIA
 0874   REF   9  LAST   82      4743          MIDAVBIT =      BIT2            PORTALS              MIDTOAV
A0875
A0876                                                         BIT 1 FLAG 9    (S)
 0877                           0225          AVEMIDSW =      1490            AVETOMID CALLING     NO AVETOMID W INTEGR
A0878                                                                         FOR W.MATRIX INTEGR  ALLOW SET UP RN,VN,
 0879   REF   9  LAST   82      4744          AVEMDBIT =      BIT1            DONT WRITE OVER RN,  PIPTIME
A0880                                                                         VN,PIPTIME
```

```
A0881

 0882  REF   1               0106          RASFLAG  EQUALS FLGWRD10        WAS ONLY AN INSTALL- ERASTALL FLAG
A0883

 0884  REF  11  LAST   82    0106          FLGWRD10 =      STATE +10D       (150 - 164)

A0885                                                                       (SET)                (RESET)

A0886                                                      BIT 15 FLAG 10
A0887                                               =      150D
A0888

A0889                                                      BIT 14 FLAG 10   (L,C)
 0890                        0227          INTFLAG  =      151D             INTEGRATION IN       INTEGRATION NOT IN
 0891  REF  10  LAST   82    4727          INTFLBIT =      BIT14            PROGRESS             PROGRESS
A0892

A0893                                                      BIT 13 FLAG 10   (S,L)
 0894                        0230          APSFLAG  =      152D             ASCENT STAGE         DESCENT STAGE
 0895  REF  12  LAST   82    4730          APSFLBIT =      BIT13            ***PROTECTED FROM FRESH START ***
A0896

A0897                                                      BIT 12 FLAG 10
A0898                                               =      153D
A0899

A0900                                                      BIT 11 FLAG 10
A0901                                               =      154D
A0902

A0903                                                      BIT 10 FLAG 10
A0904                                               =      155D
A0905

A0906                                                      BIT  9 FLAG 10
A0907                                               =      156D
A0908

A0909                                                      BIT  8 FLAG 10
A0910                                               =      157D
A0911

A0912                                                      BIT 7 FLAG 10    (L,C)
 0913                        0236          REINTFLG =      158D             INTEGRATION ROUTINE INTEGRATION ROUTINE
 0914  REF  11  LAST   83    4736          REINTBIT =      BIT7             TO BE RESTARTED      NOT TO BE RESTARTED
A0915

A0916                                                      BIT  6 FLAG 10
A0917                                               =      159D
```

```
A0918

A0919                                                   BIT  5 FLAG 10
A0920                                         =         160D
A0921

A0922                                                   BIT  4 FLAG 10
A0923                                         =         161D
A0924

A0925                                                   BIT  3 FLAG 10
A0926                                         =         162D
A0927

A0928                                                   BIT  2 FLAG 10
 0929                        0243   CONTRLFL  =         163D          DAP CONTROLLING      DAP NOT CONTROLLING
 0930   REF  10  LAST   83   4743   CONTRLBT  =         BIT2          VEHICLE ATTITUDE     VEHICLE ATTITUDE
A09301

A0931                                                   BIT  1 FLAG 10
 0932                        0244   NPGNCSFL  =         164D          LAST ACTIVE DAP      LAST ACTIVE DAP
 0933   REF  10  LAST   83   4744   NPGNCSBT  =         BIT1          PASS DONE WITH AN    PASS DONE WITH A
A09331                                                                AGS INDICATION       PGNCS INDICATION
A0934


 0935   REF  12  LAST   84   0107   FLGWRD11  =         STATE +11D    (165 - 179)

A0936                                                                 (SET)                (RESET)

A0937                                                   BIT 15 FLAG 11  (L)(R12)
 0938                        0245   LRBYPASS  =         165D          BYPASS ALL LANDING  DO NOT BYPASS LR
 0939   REF  10  LAST   80   4726   LRBYBIT   =         BIT15         RADAR UPDATES       UPDATES
A0940

A0941                                                   BIT 14 FLAG 11
 0942                        0246   VFAILFLG  =         166D          LANDING RADAR VEL  LANDING RADAR VEL
 0943   REF  11  LAST   84   4727   VFAILBIT  =         BIT14         FAILED REAS TEST   PASS REAS TEST
A0944

A0945                                         =         BIT 13 FLAG 11
 0946                        0247   HFAILFLG  =         167D          LANDING RADAR ALT  LANDING RADAR VEL
 0947   REF  13  LAST   84   4730   HFAILBIT  =         BIT13         FAILED REAS TEST   PASS REAS TEST
A0948

A0949                                                   BIT 12 FLAG 11  (L)(R12)
 0950                        0250   VXINH     =         168D          IF Z VELOCITY DATA  UPDATE X AXIS
A0951                                                                 UNREASONABLE,       VELOCITY
 0952   REF  10  LAST   82   4731   VXINHBIT  =         BIT12         BYPASS X VELOCITY
A0953                                                                 UPDATE ON NEXT PASS
```

```
A0954                                                      BIT 11 FLAG 11  (L)(R12)
 0955                              0251        PSTHIGAT =   169D            PAST HIGATE           PREHIGATE
 0956  REF  11  LAST   82          4732        PSTHIBIT =   BIT11
A0957

A0958                                                      BIT 10 FLAG 11  (L)(R12)
 0959                              0252        NOLRREAD =   170D            LANDING RADAR         LR NOT REPOSITIONING
A0960                                                                       REPOSITIONING;
 0961  REF  10  LAST   83          4733        NOLRRBIT =   BIT10           BYPASS UPDATE
A0962

A0963                                                      BIT 9 FLAG 11   (L)(R12)
 0964                              0253        XORFLG   =   171D            BELOW LIMIT           ABOVE LIMIT DO
A0965                                                                       INHIBIT X AXIS        NOT INHIBIT
 0966  REF   8  LAST   83          4734        XORFLBIT =   BIT9            OVERRIDE
A0967

A0968                                                      BIT 8 FLAG 11
 0969                              0254        LRINH    =   172D            LANDING RADAR UP-     LR UPDATES INHIBITED
 0970  REF  11  LAST   83          4735        LRINHBIT =   BIT8            DATES PERMITTED       BY ASTRONAUT
A0971                                                                       BY ASTRONAUT
A0972

A0973                                                      BIT 7 FLAG 11   (L)(R12)
 0974                              0255        VELDATA  =   173D            LR VELOCITY           LR VELOCITY MEASURE
 0975  REF  12  LAST   84          4736        VELDABIT =   BIT7            MEASUREMENT MADE      NOT MADE
A0976

A0977                                                      BIT 6 FLAG 11
A0978                                                   =   174D
A0979                                                   =   BIT6
A0980

A0981                                                      BIT 5 FLAG 11   (L)(R12)
A0982                                                   =   175D
A0983                                                   =   BIT5
A0984

A0985                                                      BIT 4 FLAG 11   (L)(R12)
 0986                              0260        RNGEDATA =   176D            LR ALTITUDE           LR ALTITUDE MEASURE
 0987  REF  10  LAST   83          4741        RNGEDBIT =   BIT4            MEASUREMENT MADE      NOT MADE
A0988

A0989                                                      BIT 3 FLAG 11
 0990                              0261        R12RDFLG =   177D            WAIT UNTIL ALL VEL       ALLOW R12 PROCESS-
 0991  REF  10  LAST   83          4742        R12RDBIT =   BIT3            READS DONE BEFORE        ING OF VELDATA;
A0992                                                                       R12 PROCESSING           LR VEL READ DONE
A0993

A0994                                                      BIT 2 FLAG 11   (L)(R12)
```

```
 0995                         0262          VFLSHFLG =        178D             LR VELOCITY FAIL      LR VEL FAIL LAMP
 0996   REF  11  LAST   85    4743          VFLSHBIT =        BIT2             LAMP SHOULD BE        SHOULDN'T FLASH
A0997                                                                          FLASHING
A0998

A0999                                                         BIT 1 FLAG 11    (L)(R12)
 1000                         0263          HFLSHFLG =        179D             LR ALTITUDE FAIL      LR ALTITUDE FAIL
 1001   REF  11  LAST   85    4744          HFLSHBIT =        BIT1             LAMP SHOULD BE        LAMP SHOULD NOT BE
A1002                                                                          FLASHING              FLASHING
A1003

 1004   REF   1               0110          RADMODES EQUALS FLGWRD12           RADAR FLAG WORD
A1005

 1006   REF  13  LAST   85    0110          FLGWRD12 =        STATE +12D       (180 - 194)      WAS RADMODES

A1007                                                                          (SET)                 (RESET)

A1008                                                         BIT 15 FLAG 12
 1009                         0264          CDESFLAG =        180D             CONTINUOUS DESIG-     LGC CHECKS FOR LOCK-
 1010   REF  11  LAST   85    4726          CDESBIT  =        BIT15            NATE. LGC COMMANDS    ON WHEN ANTENNA
A1011                                                                          RR REGARDLESS OF      BEING DESIGNATED
A1012                                                                          LOCK-ON
A1013

A1014                                                         BIT 14 FLAG 12
 1015                         0265          REMODFLG =        181D             CHANGE IN ANTENNA     NO REMODE REQUESTED
 1016   REF  12  LAST   85    4727          REMODBIT =        BIT14            MODE BEEN REQUESTED OR OCCURRING
A1017                                                                          I.E., REMODE
A1018

A1019                                                         BIT 13 FLAG 12
 1020                         0266          RCDU0FLG =        182D             RR CDU'S BEING        RR CDU'S NOT BEING
 1021   REF  14  LAST   85    4730          RCDU0BIT =        BIT13            ZEROED                ZEROED
A1022

A1023                                                         BIT 12 FLAG 12
 1024                         0267          ANTENFLG =        183D             RR ANTENNA MODE IS    RR ANTENNA IN MODE 1
 1025   REF  11  LAST   85    4731          ANTENBIT =        BIT12            MODE 2
A1026

A1027                                                         BIT 11 FLAG 12
 1028                         0270          REPOSMON =        184D             REPOSITION MONITOR.  NO REPOSITION TAKING
 1029   REF  12  LAST   86    4732          REPOSBIT =        BIT11            RR REPOSITION IS      PLACE
A1030                                                                          TAKING PLACE
A1031

A1032                                                         BIT 10 FLAG 12
 1033                         0271          DESIGFLG =        185D             RR DESIGNATE          RR DESIGNATE NOT
 1034   REF  11  LAST   86    4733          DESIGBIT =        BIT10            REQUESTED OR IN       REQUESTED OR IN
```

```
A1035                                                                     PROGRESS              PROGRESS
A1036

A1037                                                     BIT 9 FLAG 12
 1038                        0272         ALTSCALE =      186D            LR ALTITUDE READING LR ALTITUDE READING
 1039  REF   9  LAST   86    4734         ALTSCBIT =      BIT9            IS ON HIGH SCALE    IS ON LOW SCALE
A1040

A1041                                                     BIT 8 FLAG 12
 1042                        0273         LRVELFLG =      187D            LR VELOCITY DATA    NO LR VELOCITY DATA
 1043  REF  12  LAST   86    4735         LRVELBIT =      BIT8            FAIL                FAIL
A1044

A1045                                                     BIT 7 FLAG 12
 1046                        0274         RCDUFAIL =      188D            RR CDU FAIL HAS     RR CDU FAIL OCCURRED
 1047  REF  13  LAST   86    4736         RCDUFBIT =      BIT7            NOT OCCURRED
A1048

A1049                                                     BIT 6 FLAG 12
 1050                        0275         LRPOSFLG =      189D            LANDING RADAR       LR POSITION 1
 1051  REF  11  LAST   83    4737         LRPOSBIT =      BIT6            POSITION 2
A1052

A1053                                                     BIT 5 FLAG 12
 1054                        0276         LRALTFLG =      190D            LR ALTITUDE DATA    NO LR ALTITUDE DATA
 1055  REF  10  LAST   83    4740         LRALTBIT =      BIT5            FAIL. COULD NOT BE  FAIL
A1056                                                                     READ SUCCESSFULLY.
A1057

A1058                                                     BIT 4 FLAG 12
 1059                        0277         RRDATAFL =      191D            RR DATA FAIL.       NO RR DATA FAIL.
 1060  REF  11  LAST   86    4741         RRDATABT =      BIT4            DATA COULD NOT BE
A1061                                                                     READ SUCCESSFULLY
A1062

A1063                                                     BIT 3 FLAG 12
 1064                        0300         RRRSFLAG =      192D            RR RANGE READING    RR RANGE READING ON
 1065  REF  11  LAST   86    4742         RRRSBIT  =      BIT3            ON THE HIGH SCALE   THE LOW SCALE
A1066

A1067                                                     BIT 2 FLAG 12
 1068                        0301         AUTOMODE =      193D            RR NOT IN AUTO MODE.  RR IN AUTO MODE
 1069  REF  12  LAST   87    4743         AUTOMBIT =      BIT2            AUTO MODE DISCRETE
A1070                                                                     IS NOT PRESENT
A1071

A1072                                                     BIT 1 FLAG 12
 1073                        0302         TURNONFL =      194D            RR TURN-ON SEQUENCE NO RR TURN-ON
 1074  REF  12  LAST   87    4744         TURNONBT =      BIT1            IN PROGRESS. (ZERO  SEQUENCE IN PROGRESS
A1075                                                                     CDU'S, FIX ANTENNA
A1076                                                                      MODE)
A1077

 1078  REF   1               0111        DAPBOOLS EQUALS FLGWRD13          DIGITAL AUTOPILOT FLAGWORD
A1079

 1080  REF  14  LAST   87    0111        FLGWRD13 =       STATE +13D       (195 - 209)     WAS DAPBOOLS

A1081                                                                      (SET)                  (RESET)

A1082                                                     BIT 15 FLAG 13
 1083                        0303        PULSEFLG =       195D             MINIMUM IMPULSE        NOT IN MINIMUM
 1084  REF  12  LAST   87    4726        PULSES   =       BIT15            COMMAND MODE IN        IMPULSE COMMAND MODE
A1085                                                                      "ATT HOLD" (V76)       (V77)
A1086

A1087                                                     BIT 14 FLAG 13
 1088                        0304        USEQRFLG =       196D             GIMBAL UNUSABLE.       TRIM GIMBAL MAY BE
 1089  REF  13  LAST   87    4727        USEQRJTS =       BIT14            USE JETS ONLY.         USED.
A1090

A1091                                                     BIT 13 FLAG 13
 1092                        0305        CSMDKFLG =       197D             CSM DOCKED. USE        CSM NOT DOCKED TO LM
 1093  REF  15  LAST   87    4730        CSMDOCKD =       BIT13            BACKUP DAP
A1094

A1095                                                     BIT 12 FLAG 13
 1096                        0306        OURRCFLG =       198D             CURRENT DAP PASS       CURRENT DAP PASS IS
 1097  REF  12  LAST   87    4731        OURRCBIT =       BIT12            IS RATE COMMAND        NOT RATE COMMAND
A1098

A1099                                                     BIT 11 FLAG 13
 1100                        0307        ACC4-2FL =       199D             4 JET X-AXIS TRANS-    2 JET X-AXIS TRANS-
 1101  REF  13  LAST   87    4732        ACC4OR2X =       BIT11            LATION REQUESTED       LATION REQUESTED
A1102

A1103                                                     BIT 10 FLAG 13
 1104                        0310        AORBTFLG =       200D             B SYSTEM FOR X-        A SYSTEM FOR X-
 1105  REF  12  LAST   87    4733        AORBTRAN =       BIT10            TRANSLATION            TRANSLATION PREFERR'D
A1106

A1107                                                     BIT 9 FLAG 13
 1108                        0311        XOVINFLG =       201D             X-AXIS OVERRIDE        X-AXIS OVERRIDE OKAY
 1109  REF  10  LAST   88    4734        XOVINHIB =       BIT9             LOCKED OUT
A1110

A1111                                                     BIT 8 FLAG 13
 1112                        0312        DRIFTDFL =       202D             ASSUME 0 OFFSET        USE OFFSET ACCELERA-
 1113  REF  13  LAST   88    4735        DRIFTBIT =       BIT8             DRIFTING FLIGHT.       TION ESTIMATE
A1114
```

```
A1115                                                  BIT 7 FLAG 13
 1116                       0313        RHCSCFLG =     203D            NORMAL RHC SCALING  FINE RHC SCALING
 1117   REF  14  LAST  88   4736        RHCSCALE =     BIT7            REQUESTED           REQUESTED
A1118

A1119                                                  BIT 6 FLAG 13
 1120                       0314        ULLAGFLG =     204D            ULLAGE REQUEST BY   NO INTERNAL ULLAGE
 1121   REF  12  LAST  88   4737        ULLAGER  =     BIT6            MISSION PROGRAM     REQUEST
A1122

A1123                                                  BIT 5 FLAG 13
 1124                       0315        DBSL2FLG =     205D            5 DEG DEADBAND      1 OR .3 DEG DEADBAND
 1125   REF  11  LAST  88   4740        DBSLECT2 =     BIT5            SELECTED BY CREW    SELECTED BY CREW
A11251                                                                                     (SEE BIT4 DAPBOOLS)
A1126

A1127                                                  BIT 4 FLAG 13
 1128                       0316        DBSELFLG =     206D            1 DEG DEADBAND      MIN DB SELECTED BY
 1129   REF  12  LAST  88   4741        DBSELECT =     BIT4            SELECTED BY CREW    CREW (0.3 DEG)
A1130

A1131                                                  BIT 3 FLAG 13
 1132                       0317        ACCOKFLG =     207D            CONTROL AUTHORITY   RESTART OR FRESH ST.
 1133   REF  12  LAST  88   4742        ACCSOKAY =     BIT3            VALUES FROM 1/ACCS  SINCE LAST 1/ACCS;
A1134                                                                  USABLE              OUTPUTS SUSPECT.
A1135

A1136                                                  BIT 2 FLAG 13
 1137                       0320        AUTR2FLG =     208D            THESE FLAGS ARE USED TOGETHER TO INDICAT
 1138   REF  13  LAST  88   4743        AUTRATE2 =     BIT2            ASTRONAUT-CHOSEN KALCMANU MANEUVER RATES
A1139                                                                  (0,0)=(BIT2,BIT1)= 0.2 DEG/SEC
A1140                                                                  (0,1)=  0.5 DEG/SEC
A1141                                                  BIT 1 FLAG 13
 1142                       0321        AUTR1FLG =     209D            (1,0)=  2.0 DEG/SEC
 1143   REF  13  LAST  88   4744        AUTRATE1 =     BIT1            (1,1)= 10.0 DEG/SEC
A1144
```

```
L        SUBROUTINE CALLS                                                                   USER'S PAGE NO.   1       FO S4

 0001  *                          0000                         SUBRO  LUMERASE  176
 0002  *                          0000                         SUBRO  LEMONAID  156
 0003  *                          0000                         SUBRO  LEMP20S   168
 0004  *                          0000                         SUBRO  LEMP30S   105
 0005  *                          0000                         SUBRO  KISSING   067
 0006  *                          0000                         SUBRO  FLY       197
 0007  *                          0000                         SUBRO  LEMP50S   130
 0008  *                          0000                         SUBRO  SKIPPER   131
 0009  *                          0000                         SUBRO  LMDAP     032

*** END OF MAIN PROGRAM ***
```

```
R0001    CONVENTIONS AND NOTATIONS UTILIZED FOR ERASABLE ASSIGNMENTS.

R0002              EQUALS IS USED IN TWO WAYS.  IT IS OFTEN USED TO CHAIN A GROUP
R0003                     OF ASSIGNMENTS SO THAT THE GROUP MAY BE MOVED WITH THE
R0004                     CHANGING OF ONLY ONE CARD.  EXAMPLE.

A0005                                                X         EQUALS START
A0006                                                Y         EQUALS X          +SIZE.X
A0007                                                Z         EQUALS Y          +SIZE.Y

R0008                     (X, Y, AND Z ARE CONSECUTIVE AND BEGIN AT START.        )
R0009                     (SIZE.X AND SIZE.Y ARE THE RESPECTIVE SIZES OF X AND Y,
R0010                      USUALLY NUMERIC,  IE. 1, 2, 6, 18D ETC.                )

R0011              EQUALS OFTEN IMPLIES THE SHARING OF REGISTERS (DIFFERENT NAMES
R0012                     AND DIFFERENT DATA).  EXAMPLE.

A0013                                                X         EQUALS Y


R0014              = MEANS THAT MULTIPLE NAMES HAVE BEEN GIVEN TO THE SAME DATA.
R0015                     (THIS IS LOGICAL EQUIVALENCE, NOT SHARING)  EXAMPLE.

A0016                                                X         =       Y


R0017              THE SIZE AND UTILIZATION OF AN ERASABLE ARE OFTEN INCLUDED IN
R0018              THE COMMENTS IN THE FOLLOWING FORM.  M(SIZE)N.

R0019                     M REFERS TO THE MOBILITY OF THE ASSIGNMENT.
R0020                          B   MEANS THAT THE SYMBOL IS REFERENCED BY BASIC
R0021                              INSTRUCTIONS AND THUS IS E-BANK SENSITIVE.
R0022                          I   MEANS THAT THE SYMBOL IS REFERENCED ONLY BY
R0023                              INTERPRETIVE INSTRUCTIONS, AND IS THUS E-BANK
R0024                              INSENSITIVE AND MAY APPEAR IN ANY E-BANK.

R0025                     SIZE IS THE NUMBER OF REGISTERS INCLUDED BY THE SYMBOL.

R0026                     N INDICATES THE NATURE OR PERMANENCE OF THE CONTENTS.
R0027                          PL  MEANS THAT THE CONTENTS ARE PAD LOADED.
R0028                          DSP MEANS THAT THE REGISTER IS USED FOR A DISPLAY.
R0029                          PRM MEANS THAT THE REGISTER IS PERMANENT, IE. IT
R0030                              IS USED DURING THE ENTIRE MISSION FOR ONE
R0031                              PURPOSE AND CANNOT BE SHARED.
R0032                          TMP MEANS THAT THE REGISTER IS USED TEMPORARILY OR
R0033                              IS A SCRATCH REGISTER FOR THE ROUTINE TO WHICH
R0034                              IT IS ASSIGNED.  THAT IS, IT NEED NOT BE SET
R0035                              PRIOR TO INVOCATION OF THE ROUTINE NOR DOES IT
R0036                              CONTAIN USEFUL OUTPUT TO ANOTHER ROUTINE.  THUS
```

```
R0037                                       IT MAY BE SHARED WITH ANY OTHER ROUTINE WHICH
R0038                                       IS NOT ACTIVE IN PARALLEL.
R0039                                   IN  MEANS INPUT TO THE ROUTINE AND IT IS PROBABLY
R0040                                       TEMPORARY FOR A HIGHER-LEVEL ROUTINE/PROGRAM.
R0041                                   OUT MEANS OUTPUT FROM THE ROUTINE, PROBABLY
R0042                                       TEMPORARY FOR A HIGHER-LEVEL ROUTINE/PROGRAM.
```

```
L       ERASABLE ASSIGNMENTS                                                              USER'S PAGE NO.   3      FO S4

P0043               SPECIAL REGISTERS.

 0044                                0000          A         EQUALS 0
 0045                                0001          L         EQUALS 1          L AND Q ARE BOTH CHANNELS AND REGISTERS.
 0046                                0002          Q         EQUALS 2
 0047                                0003          EBANK     EQUALS 3
 0048                                0004          FBANK     EQUALS 4
 0049                                0005          Z         EQUALS 5          ADJACENT TO FBANK AND BBANK FOR DXCH Z
 0050                                0006          BBANK     EQUALS 6          (DTCB) AND DXCH FBANK (DTCF).
A0051                                                                          REGISTER 7 IS A ZERO-SOURCE, USED BY ZL.

 0052                                0010          ARUPT     EQUALS 10         INTERRUPT STORAGE.
 0053                                0011          LRUPT     EQUALS 11
 0054                                0012          QRUPT     EQUALS 12
 0055                                0013          SAMPTIME  EQUALS 13         SAMPLED TIME 1 & 2.
 0056                                0015          ZRUPT     EQUALS 15         (13 AND 14 ARE SPARES.)
 0057                                0016          BANKRUPT  EQUALS 16         USUALLY HOLDS FBANK OR BBANK.
 0058                                0017          BRUPT     EQUALS 17         RESUME ADDRESS AS WELL.

 0059                                0020          CYR       EQUALS 20
 0060                                0021          SR        EQUALS 21
 0061                                0022          CYL       EQUALS 22
 0062                                0023          EDOP      EQUALS 23         EDITS INTERPRETIVE OPERATION CODE PAIRS.


 0063                                0024          TIME2     EQUALS 24
 0064                                0025          TIME1     EQUALS 25
 0065                                0026          TIME3     EQUALS 26
 0066                                0027          TIME4     EQUALS 27
 0067                                0030          TIME5     EQUALS 30
 0068                                0031          TIME6     EQUALS 31
 0069                                0032          CDUX      EQUALS 32
 0070                                0033          CDUY      EQUALS 33
 0071                                0034          CDUZ      EQUALS 34
 0072                                0035          CDUT      EQUALS 35         REND RADAR TRUNNION CDU
 0073                                0036          CDUS      EQUALS 36         REND RADAR SHAFT CDU
 0074                                0037          PIPAX     EQUALS 37
 0075                                0040          PIPAY     EQUALS 40
 0076                                0041          PIPAZ     EQUALS 41
 0077                                0042          Q-RHCCTR  EQUALS 42         RHC COUNTER REGISTERS
 0078                                0043          P-RHCCTR  EQUALS 43
 0079                                0044          R-RHCCTR  EQUALS 44
 0080                                0045          INLINK    EQUALS 45
 0081                                0046          RNRAD     EQUALS 46
 0082                                0047          GYROCMD   EQUALS 47
 0083                                0050          CDUXCMD   EQUALS 50
 0084                                0051          CDUYCMD   EQUALS 51
 0085                                0052          CDUZCMD   EQUALS 52
 0086                                0053          CDUTCMD   EQUALS 53         RADAR TRUNNION COMMAND
 0087                                0054          CDUSCMD   EQUALS 54         RADAR SHAFT COMMAND
 0088                            0055            THRUST   EQUALS 55
 0089                            0056            LEMONM   EQUALS 56
 0090                            0057            OUTLINK  EQUALS 57
 0091                            0060            ALTM     EQUALS 60

R0092            INTERPRETIVE REGISTERS ADDRESSED RELATIVE TO VAC AREA.

 0093                            0042            LVSQUARE EQUALS 34D                SQUARE OF VECTOR INPUT TO ABVAL AND UNIT
 0094                            0044            LV       EQUALS 36D                LENGTH OF VECTOR INPUT TO UNIT.
 0095                            0046            X1       EQUALS 38D                INTERPRETIVE SPECIAL REGISTERS RELATIVE
 0096                            0047            X2       EQUALS 39D                TO THE WORK AREA.
 0097                            0050            S1       EQUALS 40D
 0098                            0051            S2       EQUALS 41D
 0099                            0052            QPRET    EQUALS 42D

R0100   INPUT/OUTPUT CHANNELS

A0101                                             *** CHANNEL ZERO IS TO BE USED IN AN INDEXED OPERATION ONLY. ***
 0102   REF    1                 0001            LCHAN    EQUALS L
 0103   REF    1                 0002            QCHAN    EQUALS Q
 0104                            0003            HISCALAR EQUALS 3
 0105                            0004            LOSCALAR EQUALS 4
 0106                            0005            CHAN5    EQUALS 5
 0107                            0006            CHAN6    EQUALS 6
 0108                            0007            SUPERBNK EQUALS 7                  SUPER-BANK.
 0109                            0010            OUT0     EQUALS 10
 0110                            0011            DSALMOUT EQUALS 11
 0111                            0012            CHAN12   EQUALS 12
 0112                            0013            CHAN13   EQUALS 13
 0113                            0014            CHAN14   EQUALS 14
 0114                            0015            MNKEYIN  EQUALS 15
 0115                            0016            NAVKEYIN EQUALS 16
 0116                            0030            CHAN30   EQUALS 30
 0117                            0031            CHAN31   EQUALS 31
 0118                            0032            CHAN32   EQUALS 32
 0119                            0033            CHAN33   EQUALS 33
 0120                            0034            DNTM1    EQUALS 34
 0121                            0035            DNTM2    EQUALS 35
 0122                            0076            CHAN76   EQUALS 76
 0123                            0077            CHAN77   EQUALS 77
R0124   END OF CHANNEL ASSIGNMENTS
```

```
P0125   INTERPRETIVE SWITCH BIT ASSIGNMENTS
A0126

R0127              **  FLAGWORDS AND BITS NOW ASSIGNED AND DEFINED IN THEIR OWN LOG SECTION.  **
```

```
P0129    GENERAL ERASABLE ASSIGNMENTS.

 0130                                0061                    SETLOC 61
R0131              INTERRUPT TEMPORARY STORAGE POOL.                                   (11D)

R0133                (ITEMP1 THROUGH RUPTREG4)

R0134              ANY OF THESE MAY BE USED AS TEMPORARIES DURING INTERRUPT OR WITH INTERRUPT INHIBITED. THE ITEMP SERIES
R0136    IS USED DURING CALLS TO THE EXECUTIVE AND WAITLIST - THE RUPTREGS ARE NOT.

 0138                                0061     0061   ITEMP1   ERASE
 0139    REF   1                     0061            WAITEXIT EQUALS ITEMP1
 0140    REF   2  LAST    97         0061            EXECTEM1 EQUALS ITEMP1

 0141                                0062     0062   ITEMP2   ERASE
 0142    REF   1                     0062            WAITBANK EQUALS ITEMP2
 0143    REF   2  LAST    97         0062            EXECTEM2 EQUALS ITEMP2

 0144                                0063     0063   ITEMP3   ERASE
 0145    REF   1                     0063            WAITADR  EQUALS ITEMP3
 0146    REF   2  LAST    97         0063            NEWPRIO  EQUALS ITEMP3

 0147                                0064     0064   ITEMP4   ERASE
 0148    REF   1                     0064            LOCCTR   EQUALS ITEMP4
 0149    REF   2  LAST    97         0064            WAITTEMP EQUALS ITEMP4

 0150                                0065     0065   ITEMP5   ERASE
 0151    REF   1                     0065            NEWLOC   EQUALS ITEMP5

 0152                                0066     0066   ITEMP6   ERASE
A0153                                                NEWLOC+1 EQUALS ITEMP6           DP ADDRESS.

 0154                                0067                     SETLOC 67
 0155                                0067     0067   NEWJOB   ERASE                   MUST BE AT LOC 67 DUE TO WIRING.


 0156                                0070     0070   RUPTREG1 ERASE
 0157                                0071     0071   RUPTREG2 ERASE
 0158                                0072     0072   RUPTREG3 ERASE
 0159                                0073     0073   RUPTREG4 ERASE
 0160    REF   1                     0073            KEYTEMP1 EQUALS RUPTREG4
 0161    REF   2  LAST    97         0073            DSRUPTEM EQUALS RUPTREG4

R0162              FLAGWORD RESERVATIONS.                                              (16D)

 0164                                0074     0113   STATE    ERASE           +15D    FLAGWORD REGISTERS.
A0165

R0166              P25 RADAR STORAGE.  (MAY BE UNSHARED IN E7)  (TEMP OVERLAY)     (2D)     OVERLAYS FLGWRD 14 & 15
```

```
  0168  REF  15  LAST  39     0112              LASTYCMD EQUALS STATE    +14D   B(1)PRM  THESE ARE CALLED BY T4RUPT
  0169  REF   1               0113              LASTXCMD EQUALS LASTYCMD +1     B(1)PRM  THEY MUST BE CONTIGUOUS,Y FIRST
 A0170


 R0171           EXEC TEMPORARIES WHICH MAY BE USED BETWEEN CCS NEWJOBS.  (32D) (INTB15+ THROUGH RUPTMXTM)
  0173                        0114      0114    INTB15+  ERASE                  REFLECTS 15TH BIT OF INDEXABLE ADDRESSES
  0174  REF   1               0114              DSEXIT   =       INTB15+        RETURN FOR DSPIN
  0175  REF   2  LAST  98     0114              EXITEM   =       INTB15+        RETURN FOR SCALE FACTOR ROUTINE SELECT
  0176                        0115      0115    INTBIT15 ERASE                  SIMILAR TO ABOVE.
  0177  REF   1               0115              WDRET    =       INTBIT15       RETURN FOR DSPWD
  0178  REF   2  LAST  98     0115              DECRET   =       INTBIT15       RETURN FOR PUTCOM(DEC LOAD)
  0179  REF   3  LAST  98     0115              21/22REG =       INTBIT15       TEMP FOR CHARIN

 R0180           THE REGISTERS BETWEEN ADDRWD AND PRIORITY MUST STAY IN THE FOLLOWING ORDER FOR INTERPRETIVE TRACE.

  0182                        0116      0116    ADDRWD   ERASE                  12 BIT INTERPRETIVE OPERAND SUB-ADDRESS.
  0183                        0117      0117    POLISH   ERASE                  HOLDS CADR MADE FROM POLISH ADDRESS.
  0184  REF   1               0117              UPDATRET =       POLISH         RETURN FOR UPDATNN, UPDATVB
  0185  REF   2  LAST  98     0117              CHAR     =       POLISH         TEMP FOR CHARIN
  0186  REF   3  LAST  98     0117              ERCNT    =       POLISH         COUNTER FOR ERROR LIGHT RESET
  0187  REF   4  LAST  98     0117              DECOUNT  =       POLISH         COUNTER FOR SCALING AND DISPLAY (DEC)

  0188                        0120      0120    FIXLOC   ERASE                  WORK AREA ADDRESS.
  0189                        0121      0121    OVFIND   ERASE                  SET NON-ZERO ON OVERFLOW.

  0190                        0122      0127    VBUF     ERASE   +5             TEMPORARY STORAGE USED FOR VECTORS.
  0191  REF   1               0122              SGNON    =       VBUF           TEMP FOR +,- ON
  0192  REF   2  LAST  98     0122              NOUNTEM  =       VBUF           COUNTER FOR MIXNOUN FETCH
  0193  REF   3  LAST  98     0122              DISTEM   =       VBUF           COUNTER FOR OCTAL DISPLAY VERBS
  0194  REF   4  LAST  98     0122              DECTEM   =       VBUF           COUNTER FOR FETCH (DEC DISPLAY VERBS)

  0195  REF   5  LAST  98     0123              SGNOFF   =       VBUF     +1    TEMP FOR +,- ON
  0196  REF   6  LAST  98     0123              NVTEMP   =       VBUF     +1    TEMP FOR NVSUB
  0197  REF   7  LAST  98     0123              SFTEMP1  =       VBUF     +1    STORAGE FOR SF CONST HI PART(=SFTEMP2-1)
  0198  REF   8  LAST  98     0123              HITEMIN  =       VBUF     +1    TEMP FOR LOAD OF HRS, MIN, SEC
 A0199                                                                                    MUST = LOTEMIN-1.
  0200  REF   9  LAST  98     0124              CODE     =       VBUF     +2    FOR DSPIN
  0201  REF  10  LAST  98     0124              SFTEMP2  =       VBUF     +2    STORAGE FOR SF CONST LO PART(=SFTEMP1+1)
  0202  REF  11  LAST  98     0124              LOTEMIN  =       VBUF     +2    TEMP FOR LOAD OF HRS, MIN, SEC
 A0203                                                                                    MUST = HITEMIN+1.
  0204  REF  12  LAST  98     0125              MIXTEMP  =       VBUF     +3    FOR MIXNOUN DATA
 R0205  ALSO MIXTEMP+1 = VBUF+4, MIXTEMP+2 = VBUF+5.

  0206                        0130      0132    BUF      ERASE   +2             TEMPORARY SCALAR STORAGE.
  0207                        0133      0134    BUF2     ERASE   +1
  0208  REF   1               0130              INDEXLOC EQUALS  BUF            CONTAINS ADDRESS OF SPECIFIED INDEX.
  0209  REF   2  LAST  98     0130              SWWORD   EQUALS  BUF            ADDRESS OF SWITCH WORD.
  0210  REF   3  LAST  98     0131              SWBIT    EQUALS  BUF  +1        SWITCH BIT WITHIN SWITCH WORD.
  0211                        0135      0135    MPTEMP   ERASE                  TEMPORARY USED IN MULTIPLY AND SHIFT.
```

18x3=54

```
 0212  REF   1                0135         DMPNTEMP =       MPTEMP            DMPSUB TEMPORARY
 0213                         0136   0136  DOTINC   ERASE                     COMPONENT INCREMENT FOR DOT SUBROUTINE.
 0214  REF   1                0136         DVSIGN   EQUALS DOTINC             DETERMINES SIGN OF DDV RESULT.
 0215  REF   2  LAST   99     0136         ESCAPE   EQUALS DOTINC             USED IN ARCSIN/ARCCOS.
 0216  REF   3  LAST   99     0136         ENTRET   =      DOTINC             EXIT FROM ENTER

 0217                         0137   0137  DOTRET   ERASE                     RETURN FROM DOT SUBROUTINE.
 0218  REF   1                0137         DVNORMCT EQUALS DOTRET             DIVIDEND NORMALIZATION COUNT IN DDV.
 0219  REF   2  LAST   99     0137         ESCAPE2  EQUALS DOTRET             ALTERNATE ARCSIN/ARCCOS SWITCH.
 0220  REF   3  LAST   99     0137         WDCNT    =      DOTRET             CHAR COUNTER FOR DSPWD
 0221  REF   4  LAST   99     0137         INREL    =      DOTRET             INPUT BUFFER SELECTOR ( X,Y,Z, REG )

 0222                         0140   0140  MATINC   ERASE                     VECTOR INCREMENT IN MXV AND VXM.
 0223  REF   1                0140         MAXDVSW  EQUALS MATINC             +0 IF DP QUOTIENT IS NEAR ONE - ELSE -1.
 0224  REF   2  LAST   99     0140         POLYCNT  EQUALS MATINC             POLYNOMIAL LOOP COUNTER
 0225  REF   3  LAST   99     0140         DSPMMTEM =      MATINC             DSPCOUNT SAVE FOR DSPMM
 0226  REF   4  LAST   99     0140         MIXBR    =      MATINC             INDICATOR FOR MIXED OR NORMAL NOUN

 0227                         0141   0141  TEM1     ERASE                     EXEC TEMP
 0228  REF   1                0141         POLYRET  =      TEM1
 0229  REF   2  LAST   99     0141         DSREL    =      TEM1               REL ADDRESS FOR DSPIN

 0230                         0142   0142  TEM2     ERASE                     EXEC TEMP
 0231  REF   1                0142         DSMAG    =      TEM2               MAGNITUDE STORE FOR DSPIN
 0232                         0143   0143  TEM3     ERASE                     EXEC TEMP
 0233  REF   1                0143         COUNT    =      TEM3               FOR DSPIN

 0234                         0144   0144  TEM4     ERASE                     EXEC TEMP
 0235  REF   1                0144         RELRET   =      TEM4               RETURN FOR RELDSP
 0236  REF   2  LAST   99     0144         DSPWDRET =      TEM4               RETURN FOR DSPSIGN
 0237  REF   3  LAST   99     0144         SEPSCRET =      TEM4               RETURN FOR SEPSEC
 0238  REF   4  LAST   99     0144         SEPMNRET =      TEM4               RETURN FOR SEPMIN

 0239                         0145   0145  TEM5     ERASE                     EXEC TEMP
 0240  REF   1                0145         NOUNADD  =      TEM5               TEMP STORAGE FOR NOUN ADDRESS

 0241                         0146   0146  NNADTEM  ERASE                     TEMP FOR NOUN ADDRESS TABLE ENTRY
 0242                         0147   0147  NNTYPTEM ERASE                     TEMP FOR NOUN TYPE TABLE ENTRY
 0243                         0150   0150  IDAD1TEM ERASE                     TEMP FOR INDIR ADRESS TABLE ENTRY(MIXNN)
A0244                                                                         MUST = IDAD2TEM-1, = IDAD3TEM-2.
 0245                         0151   0151  IDAD2TEM ERASE                     TEMP FOR INDIR ADRESS TABLE ENTRY(MIXNN)
A0246                                                                         MUST = IDAD1TEM+1, = IDAD3TEM-1.
 0247                         0152   0152  IDAD3TEM ERASE                     TEMP FOR INDIR ADRESS TABLE ENTRY(MIXNN)
A0248                                                                         MUST = IDAD1TEM+2, = IDAD2TEM+1.
 0249                         0153   0153  RUTMXTEM ERASE                     TEMP FOR SF ROUT TABLE ENTRY(MIXNN ONLY)

R0250            AX*SR*T STORAGE.                                             (6D)

 0252  REF   2  LAST   99     0142         DEXDEX   EQUALS TEM2               B(1)TMP
 0253  REF   2  LAST   99     0143         DEX1     EQUALS TEM3               B(1)TMP
 0254   REF   5  LAST   99     0144            DEX2     EQUALS TEM4           B(1)TMP
 0255   REF   2  LAST   99     0145            RTNSAVER EQUALS TEM5           B(1)TMP
 0256   REF   1                0157            TERMITMP EQUALS MPAC +3        B(2)TMP

 0257   REF   1                0143            DEXI      =      DEX1


R0258             THE FOLLOWING 10 REGISTERS ARE USED FOR TEMPORARY STORAGE OF THE DERIVATIVE COEFFICIENT TABLE OF
R0260   SUBROUTINE ROOTPSRS.   THEY MUST REMAIN WITHOUT INTERFERENCE WITH ITS SUBROUTINES WHICH ARE POWRSERS (POLY),
R0262   DMPSUB, DMPNSUB, SHORTMP, DDV/BDDV, ABS, AND USPRCADR.

 0263   REF   2  LAST  100     0142            DERCOF-8 =       MPAC     -12    ROOTPSRS DER COF N-4 HI ORDER
 0264   REF   3  LAST  100     0143            DERCOF-7 =       MPAC     -11    ROOTPSRS DER COF N-4 LO ORDER
 0265   REF   4  LAST  100     0144            DERCOF-6 =       MPAC     -10    ROOTPSRS DER COF N-3 HI ORDER
 0266   REF   5  LAST  100     0145            DERCOF-5 =       MPAC     -7     ROOTPSRS DER COF N-3 LO ORDER
 0267   REF   6  LAST  100     0146            DERCOF-4 =       MPAC     -6     ROOTPSRS DER COF N-2 HI ORDER
 0268   REF   7  LAST  100     0147            DERCOF-3 =       MPAC     -5     ROOTPSRS DER COF N-2 LO ORDER
 0269   REF   8  LAST  100     0150            DERCOF-2 =       MPAC     -4     ROOTPSRS DER COF N-1 HI ORDER
 0270   REF   9  LAST  100     0151            DERCOF-1 =       MPAC     -3     ROOTPSRS DER COF N-1 LO ORDER
 0271   REF  10  LAST  100     0152            DERCOFN  =       MPAC     -2     ROOTPSRS DER COF N HI ORDER
 0272   REF  11  LAST  100     0153            DERCOF+1 =       MPAC     -1     ROOTPSRS DER COF N LO ORDER

 0273   REF   5  LAST   98     0117            PWRPTR   =       POLISH          ROOTPSRS POWER TABLE POINTER
 0274   REF  13  LAST   98     0124            DXCRIT   =       VBUF     +2     ROOTPSRS CRITERION FOR ENDING ITERS HI
 0275   REF  14  LAST  100     0125            DXCRIT+1 =       VBUF     +3     ROOTPSRS CRITERION FOR ENDING ITERS LO
 0276   REF  15  LAST  100     0126            ROOTPS   =       VBUF     +4     ROOTPSRS ROOT HI ORDER
 0277   REF  16  LAST  100     0127            ROOTPS+1 =       VBUF     +5     ROOTPSRS ROOT LO ORDER
 0278   REF   4  LAST   98     0132            RETROOT  =       BUF      +2     ROOTPSRS RETURN ADDRESS OF USER
 0279   REF   5  LAST   99     0140            PWRCNT   =       MATINC          ROOTPSRS DER TABLE LOOP COUNTER
 0280   REF   3  LAST   99     0141            DERPTR   =       TEM1            ROOTPSRS DER TABLE POINTER
A0281
```

```
L       ERASABLE ASSIGNMENTS                                                                    USER'S PAGE NO.  10       F0 S4

P0282             DYNAMICALLY ALLOCATED CORE SETS FOR JOBS.                               (84D)

 0284                                 0154      0162    MPAC      ERASE  +6              MULTI-PURPOSE ACCUMULATOR.
 0285                                 0163      0163    MODE      ERASE                  +1 FOR TP, +0 FOR DP, OR -1 FOR VECTOR.
 0286                                 0164      0164    LOC       ERASE                  LOCATION ASSOCIATED WITH JOB.
 0287                                 0165      0165    BANKSET   ERASE                  USUALLY CONTAINS BBANK SETTING.
 0288                                 0166      0166    PUSHLOC   ERASE                  WORD OF PACKED INTERPRETIVE PARAMETERS.
 0289                                 0167      0167    PRIORITY  ERASE                  PRIORITY OF PRESENT JOB AND WORK AREA.

 0290                                 0170      0313              ERASE  +83D            EIGHT SETS OF  12 REGISTERS EACH
A0291

R0292   INCORP STORAGE: R22 (N29)    (SHARES WITH FOLLOWING SECTION)                      (4D)

 0294   REF   1                       0314              R22DISP   EQUALS TIME2SAV        I(4) N49 DISPLAY OF DELTA P AND DELTA V
A0295

R0296   STANDBY VERB ERASABLES                                                            (4D)
 0298                                 0314      0315    TIME2SAV  ERASE  +1
 0299                                 0316      0317    SCALSAVE  ERASE  +1
R0300

R0301           HARDWARE RESTART COUNTER                                               (1D)

 0302                                 0320      0320    REDOCTR   ERASE                  CONTAINS NUMBER OF RESTARTS
R0303

R0304    UNSHARED STORAGE FOR DESIRED GIMBAL ANGLES                                    (3D)

 0305                                 0321      0323    THETAD    ERASE  +2
 0306   REF   1                       0321              CPHI      =      THETAD            O   DESIRED GIMBAL ANGLES
 0307   REF   2  LAST  101            0322              CTHETA    =      THETAD +1         I   FOR
 0308   REF   3  LAST  101            0323              CPSI      =      THETAD +2         M   MANEUVER.
R0309

R0310    STORAGE FOR DELTAV/S                                                          (6D)

 0311                                 0324      0331    DELV      ERASE  +5
 0312   REF   1                       0324              DELVX     =      DELV
 0313   REF   2  LAST  101            0326              DELVY     =      DELV +2
 0314   REF   3  LAST  101            0330              DELVZ     =      DELV +4
A0315

R0316            WAITLIST REPEAT FLAG                                                     (1D)

 0318                                 0332      0332    RUPTAGN   ERASE
 0319   REF   1                       0332              KEYTEMP2 =       RUPTAGN           TEMP FOR KEYRUPT, UPRUPT
A0320

R0321            DOWNLINK STORAGE.                                                        (27D)
```

```
 0323                            0333      0365     DNTMERAS ERASE   +26D              B(27D)PRM  ERASABLES USED BY DOWN-
A0324                                                                                   TELEMETRY PROGRAM -- CANNOT BE SHARED.

 0325   REF    1                 0333               DNLSTCOD EQUALS DNTMERAS           B(1)PRM  CODE SPECIFYING WHICH DOWNLIST
A0326                                                                                           WILL BE SELECTED FOR TRANSMISSION
 0327   REF    1                 0334               CTLIST   EQUALS DNLSTCOD +1        B(1)PRM  POINTER TO CURRENT LOCATION OF
A0328                                                                                              THE CONTROL LIST.
 0329   REF    1                 0335               DNTMGOTO EQUALS CTLIST   +1        B(1)PRM  POINTER TO LOCATION WHERE DNTM
A0330                                                                                   PROCESSING WILL RESUME NEXT DOWNRUPT.
 0331   REF    1                 0336               DNECADR  EQUALS DNTMGOTO +1        B(1)PRM  HOLDS CONTENTS OF CURRENT
A0332                                                                                          CONTROL LIST LOCATION.
 0333   REF    1                 0336               TMINDEX  EQUALS DNECADR            B(1)  INDEX FOR LOADING SNAPSHOT BUFFER.
 0334   REF    2  LAST   102     0336               DUMPLOC  EQUALS DNECADR            B(1)  BITS 1-11 CONTAIN ECADR OF AGC DP
A0335                                                                                   WORD BEING DUMPED BY V74 ERASABLE DUMP.
A0336                                                                                         BITS 12-15 CONTAIN COUNT OF
A0337                                                                                   COMPLETE DUMPS ALREADY SENT.
 0338   REF    3  LAST   102     0337               SUBLIST  EQUALS DNECADR  +1        B(1)PRM  POINTER TO CURRENT SUBLIST LOC.
 0339   REF    1                 0340               DNTMBUFF EQUALS SUBLIST  +1        B(22)PRM DOWNLINK SNAPSHOT BUFFER

R0340             UNSWITCHED FOR DISPLAY INTERFACE ROUTINES.                           (6D)

 0343                            0366      0366     NVWORD   ERASE
 0344                            0367      0367     MARKNV   ERASE
 0345                            0370      0370     NVSAVE   ERASE                      PURPOSES)
 0348                            0371      0371     CADRFLSH ERASE
 0349                            0372      0372     CADRMARK ERASE
 0350                            0373      0373     TEMPFLSH ERASE
A03501


R03502            CHANNEL BIT FAILURE PROTECTION WORD - PAD LOADED AS ZERO             (1D)

 03504                           0374      0374     CHANBKUP ERASE                     B(1)PRM


R03505            ALARM CODE REGISTERS                                                 (3D)

 0351                            0375      0377     FAILREG  ERASE           +2        B(3)PRM  3 ALARM CODE REGISTERS

R0352             VAC AREAS. -BE CAREFUL OF PLACEMENT-                                 (220D)

 0354                            0400      0400     VAC1USE  ERASE
 0355                            0401      0453     VAC1     ERASE  +42D
 0356                            0454      0454     VAC2USE  ERASE
 0357                            0455      0527     VAC2     ERASE  +42D
 0358                            0530      0530     VAC3USE  ERASE
 0359                            0531      0603     VAC3     ERASE  +42D
 0360                            0604      0604     VAC4USE  ERASE
 0361                            0605      0657     VAC4     ERASE  +42D
 0362                                0660     0660   VAC5USE   ERASE
 0363                                0661     0733   VAC5      ERASE   +42D

R0364               TEMPORARIES USED BY RESTARTS ROUTINE

 0365    REF   1                     0705            GOLOC     EQUALS VAC5      +20D    B(4)

R03652              R59 - STAR ACQUISITION ROUTINE                                      (1D)

 03654                               0734     0734   POSCODE   ERASE                    B(1)TMP DETENT POSITION CNTR IN R59

R0366               CALCSMSC                                                            (12D)

 0370                                0735     0750   STARALGN  ERASE   +11D
 0371    REF   1                     0735            SINCDU    =       STARALGN
 0372    REF   2  LAST   103         0743            COSCDU    =       STARALGN +6

 0373    REF   1                     0741            SINCDUX   =       SINCDU   +4
 0374    REF   2  LAST   103         0735            SINCDUY   =       SINCDU
 0375    REF   3  LAST   103         0737            SINCDUZ   =       SINCDU   +2
 0376    REF   1                     0747            COSCDUX   =       COSCDU   +4
 0377    REF   2  LAST   103         0743            COSCDUY   =       COSCDU
 0378    REF   3  LAST   103         0745            COSCDUZ   =       COSCDU   +2

R0379               PHASE TABLE AND RESTART COUNTERS.                                   (12D)

 0381                                0751     0751   -PHASE1   ERASE
 0382                                0752     0752   PHASE1    ERASE
 0383                                0753     0753   -PHASE2   ERASE
 0384                                0754     0754   PHASE2    ERASE
 0385                                0755     0755   -PHASE3   ERASE
 0386                                0756     0756   PHASE3    ERASE
 0387                                0757     0757   -PHASE4   ERASE
 0388                                0760     0760   PHASE4    ERASE
 0389                                0761     0761   -PHASE5   ERASE
 0390                                0762     0762   PHASE5    ERASE
 0391                                0763     0763   -PHASE6   ERASE
 0392                                0764     0764   PHASE6    ERASE

R0393               A**SR*T STORAGE.                                                    (6D)

 0395                                0765     0772   CDUSPOT   ERASE   +5               B(6)

 0396    REF   1                     0765            CDUSPOTY =        CDUSPOT
 0397    REF   2  LAST   103         0767            CDUSPOTZ =        CDUSPOT +2
 0398     REF   3  LAST  103          0771                CDUSPOTX =        CDUSPOT +4

R0399                VERB 37 STORAGE.                                                              (2D)

 0401                                   0773       0773     MINDEX   ERASE                         B(1) TMP INDEX FOR MAJOR MODE
 0402                                   0774       0774     MMNUMBER ERASE                         B(1) TMP MAJOR MODE REQUESTED BY V37

R0403                PINBALL INTERRUPT ACTION.                                                     (1D)

 0405                                   0775       0775     DSPCNT   ERASE                         B(1)PRM COUNTER FOR DSPOUT.

R0406                PINBALL EXECUTIVE ACTION                                                      (44D)

 0408                                   0776       0776     DSPCOUNT ERASE                         DISPLAY POSITION INDICATOR.
 0409                                   0777       0777     DECBRNCH ERASE                         +DEC, - DEC, OCT INDICATOR
 0410                                   1000       1000     VERBREG  ERASE                         VERB CODE
 0411                                   1001       1001     NOUNREG  ERASE                         NOUN CODE
 0412                                   1002       1002     XREG     ERASE                         R1 INPUT BUFFER
 0413                                   1003       1003     YREG     ERASE                         R2 INPUT BUFFER
 0414                                   1004       1004     ZREG     ERASE                         R3 INPUT BUFFER
 0415                                   1005       1005     XREGLP   ERASE                         LO PART OF XREG (FOR DEC CONV ONLY)
 0416                                   1006       1006     YREGLP   ERASE                         LO PART OF YREG (FOR DEC CONV ONLY)
 0417     REF   1                       1006                HITEMOUT =        YREGLP               TEMP FOR DISPLAY OF HRS, MIN, SEC
A0418                                                                                                         MUST = LOTEMOUT-1.
 0419                                   1007       1007     ZREGLP   ERASE                         LO PART OF ZREG (FOR DEC CONV ONLY)
 0420     REF   1                       1007                LOTEMOUT =        ZREGLP               TEMP FOR DISPLAY OF HRS, MIN, SEC
A0421                                                                                                         MUST = HITEMOUT+1.
 0422                                   1010       1010     MODREG   ERASE                         MODE CODE
 0423                                   1011       1011     DSPLOCK  ERASE                         KEYBOARD/SUBROUTINE CALL INTERLOCK
 0424                                   1012       1012     REQRET   ERASE                         RETURN REGISTER FOR LOAD
 0425                                   1013       1013     LOADSTAT ERASE                         STATUS INDICATOR FOR LOADTST
 0426                                   1014       1014     CLPASS   ERASE                         PASS INDICATOR CLEAR
 0427                                   1015       1015     NOUT     ERASE                         ACTIVITY COUNTER FOR DSPTAB
 0428                                   1016       1016     NOUNCADR ERASE                         MACHINE CADR FOR NOUN
 0429                                   1017       1017     MONSAVE  ERASE                         N/V CODE FOR MONITOR. (= MONSAVE1-1)
 0430                                   1020       1020     MONSAVE1 ERASE                         NOUNCADR FOR MONITOR(MATBS) =MONSAVE +1
 0431                                   1021       1021     MONSAVE2 ERASE                         NVMONOPT OPTIONS
 0432                                   1022       1035     DSPTAB   ERASE    +11D                 0-10D, DISPLAY PANEL BUFF. 11D, C/S LTS.
 0433                                   1036       1036     NVQTEM   ERASE                         NVSUB STORAGE FOR CALLING ADDRESS
A0434                                                                                              MUST = NVBNKTEM-1
 0435                                   1037       1037     NVBNKTEM ERASE                         NVSUB STORAGE FOR CALLING BANK
A0436                                                                                              MUST = NVQTEM+1
 0437                                   1040       1040     VERBSAVE ERASE                         NEEDED FOR RECYCLE
 0438                                   1041       1041     CADRSTOR ERASE                         ENDIDLE STORAGE
 0439                                   1042       1042     DSPLIST  ERASE                         WAITING REG FOR DSP SYST INTERNAL USE
 0440                                   1043       1043     EXTVBACT ERASE                         EXTENDED VERB ACTIVITY INTERLOCK
 0441                                   1044       1046     DSPTEM1  ERASE              +2         BUFFER STORAGE AREA 1 (MOSTLY FOR TIME)
 0442                          1047      1051    DSPTEM2  ERASE          +2      BUFFER STORAGE AREA 2 (MOSTLY FOR DEG)


 0443   REF    1               1050              DSPTEMX  EQUALS DSPTEM2  +1     B(2) S-S DISPLAY BUFFER FOR EXT. VERBS
 0444   REF    1               1044              NORMTEM1 EQUALS DSPTEM1         B(3)DSP NORMAL DISPLAY REGISTERS.
A0445


R0446            DISPLAY FOR EXTENDED VERBS (V82, R04(V62), V41(N72) )           (2D)

 0448   REF    1               1050              OPTIONX  EQUALS DSPTEMX         (2) EXTENDED VERB OPTION CODE
A0449

R0450            TBASES AND PHSPRDT S.                                           (12D)

 0452                          1052      1052    TBASE1   ERASE
 0453                          1053      1053    PHSPRDT1 ERASE
 0454                          1054      1054    TBASE2   ERASE
 0455                          1055      1055    PHSPRDT2 ERASE
 0456                          1056      1056    TBASE3   ERASE
 0457                          1057      1057    PHSPRDT3 ERASE
 0458                          1060      1060    TBASE4   ERASE
 0459                          1061      1061    PHSPRDT4 ERASE
 0460                          1062      1062    TBASE5   ERASE
 0461                          1063      1063    PHSPRDT5 ERASE
 0462                          1064      1064    TBASE6   ERASE
 0463                          1065      1065    PHSPRDT6 ERASE

 0464   REF    1               1055              PIPCTR   =      PHSPRDT2        USED TO COUNT DOWN R10 CYLCES.  USED IN
A0465                                                                            CONJUNCTION WITH TBASE2, SO THIS
A0466                                                                            LOCATION IS FUNCTIONALLY =.  SEE R10,R11

R0467            UNSWITCHED FOR DISPLAY INTERFACE ROUTINES.                      (5D)

 0469                          1066      1066    NVWORD1  ERASE                  B(1) * USED DURING POWERED FLIGHT ONLY *

 0470                          1067      1067    EBANKSAV ERASE
 0471   REF    1               1067              DSPFLG   =      EBANKSAV
 0472                          1070      1070    MARKFLAG ERASE
 0473                          1071      1071    EBANKTEM ERASE
 0474                          1072      1072    MARK2PAC ERASE
R0475


R0476            CODE WORD FOR AGS RENDEZVOUS DOWNLIST XFER OF RADAR DATA        (1D)

 0477                          1073      1073    AGSCODE  ERASE                  B(1) DO NOT SHARE.
```

```
R0478            IMU COMPENSATION UNSWITCHED ERASABLE.                                  (1D)

 0480                          1074     1074   1/PIPADT ERASE
A0481

R0482            TEMPORARIES FOR SPCOS AND SPSIN                                        (2D)

 0484                          1075     1075   TEMK     ERASE                           (1)
 0485                          1076     1076   SQ       ERASE                           (1)
A0486

R0487       **** RADAR ****                                                             (13D)

 0489                          1077     1077   SAMPLIM  ERASE                           B(1)       LR    R12,P60S,R04,R77
 0490   REF   1                1077            RADUSE   EQUALS SAMPLIM                  B(1)PRM    BOTH  P20,P22,R12,R04
 0491                          1100     1103   SAMPLSUM ERASE  +3                       B(2),I(2)  BOTH
 0492   REF   1                1100            RRTARGET EQUALS SAMPLSUM                 I(6)       RR  P20,P22,R04,V41

 0493                          1104     1105   TIMEHOLD ERASF  +1                       B(2)       BOTH
 0494                          1106     1107   TANG     ERASE  +1                       B(2),I     RR
 0495   REF   1                1106            MODEA    EQUALS TANG                     B(2),I     RR

 0496                          1110     1111   MODEB    ERASE  +1                       B(2),I     RP
 0497   REF   1                1110            NSAMP    EQUALS MODEB                    B(1)       BOTH

 0498                          1112     1112   DESRET   ERASE                           B(1),I     RR
 0499   RFF   1                1112            OLDATAGD EQUALS DESRET                   B(1)       BOTH

 0500                          1113     1113   DESCOUNT ERASE                           B(1)       RR
A0501


R0502            ******    P22    ******                                                (6D)

 0504   REF   1                1100            RSUBC    EQUALS RRTARGET                 I(6)S-S  CSM POSITION VECTOR
A0505
```

```
P0506                UNSWITCHED FOR ORBIT INTEGRATION.                                        (21D)

 0508                           1114      1140    TDEC      ERASE  +20D                       I(2)
 0509   REF    1                1116              COLREG    EQUALS TDEC        +2             I(1)
 0510   REF    1                1117              LAT       EQUALS COLREG      +1             I(2)
 0511   REF    1                1121              LONG      EQUALS LAT         +2             I(2)
 0512   REF    1                1123              ALT       EQUALS LONG        +2             I(2)
 0513   REF    1                1125              YV        EQUALS ALT         +2             I(6)
 0514   REF    1                1133              ZV        EQUALS YV          +6             I(6)
A0515

R0516                MISCELLANEOUS UNSWITCHED.                                                (20D)

 0518                           1141      1141    P40/RET   ERASE                             (WILL BE PUT IN F6 WHEN THERE IS ROOM)
 0519                           1142      1142    GENRET    ERASE                             B(1)  R61 RETURN CADR.
 0520                           1143      1143    OPTION1   ERASE                             B(1)   NOUN 06 USES THIS
 0521                           1144      1144    OPTION2   ERASE                             B(1)   NOUN 06 USES THIS
 0522                           1145      1145    OPTION3   ERASE                             B(1)  NOUN 06 USES THIS
 0523                           1146      1147    LONGCADR  ERASE  +1                         B(2)  LONGCALL REGISTER
 0524                           1150      1151    LONGBASE  ERASE  +1
 0525                           1152      1153    LONGTIME  ERASE  +1                         B(2)     LONGCALL REGISTER
 0526                           1154      1154    CDUTEMPX  ERASE                             B(1)TMP
 0527                           1155      1155    CDUTEMPY  ERASE                             B(1)TMP
 0528                           1156      1156    CDUTEMPZ  ERASE                             B(1)TMP
 0529                           1157      1157    PIPATMPX  ERASE                             B(1)TMP
 0530                           1160      1160    PIPATMPY  ERASE                             B(1)TMP
 0531                           1161      1161    PIPATMPZ  ERASE                             B(1)TMP

 0532                           1162      1162    DISPDEX   ERASE                             B(1)
 0533                           1163      1163    TEMPR60   ERASE                             B(1)
 0534                           1164      1164    PRIOTIME  ERASE                             B(1)


R0535   P27  (UPDATE PROGRAM ) STORAGE.                                                       (26D)

 0537                           1165      1165    UPVERBSV  ERASE                             B(1) UPDATE VERB ATTEMPTED.
 0538                           1166      1216    UPTEMP    ERASE  +24D                       B(1)TMP SCRATCH
R0539   RETAIN THE ORDER OF COMPNUMB THRU UPBUFF +19D FOR DOWNLINK PURPOSES.
 0540   REF    1                1167              COMPNUMB  EQUALS UPTEMP +1                  B(1)TMP NUMBER OF ITEMS TO BE UPLINKED
 0541   REF    1                1170              UPOLDMOD  EQUALS COMPNUMB +1                B(1)TMP INTERRUPTED PROGRAM MM
 0542   REF    1                1171              UPVERB    EQUALS UPOLDMOD +1                B(1)TMP VERB NUMBER
 0543   REF    1                1172              UPCOUNT   EQUALS UPVERB    +1               B(1)TMP UPBUFF INDEX
 0544   REF    1                1173              UPBUFF    EQUALS UPCOUNT   +1               B(20D)
A0545


R0546                TEMPORARY FOR RESTART PROTECTION IN SERVICER                             (2D)

 0548   REF    1                1173              DVTEMP    EQUALS UPBUFF                     B(2) TEMP. SAVE DVTOTAL FOR RESTARTS.
```

```
R0549             SPECIAL DEFINITION FOR SYSTEM TEST ERASABLE PGMS.                 (2D)

 0551   REF   2  LAST  107      1166            EBUF2    EQUALS UPTEMP              B(2) FOR EXCLUSIVE USE OF SYSTEM TEST
A0552

R0553             PERM STATE VECTORS FOR BOOST AND DOWNLINK-WHOLE MISSION-          (14D)

 0555                           1217     1224   RN       ERASE  +5                  B(6)PRM
 0556                           1225     1232   VN       ERASE  +5                  B(6)PRM
 0557                           1233     1234   PIPTIME  ERASE           +1         B(2)PRM  (MUST BE FOLLOWED BY GDT/2)


R0558             SERVICER   -MUST FOLLOW PIPTIME-                                  (18D)

 0560                           1235     1256   GDT/2    ERASE  +17D                B(6)TMP  ** MUST FOLLOW PIPTIME **
 0561   REF   1                 1243            MASS     EQUALS GDT/2    +6         B(2)
 0562   REF   1                 1243            WEIGHT/G =      MASS
 0563   REF   2  LAST  108      1245            ABDELV   EQUALS MASS     +2         (1)
 0564   REF   1                 1246            PGUIDE   EQUALS ABDELV   +1         (2)
 0565   REF   1                 1250            DVTHRUSH EQUALS PGUIDE   +2         (1)
 0566   REF   1                 1251            AVEGEXIT EQUALS DVTHRUSH +1          (2)
 0567   REF   1                 1251            AVGEXIT  =      AVEGEXIT
 0568   REF   2  LAST  108      1253            TEMX     EQUALS AVEGEXIT +2          (1)
 0569   REF   1                 1254            TEMY     EQUALS TEMX     +1          (1)
 0570   REF   1                 1255            TEMZ     EQUALS TEMY     +1          (1)
 0571   REF   1                 1256            PIPAGE   EQUALS TEMZ +1             B(1)
A0572


R0573             ALIGNMENT                                                         (7D)

 0575   REF   2  LAST  108      1235            AOTCODE  EQUALS GDT/2               B(1)TMP DOWNLINKED -- STAR CODE
 05755  REF   1                 1235            STARCODE =      AOTCODE             B(1)TMP DSP N70,N71
 0576   REF   2  LAST  108      1236            XCOUNT   =      AOTCODE  +1         B(1)TMP DSP N70,N71   X MARK COUNTER
 05762  REF   3  LAST  108      1237            YCOUNT   =      AOTCODE  +2         B(1)TMP DSP N70,N71   Y MARK COUNTER

 05765  REF   4  LAST  108      1240            CURSOR   EQUALS AOTCODE  +3         B(1)TMP DOWNLNK -- STAR MEASUREMENT QTY
 0577   REF   1                 1241            SPIRAL   EQUALS CURSOR   +1         B(1)TMP DOWNLNK -- STAR MEASUREMENT QTY
 05772  REF   1                 1241            SITIME   EQUALS SPIRAL              B(2)TMP TIME USED IN LANDING SITE COMP

R0578             S34/35.5  TEMPORARY    (2)

 0579   REF   3  LAST  108      1235            TMPDV    EQUALS GDT/2               B(2) TMP SAVE FOR DVLVC

R0580             USED FOR SUMMATION OF UPRUPT DURING PRELAUNCH & SYS TEST LEADIN(3D)

 0582   REF   2  LAST  108      1245            UPSUM    EQUALS ABDELV              (3)
```

```
R0583             P 76  DISPLAY     N84                                          (6D)

 0585  REF   1                1250           DELVOV   EQUALS UPSUM     +3     I(6)

R05851           P76 - P77 STORAGE                                               (1D)

 05853 REF   4   LAST  108    1235           OPTFLAG  EQUALS GDT/2            B(1)TMP  FLAG FOR P76 OR P77

R0586            PERMANENT LEM DAP STORAGE.                                      (5D)

 0588                         1257     1257  CH5MASK  ERASE                   B(1)PRM
 0589                         1260     1260  CH6MASK  ERASE                   B(1)PRM JET FAILURE MASK.
 0590                         1261     1261  SPNDX    ERASE                   B(1)
 0603                         1262     1263  T5ADR    ERASE    +1             GENADR OF NEXT LM DAP T5RUPT. * 2CADR *
A0604                                                                         BBCON  OF NEXT LM DAP T5RUPT.    2CADR

R06043           DISPLAY INTERFACE RESTART PROTECTION STORAGE                    (1D)

 06045                        1264     1264  RESTREG  ERASE                   B(1)PRM

R0605            ERASABLES FOR RADAR READ PROTECTION (C13STALL)                  (4D)

 0607                         1265     1265  C13QSAV  ERASE                   B(1) QSAVE FOR C13STALL USERS.
 0608                         1266     1266  C13FSAV  ERASE                   B(1) FBANK SAVE FOR C13STALL.
 0609                         1267     1267  RADTIME  ERASE                   B(1) NEG. TIME OF SCALAR READ.
 0610                         1270     1270  RADDEL   ERASE                   B(1) DELTA TIME FROM SCALAR READ TO T5.
A0611

R0612            RADAREAD STORAGE                                                (2D)

 0614                         1271     1272  TTOTIG   ERASE   +1              B(2) LATEST ESTIMATE OF TIME TO IGNITION
A0615

R0616            RCS FAILURE MONITOR STORAGE                                     (1)
 0618                         1273     1273  PVALVEST ERASE                   B(1) PRM

R0619            KALCMANU/DAP INTERFACE.                                         (3D)

 0621                         1274     1274  DELPEROR ERASE                   B(1)PRM COMMAND LAGS.
 0622                         1275     1275  DELQEROR ERASE                   B(1)PRM
 0623                         1276     1276  DELREROR ERASE                   B(1)PRM

R0624            MODE SWITCHING ERASABLE.                                        (9D)
```

```
R0626      RETAIN THE ORDER OF IMODES30 AND IMODES33 FOR DOWNLINK PURPOSES.
 0627                             1277      1277    IMODES30 ERASE                          B(1)
 0628                             1300      1300    IMODES33 ERASE
 0629                             1301      1303    MODECADR ERASE  +2                      B(3)PRM
 0630    REF   1                  1301              IMUCADR  EQUALS MODECADR
 0631    REF   2  LAST  110       1302              OPTCADR  EQUALS MODECADR +1
 0632    REF   3  LAST  110       1303              RADCADR  EQUALS MODECADR +2
 0633                             1304      1306    ATTCADR  ERASE  +2                      B(3)PRM
 0634    REF   1                  1306              ATTPRIO  =      ATTCADR  +2
 0635                             1307      1307    MARKSTAT ERASE

R0636             T4RUPT ERASABLE.                                                      (2D)

 0638                             1310      1310    DSRUPTSW ERASE
 0639                             1311      1311    LGYRO    ERASE                          (1)

R0640             RENDEZVOUS RADAR TASK STORAGE                                         (3D)

 0642                             1312      1314    RRRET    ERASE           +2D            B(1)TMP  P20'S, PERHAPS R29 & R12
 0643    REF   1                  1313              RDES     EQUALS RRRET    +1             B(1)TMP
 0644    REF   1                  1314              RRINDEX  EQUALS RDES     +1             B(1)TMP
A0645


R0646    MEASUREMENT INCORPORATION                                                      (4D)

 0648                             1315      1315    WIXA     ERASE                          B(1)
 0649                             1316      1316    WIXB     ERASE                          B(1)
 0650                             1317      1317    ZIXA     ERASE                          B(1)
 0651                             1320      1320    ZIXB     ERASE                          B(1)

R0652             LANDING RADAR PADLOAD                                                 (1D)

 0654    REF   1                  1315              LRWHI    EQUALS WIXA                    B(1) P.L.  P64 LR WEIGHTING FUNCTION
A06545


R0655             AGS DOWNLINK ID CODE FOR RESTART PURPOSES                             (1D)

 0657                             1321      1321    AGSWORD  ERASE


R0658             SOME MISCELLANEOUS UNSWITCHED.                                        (6D)

 0660                             1322      1322    RATEINDX ERASE                           (1)    USED BY KALCMANU
 0661                             1323      1325    DELAYLOC ERASE  +2
 0662                             1326      1326    LEMMASS  ERASE                          KEEP CONTIGUOUS W.  CSMMASS  (1)EACH
 0663                             1327      1327    CSMMASS  ERASE
R0664    LESS IS MORE.
```

```
R0665               RENDEZVOUS AND LANDING RADAR DOWNLINK STORAGE.                 (7D)

R0667                    (NORMALLY USED DURING P20, BUT MAY ALSO)
R0668                    (BE REQUIRED FOR THE V62 SPURIOUS TEST.)

R0669                                (PLEASE KEEP IN THIS ORDER)

 0670                           1330    1336   DNRRANGE ERASE           +6     B(1) TMP
 0671     REF   1               1331           DNRRDOT  EQUALS DNRRANGE +1     B(1)TMP
 0672     REF   1               1332           DNINDEX  EQUALS DNRRDOT  +1     B(1)TMP
 0673     REF   1               1333           DNLRVELX EQUALS DNINDEX  +1     B(1)TMP
 0674     REF   1               1334           DNLRVELY EQUALS DNLRVELX +1     B(1)TMP
 0675     REF   1               1335           DNLRVELZ EQUALS DNLRVELY +1     B(1)TMP
 0676     REF   1               1336           DNLRALT  EQUALS DNLRVELZ +1     B(1) TMP

R0677               RADAR -- RR AND LR                                         (1D)

 0679     REF   2   LAST  111   1332           RADBITS  EQUALS DNINDEX         B(1)PRM   SHOWS TYPE OF RADAR READ


R0680               INCORPORATION UNSWITCHED.                                  (1D)

 0682     REF   1               1256           W.IND    EQUALS PIPAGE          B(1) TMP  --  INDEX IN CLOSED LOOP
A0683


R0684               SUBROUTINE BALLANGS OF R60.                                (1D)

 0686                           1337    1337   BALLEXIT ERASE                  B(1)SAVE LOCATION FOR BALLINGS SUBR EXIT


R0687               SOME LEM DAP STORAGE.                                      (4D)

 0689                           1340    1340   DAPDATR1 ERASE                  B(1)DSP  DAP CONFIG.
 0690                           1341    1342   TEVENT   ERASE           +1     B(2)DSP
 0691                           1343    1343   DB       ERASE                  B(1) PRM DEAD BAND
 0692     REF   1               1343           DBVAL1   =      DB              B(1) PRM
A0693


R0694           NOUN 87 USED IN R52 AUTO OPTICS                                (2D)

 0696                           1344    1345   AZ       ERASE   +1D            B(1)  AZ AND EL MUST BE CONTIGUOUS
 0697     REF   1               1345           EL       EQUALS AZ +1D          B(1)
A0698

R0699               P63, P64, P65, P66, AND P67.                               (1D)
 0701                           1346    1346   WCHPHASE ERASE                  B(1)
A0702
```

```
R0703            PADLOADS FOR R2 LUNAR POTENTIAL MODEL.                                    (2D)

 0705                          1347      1347   E3J22R2M ERASE                     I(1)
 0706                          1350      1350   E32C31RM ERASE                     I(1)
A0707

A0708

R0709            ERASABLES FOR TRUNNION AND SHAFT COMMANDS                                 (2D)

 0711                          1351      1351   TRUNNCMD ERASE                     *** THESE TWO ERASABLES ***
 0712                          1352      1352   SHAFTCMD ERASE                     *** MUST BE IN ORDER ***
A0713

R0714            R22 OF P20                                                        (1D)
 0716                          1353      1353   WHCHREAD ERASE                     B(1)TMP MEASUREMENT BEING PROCESSED.
A0717

R0718            LANDING PADLOAD                                                   (1D)

 0720   REF   1                1353             ELBIAS   EQUALS WHCHREAD           B(1) PL LPD ELEVATION BIAS,  PI RADIANS.

R0721            P66 PADLOAD                                                       (1D)

 0723                          1354      1354   TOOFEW   ERASE                     B(1) TOO FEW THROTTLINGS PER OMISSION:
A0724                                                                               ONE LESS THAN NO. THROTTLES REQUIRED
A0725                                                                                BETWEEN SKIPPED THROTTLES
A0726                                                                                 1466 ALARM IF THROTTLINGS <= TOOFEW
R0727            TLOSS INDICATORS FOR DOWNLINK                                     (2D)
A0729
 0730                          1355      1355   SERVDURN ERASE                     B(1)  AT SERVOUT: TIME1 - PIPTIME +1
 0731                          1356      1356   DUMLOOPS ERASE                     B(1)  LOOP COUNTER IN DUMMYJOB AT ADVAN.


R0732            SELF-CHECK ASSIGNMENTS.                                           (17D)

R0734                                   (DO NOT MOVE, S-C IS ADDRESS SENSITIVE)

 0735                          1357      1377   SELFERAS ERASE  1357 - 1377        *** MUST NOT BE MOVED ***
 0736   REF   1                1357             SFAIL    EQUALS SELFERAS           B(1)
 0737   REF   1                1360             ERESTORE EQUALS SFAIL    +1        B(1)
 0738   REF   1                1361             SELERET  EQUALS ERESTORE +1        B(1)     RETURN
 0739   REF   1                1362             SMODE    EQUALS SELERET  +1        B(1)
 0740   REF   1                1363             ALMCADR  EQUALS SMODE    +1        B(2)    ALARM-ABORT USER'S 2CADR
 0741   REF   1                1365             ERCOUNT  EQUALS ALMCADR  +2        B(1)
 0742   REF   1                1366             SCOUNT   EQUALS ERCOUNT  +1        B(3)
 0743   REF   1                1371             SKEEP1   EQUALS SCOUNT   +3        B(1)
 0744   REF   1                1372             SKEEP2   EQUALS SKEEP1   +1        B(1)
 0745   REF   1                1373             SKEEP3   EQUALS SKEEP2   +1        B(1)
 0746   REF   1                1374             SKEEP4   EQUALS SKEEP3   +1        B(1)
 0747   REF   1                 1375           SKEEP5   EQUALS SKEEP4   +1      B(1)
 0748   REF   1                 1376           SKEEP6   EQUALS SKEEP5   +1      B(1)
 0749   REF   1                 1377           SKEEP7   EQUALS SKEEP6   +1      B(1)
```

```
P3000                   EBANK-3 ASSIGNMENTS

 3001                         E3,1400                   SETLOC 1400

R3002              WAITLIST TASK LISTS.                                             (26D)

 3004                         E3,1400  E3,1407   LST1      ERASE  +7                B(8D)PRM  DELTA T S.
 3005                         E3,1410  E3,1431   LST2      ERASE  +17D              B(18D)PRM TASK 2CADR ADDRESSES.


R3006              RESTART STORAGE.                                                 (2D)

 3008                         E3,1432  E3,1433   RSBBQ     ERASE  +1                B(2)PRM SAVE BB AND Q FOR RESTARTS.


R3009              MORE LONGCALL STORAGE.(MUST BE IN LST1 S BANK.                   (2D)

 3011                         E3,1434  E3,1435   LONGEXIT ERASE  +1                 B(2)TMP MAY BE SELDOM OVERLAYED.


R3012              PHASE-CHANGE LISTS PART II.                                      (12D)

 3014                         E3,1436  E3,1436   PHSNAME1 ERASE                     B(1)PRM
 3015                         E3,1437  E3,1437   PHSBB1   ERASE                     B(1)PRM
 3016                         E3,1440  E3,1440   PHSNAME2 ERASE                     B(1)PRM
 3017                         E3,1441  E3,1441   PHSBB2   ERASE                     B(1)PRM
 3018                         E3,1442  E3,1442   PHSNAME3 ERASE                     B(1)PRM
 3019                         E3,1443  E3,1443   PHSBB3   ERASE                     B(1)PRM
 3020                         E3,1444  E3,1444   PHSNAME4 ERASE                     B(1)PRM
 3021                         E3,1445  E3,1445   PHSBB4   ERASE                     B(1)PRM
 3022                         E3,1446  E3,1446   PHSNAME5 ERASE                     B(1)PRM
 3023                         E3,1447  E3,1447   PHSBB5   ERASE                     B(1)PRM
 3024                         E3,1450  E3,1450   PHSNAME6 ERASE                     B(1)PRM
 3025                         E3,1451  E3,1451   PHSBB6   ERASE                     B(1)PRM


R3026              IMU COMPENSATION PARAMETERS.                                     (22D)

 3028                         E3,1452  E3,1452   PBIASX   ERASE                     B(1)    PIPA BIAS, PIPA SCALE FACTR TERMS
 3029       REF   1           E3,1452            PIPABIAS =        PBIASX               INTERMIXED.
 3030                         E3,1453  E3,1453   PIPASCFX ERASE
 3031       REF   1           E3,1453            PIPASCF  =        PIPASCFX
 3032                         E3,1454  E3,1454   PBIASY   ERASE
 3033                         E3,1455  E3,1455   PIPASCFY ERASE
 3034                         E3,1456  E3,1456   PBIASZ   ERASE
 3035                         E3,1457  E3,1457   PIPASCFZ ERASE

 3036                         E3,1460  E3,1460   NBDX     ERASE                     GYRO BIAS DRIFTS
 3037                         E3,1461  E3,1461   NBDY     ERASE
 3038                         E3,1462  E3,1462   NBDZ     ERASE
 3039                           E3,1463  E3,1463   ADIAX     ERASE                        ACCELERATION SENSITIVE DRIET ALONG THE
 3040                           E3,1464  E3,1464   ADIAY     ERASE                            INPUT AXIS
 3041                           E3,1465  E3,1465   ADIAZ     ERASE

 3042                           E3,1466  E3,1466   ADSRAX    ERASE                        ACCELERATION SENSITIVE DRIET ALONG THE
 3043                           E3,1467  F3,1467   ADSRAY    ERASE                            SPIN REEERENCE AXIS
 3044                           E3,1470  E3,1470   ADSRAZ    ERASE

 3045                           E3,1471  E3,1476   GCOMP     ERASE  +5                    CONTAINS COMPENSATING TORQUES

 3046   REE   1                 E3,1471            COMMAND   EQUALS GCOMP
 3047   REE   2  LAST  115      E3,1474            CDUINC    EQUALS GCOMP      +3


 3048                           E3,1477  E3,1477   GCOMPSW   ERASE
A3049


R3050                 STATE VECTORS FOR ORBIT INTEGRATION.                                (44D)

R3052                                         (DIFEQCNT THRU XKEP MUST BE IN SAME
R3053                                           EBANK AS RRECTCSM, RRECTLEM ETC
R3054                                           BECAUSE THE COPY-CYCLES (ATOPCSM,
R3055                                           PTOACSM ETC) ARE EXECUTED IN BASIC.
R3056                                             ALL OTHER REEERENCES TO THIS GROUP
R3057                                           ARE BY INTERPRETIVE INSTRUCTIONS.)

 3058                           E3,1500  E3,1553   DIEEQCNT ERASE  +43D                   B(1)
R3059                                         (UPSVELAG...XKEP MUST BE KEPT IN ORDER)

 3060   REF   1                 E3,1501            UPSVELAG EQUALS DIFEQCNT +1            B(1)
 3061   REF   2  LAST     1     E3,1502            RRECT     EQUALS UPSVELAG +1           B(6)
 3062   REF   1                 E3,1510            VRECT     EQUALS RRECT    +6           B(6)
 3063   REF   1                 E3,1516            TET       EQUALS VRECT    +6           B(2)
 3064   REF   1                 E3,1520            TDELTAV   EQUALS TET      +2           B(6)
 3065   REF   1                 E3,1526            TNUV      EQUALS TDELTAV  +6           B(6)
 3066   REF   1                 E3,1534            RCV       EQUALS TNUV     +6           B(6)
 3067   REF   1                 E3,1542            VCV       EQUALS RCV      +6           B(6)
 3068   REF   1                 E3,1550            TC        EQUALS VCV      +6           B(2)
 3069   REF   1                 E3,1552            XKEP      EQUALS TC       +2           B(2)

R3070                 CONIC ROUTINES STORAGE                                              (2D)

 3071   REF   1                 E3,1552            XPREV     EQUALS XKEP                  I(2)TMP


R3072                 PERMANENT STATE VECTORS AND TIMES.                                  (97D)

R3074                 (DO NOT OVERLAY WITH ANYTHING AFTER BOOST)
```

```
R3075               (RRECTCSM ...XKEPCSM MUST BE KEPT IN THIS ORDER)

 3076                          E3,1554  E3,1561   RRECTCSM ERASE  +5               B(6)PRM CSM VARIABLES.
 3077   REF   1                E3,1554            RRECTOTH =      RRECTCSM
 3078                          E3,1562  E3,1567   VRECTCSM ERASE  +5               B(6)PRM
 3079                          E3,1570  E3,1571   TETCSM   ERASE  +1               B(2)PRM
 3080   REF   1                E3,1570            TETOTHER =      TETCSM
 3081                          E3,1572  E3,1577   DELTACSM ERASE  +5               B(6)PRM
 3082                          E3,1600  E3,1605   NUVCSM   ERASE  +5               B(6)PRM
 3083                          E3,1606  E3,1613   RCVCSM   ERASE  +5               B(6)PRM
 3084                          E3,1614  E3,1621   VCVCSM   ERASE  +5               B(6)PRM
 3085                          E3,1622  E3,1623   TCCSM    ERASE  +1               B(2)PRM
 3086                          E3,1624  E3,1625   XKEPCSM  ERASE  +1               B(2)PRM

R3087               (RRECTLEM ...XKEPLEM MUST BE KEPT IN THIS ORDER)

 3088                          E3,1626  E3,1633   RRECTLEM ERASE  +5               B(6)PRM LEM VARIABLES
 3089   REF   1                E3,1626            RRECTHIS =      RRECTLEM
 3090                          E3,1634  E3,1641   VRECTLEM ERASE  +5               B(6)PRM
 3091                          E3,1642  E3,1643   TETLEM   ERASE  +1               B(2)PRM
 3092   REF   1                E3,1642            TETTHIS  =      TETLEM
 3093                          E3,1644  E3,1651   DELTALEM ERASE  +5               B(6)PRM
 3094                          E3,1652  E3,1657   NUVLEM   ERASE  +5               B(6)PRM
 3095                          E3,1660  E3,1665   RCVLEM   ERASE  +5               B(6)PRM
 3096                          E3,1666  E3,1673   VCVLEM   ERASE  +5               B(6)PRM
 3097                          E3,1674  E3,1675   TCLEM    ERASE  +1               B(2)PRM
 3098                          E3,1676  E3,1677   XKEPLEM  ERASE  +1               B(2)PRM

 3099                          E3,1700  E3,1705   X789     ERASE  +5
 3100                          E3,1706  E3,1710   TEPHEM   ERASE  +2
 3101                          E3,1711  E3,1712   -AYO     ERASE          +1
 3102                          E3,1713  E3,1714   AXO      ERASE          +1
A3103

R3104               STATE VECTORS FOR DOWNLINK.                                (12D)

 3106                          E3,1715  E3,1722   R-OTHER  ERASE  +5               B(6)PRM POS VECT (OTHER VECH) FOR DNLINK
 3107                          E3,1723  E3,1730   V-OTHER  ERASE  +5               B(6)PRM VEL VECT (OTHER VECH) FOR DNLINK

 3108   REF   2  LAST  116     E3,1570            T-OTHER  =      TETCSM                   TIME (OTHER VECH) FOR DNLINK

R3109               SERVICER FOR LUNAR ASCENT AND DESCENT                      (12D)

 3111   REF   1                E3,1715            R(CSM)   EQUALS R-OTHER          I(6)  FOR UPDATE OF CM STATE VECS BY LM.
 3112   REF   1                E3,1723            V(CSM)   EQUALS V-OTHER          I(6)

R3113               REFSMMAT.                                                  (18D)
```

```
 3115                      E3,1731  E3,1752   REESMMAT ERASE  +17D           I(18D)PRM

R3116              ACTIVE VEHICLE CENTANG.  MUST BE DISPLAYED ANYTIME (ALMOST.)  (2D)

 3118                      E3,1753  E3,1754   ACTCENT  ERASE           +1    I(2) S-S CENTRAL ANGLE BETWEEN ACTIVE
A3119                                                                         VEHICLE AT TPI TIG AND TARGET VECTOR.

R3120           **** USED IN CONICSEX (PLAN INERT ORIENT) ****

 3121   REF    1           E3,1706            TIMSUBO  EQUALS TEPHEM         CSEC B-42 (TRIPLE PRECISION)
A3122

R3123              LPS20.1 STORAGE    -ALL ARE PRM -                         (9D)

 3125                      E3,1755  E3,1755   LS21X    ERASE                 I(1)
 3126                      E3,1756  E3,1763   LOSVEL   ERASE  +5             I(6)
 3127                      E3,1764  E3,1765   MLOSV    ERASE  +1             I(2) MAGNITUDE OF LOS, METERS B-29
A3128

R3129          ***** P22  *****  (OVERLAYS LPS 20.1 STORAGE)                 (6D)
 3131   REF    1           E3,1756            VSUBC    EQUALS LOSVEL         I(6)S-S  CSM VELOCITY VECTOR
A3132

R3133              PADLOADED ERASABLES FOR P20/P22                           (6D)

 3135                      E3,1766  E3,1767   RANGEVAR ERASE  +1             I(2) RR RANGE ERROR VARIANCE
 3136                      E3,1770  E3,1771   RATEVAR  ERASE  +1             I(2) RR RANGE-RATE ERROR VARIANCE
 3137                      E3,1772  E3,1772   RVARMIN  ERASE                 I(1) MINIMUM RANGE ERROR VARIANCE
 3138                      E3,1773  E3,1773   VVARMIN  ERASE                 I(1) MINIMUM RANGE-RATE ERROR VARIANCE
A3139

R3140              P32-P33 STORAGE                                           (2D)

 3142                      E3,1774  E3,1775   TCDH     ERASE  +1             I(2) T2 CDH TIME IN CS. (ALSO DOWNLINKED
A3143

R3144              TIME SAVE FOR P20 AGS DOWNLIST                            (2D)

 3146                      E3,1776  E3,1777   OLDAGS   ERASE  +1             I(2)
```

```
P4000                      CRANK-4 ASSIGNMENTS

 4001                            E4,1400                     SETLOC 2000

R4002   E4 IS, FOR THE MOST PART RESERVED FOR PAD LOADED AND UNSHARABLE ERASE.

R4003            P20 STORAGE. -PAD LOADED-                                         (6D)

 4005                            E4,1400  E4,1400   WRENDPOS ERASE                 B(1)PL                        KM*2(-7)
 4006                            E4,1401  E4,1401   WRENDVEL ERASE                 B(1)PL                 KM(-1/2)*2(11)
 4007                            E4,1402  E4,1402   WSHAFT   ERASE                 B(1)PL                        KM*2(-7)
 4008                            E4,1403  E4,1403   WTRUN    ERASE                 B(1)PL                        KM*2(-7)
 4009                            E4,1404  E4,1404   RMAX     ERASE                 B(1)PL                    METERS*2(-19)
 4010                            E4,1405  E4,1405   VMAX     ERASE                 B(1)PL                     M/CSEC*2(-7)

R4011            LUNAR SURFACE NAVIGATION -- PAD LOADED --                         (2D)

 4013                            E4,1406  E4,1406   WSURFPOS ERASE                 B(1)PL
 4014                            E4,1407  E4,1407   WSURFVEL ERASE                 B(1)PL
A4015

R4016            P22 STORAGE. -PAD LOADED-                                         (2D)

 4018                            E4,1410  E4,1410   SHAFTVAR ERASE                 B(1)PL                     RAD SQ*2(12)
 4019                            E4,1411  E4,1411   TRUNVAR  ERASE                 B(1)PL                     RAD SQ*2(10)

R4020            CONISEX STORAGE.-PAD LOADED-                                      (6D)

 4022                            E4,1412  E4,1417   504LM    ERASE          +5     I(6)MOON LIBRATION VECTOR
A4023

R4024   STORAGE FOR RLS AND TLAND - PAD LOADS - ORDER IS RETAINED FOR UPLINK.      (8D)

 4026                            E4,1420  E4,1425   RLS      ERASE          +5     I(6) LANDING SITE VECTOR - MOON REF.
 4027                            E4,1426  E4,1427   TLAND    ERASE          +1     B(2) NOMINAL LANDING TIME.

R4028            INTEGRATION STORAGE.                                              (94D)

 4030                            E4,1430  E4,1565   PBODY    ERASE          +93D   I(1)
 4031   REF    1                 E4,1431            ALPHAV   EQUALS PBODY   +1     I(6)
 4032   REF    1                 E4,1437            BETAV    EQUALS ALPHAV  +6     I(6)
 4033   REF    1                 E4,1445            PHIV     EQUALS BETAV   +6     I(6)
 4034   REF    1                 E4,1453            PSIV     EQUALS PHIV    +6     I(6)
 4035   REF    1                 E4,1461            EV       EQUALS PSIV    +6     I(6)    PERTURBING ACCELERATIONS
 4036   REF    1                 E4,1467            ALPHAM   EQUALS EV      +6     I(2)
 4037   REF    1                 E4,1471            BETAM    EQUALS ALPHAM  +2     I(2)
 4038   REF    1                 E4,1473            TAU.     EQUALS BETAM   +2     I(2)
 4039  REF   1               E4,1475             DT/2      EQUALS TAU.       +2     I(2)
 4040  REF   1               E4,1477             H         EQUALS DT/2       +2     I(2)
 4041  REF   1               E4,1501             IRETURN   EQUALS H          +2     I(1)
 4042  REF   1               E4,1502             NORMGAM   EQUALS IRETURN    +1     I(1)
 4043  REF   1               E4,1503             RPQV      EQUALS NORMGAM    +1
 4044  REF   1               E4,1511             ORIGEX    EQUALS RPQV       +6     I(1)
 4045  REF   1               E4,1511             KEPRTN    EQUALS ORIGEX            I(1)
 4046  REF   2  LAST   119   E4,1512             RPSV      EQUALS ORIGEX     +1     I(6)
 4047  REF   1               E4,1520             XKEPNEW   EQUALS RPSV       +6     I(2)
 4048  REF   1               E4,1522             VECTAB    EQUALS XKEPNEW    +2     I(36D)
A4049

R4050           R04 - R77 FAIL COUNTER                                              (1D)

 4052                        E4,1566  E4,1566    RFAILCNT ERASE                     B(1)

R4053           SERVICER STORAGE  (USED BY ALL POWERED FLIGHT PROGS.)               (18D)

 4055  REF   1               E4,1536             XNBPIP    EQUALS VECTAB     +12D   I(6)
 4056  REF   1               E4,1544             YNBPIP    EQUALS XNBPIP     +6     I(6)
 4057  REF   1               E4,1552             ZNBPIP    EQUALS YNBPIP     +6     I(6)
A4058

R4059           SOME VERB 82 STORAGE                                                (4D)

 4061  REF   2  LAST   119   E4,1512             HAPOX     EQUALS RPSV              I(2)
 4062  REF   1               E4,1514             HPERX     EQUALS HAPOX      +2     I(2)
A4063

R4064           V82 STORAGE                                                         (6D)

 4066  REF   2  LAST   119   E4,1560             VONE'     EQUALS VECTAB     +30D   I(6)TMP  NORMAL VELOCITY VONE /SQRT. MU
A4067

R4068           R31(V83) STORAGE. -SHARES WITH INTEGRATION STORAGE-                 (26D)

 4070  REF   2  LAST   119   E4,1503             BASETHV   EQUALS RPQV              I(6)     BASE VEL VECTOR THIS VEH
A4071

 4072  REF   3  LAST   119   E4,1512             BASETIME EQUALS RPSV               I(2)   TIME ASSOC WITH BASE VECTORS
 4073  REF   1               E4,1571             BASEOTV   EQUALS YLEM              I(6)    BASE VELOC VECTOR OTHER VEH
A4074

 4075  REF   3  LAST   119   E4,1530             BASEOTP   EQUALS VECTAB     +6     I(6)     BASE POS VECTOR OTHER VEH
A4076

 4077  REF   4  LAST   119   E4,1560             BASETHP   EQUALS VECTAB     +30D   I(6)     BASE POS VECTOR THIS VEH
A4078
```

```
R4079               KEPLER STORAGE. (KEPLER IS CALLED BY PRECISION INTEGRATION AND (2D)
R4081               CONICS)

 4082                          E4,1567  E4,1570    EPSILONT ERASE  +1               I(2)
A4083

R4084               R36 STORAGE  (N90)                                             (6D)
A40855
 4086                          E4,1571  E4,1576    YLEM     ERASE            +5     I(2)
 4087    REF    2  LAST   119  E4,1573             YDOTLEM  EQUALS  YLEM     +2     I(2)
 4088    REF    1              E4,1575             PHILEM   EQUALS YDOTLEM   +2     I(2)


R4089               VERB 83 STORAGE.                                               (18D)

 4091                          E4,1577  E4,1620    RONE     ERASE            +17D   I(6)
 4092    REF    1              E4,1605             VONE     EQUALS RONE      +6     I(6)TMP VECTOR STORAGE.  (SCRATCH)


 4093    REF    1              E4,1613             RANGE    EQUALS VONE      +6     I(2)
 4094    REF    1              E4,1615             RRATE    EQUALS RANGE     +2     I(2)
 4095    REF    1              E4,1617             RTHETA   EQUALS RRATE     +2     I(2)


R4096               VERB 67 STORAGE                                                (6D)

 4098    REF    3  LAST   120  E4,1571             WWPOS    EQUALS YLEM             B(2)    NOUN 99  (V67)
 4099    REF    1              E4,1573             WWVEL    EQUALS WWPOS     +2     B(2)    NOUN 99  (V67)
 4100    REF    1              E4,1575             WWBIAS   EQUALS WWVEL     +2     B(2)    NOUN 99  (V67)


A4101


R4102               V82 STORAGE. (CANNOT OVERLAY RONE OR VONE)                     (5D)

 4104    REF    5  LAST   119  E4,1530             V82FLAGS EQUALS VECTAB    +6      (1) FOR V82 BITS.
 4105    REF    1              E4,1531             TFF      EQUALS V82FLAGS +1     I(2)
 4106    REF    1              E4,1533             -TPER    EQUALS TFF       +2     I(2)
A4107

R4108               MORE V82 STORAGE.  (CANNOT OVERLAY RONE OR VONE)               (6D)
A4110
 4111    REF    4  LAST   120  E4,1571             HPERMIN  EQUALS YLEM             I(2)   SET TO 300K FT OR 35K FT SR30.1
 4112    REF    1              E4,1573             RPADTEM  EQUALS HPERMIN   +2     I(2) PAD OR LANDING RADIUS FOR SR30.1
 4113    REF    1              E4,1575             TSTART82 EQUALS RPADTEM   +2     I(2) TEMP TIME STORAGE FOR V82.
A4114


R4115               ALIGNMENT PLANETARY-INERTIAL TRANSFORMATION STORAGE.           (18D)
```

```
R4117                     UNSHARED WHILE LM ON LUNAR SURFACE.

 4118                          E4,1621  E4,1642   GSAV      ERASE            +17D     I(6)
 4119   REF    1               E4,1627            YNBSAV    EQUALS GSAV      +6       I(6)
 4120   REF    1               E4,1635            ZNBSAV    EQUALS YNBSAV    +6       I(6)
A4121


R4122              KALCMANU STORAGE. CAN OVERLAY GSAV.                                (18D)

 4124   REF    2  LAST   121   E4,1621            MFS       EQUALS GSAV               I(18)
 4125   REF    1               E4,1621            MFI       EQUALS MFS                I
 4126   REF    2  LAST   121   E4,1621            KEL       EQUALS MFS                I(18)
A4127
R4128              P32-P35, P72-P75 STORAGE.                                          (40D)

 4130                          E4,1643  E4,1644   T1TOT2    ERASE            +1        (2)      TIME FROM CSI TO CDH
 4131                          E4,1645  E4,1646   T2TOT3    ERASE            +1        (2)
 4132                          E4,1647  E4,1650   ELEV      ERASE            +1        (2)
 4133                          E4,1651  E4,1656   UP1       ERASE            +5        (6)
 4134                          E4,1657  E4,1664   DELVEET1  ERASE            +5       I(6)      DV CSI IN REF
 4135                          E4,1665  E4,1672   DELVEET2  ERASE            +5       I(6)      DV CSH IN REF
 4136                          E4,1673  E4,1700   RACT1     ERASE            +5        (6)      POS VEC OF ACTIVE AT CSI TIME
 4137                          E4,1701  E4,1706   RACT2     ERASE            +5        (6)      POS VEC OF ACTIVE AT CDH TIME
 4138                          E4,1707  E4,1710   RTSR1/MU  ERASE            +1        (2)      SQ ROOT 1/MU STORAGE
 4139                          E4,1711  E4,1712   RTMU      ERASE            +1        (2)      MU STORAGE
R4140


R4141             (THE FOLLOWING ERASABLES OVERLAY PORTIONS OF THE PREVIOUS SECTION)

 4143   REF    1               E4,1643            +MGA      EQUALS T1TOT2              (2) S-S + MID GIM ANGL TO DELVEET3
A4144

 4145   REF    1               E4,1651            UNRM      EQUALS UP1                I(6) S-S
A4146

 4147   REF    1               E4,1673            DVLOS     EQUALS RACT1              I(6) S-S DELTA VELOCITY,LOS COORD-DISPLA
 4148   REF    1               E4,1701            ULOS      EQUALS RACT2              I(6) S-S UNIT LINE OF SIGHT VECTOR
A4149

 4150   REF    1               E4,1707            NOMTPI    EQUALS RTSR1/MU            (2) S-S NOMINAL TPI TIME FOR RECYCLE


R4151              SOME P30 STORAGE.                                                  (4D)

 4153   REF    2  LAST   121   E4,1707            HAPO      EQUALS RTSR1/MU           I(2)
 4154   REF    1               E4,1711            HPER      EQUALS HAPO      +2       I(2)
A4155
```

```
R4156              THE FOLLOWING ARE ERASABLE LOADS DURING A PERFORMANCE TEST.

 4157   REF   1                E4,1400             TRANSM1  EQUALS WRENDPOS         E4, 1400
 4158   REF   1                E4,1422             ALFDK    EQUALS TRANSM1   +18D


R4159   ******* THE FOLLOWING SECTIONS OVERLAY V83 AND DISPLAY STORAGE *******


R4160              V47(R47)AGS INITIALIZATION PROGRAM STORAGE. (OVERLAYS V83)      (14D)

 4162   REF   5  LAST  120   E4,1571             AGSBUFF  EQUALS YLEM             B(14)
 4163   REF   1                E4,1606             AGSBUFFE EQUALS AGSBUFF   +13D   ENDMARK


R4164              R36 OUT-OF-PLANE RENDEZVOUS DISPLAY STORAGE. (OVERLAYS V83)     (12D)

 4166   REF   2  LAST  120   E4,1577             RPASS36  EQUALS RONE             I(6) S-S
 4167   REF   1                E4,1605             UNP36    EQUALS RPASS36   +6     I(6) S-S


R4168              S-BAND ANTENNA GIMBAL ANGLES. DISPLAYED BY R05(V64).(OVERLAYS V83)  (10D)
R4170

 4171   REF   6  LAST  122   E4,1571             ALPHASB  EQUALS YLEM             B(2)   DSP NOUN 51 PITCH ANGLE
 4172   REF   1                E4,1573             BETASB   EQUALS ALPHASB   +2     B(2) DSP NOUN 51. YAW ANGLE.
 4173   REF   1                E4,1575             RLM      EQUALS BETASB    +2     I(6) S     S/C POSITION VECTOR.

R4174              **** USED IN S-BAND ANTENNA FOR LM ****                         (4D)

 4176   REF   2  LAST  122   E4,1571             PITCHANG EQUALS ALPHASB          I(2) PITCH/ANTENNA GIMBAL ANGLE REQUIRED
 4177   REF   2  LAST  122   E4,1573             YAWANG   EQUALS BETASB           I(2) YAW  /TO POINT LM STEERABLE ANTENNA
A4178                                                                                        /TOWARD CENTER OF EARTH
R4179   NOUN 56 DATA - COMPUTED AND DISPLAYED BY VERB 85.                          (4)

 4181   REF   1                E4,1571             RR-AZ    EQUALS PITCHANG         I(2) ANGLE BETWEEN LOS AND X-Z PLANE.
 4182   REF   1                E4,1573             RR-ELEV  EQUALS RR-AZ     +2     I(2) ANGLE BETWEEN LOS AND Y-Z PLANE.

R4183              R04(V62) RADAR TEST STORAGE.                                    (8D)
R4185

 4186   REF   7  LAST  122   E4,1571             RSTACK   EQUALS YLEM             B(8)   BUFFER FOR R04 NOUNS
A4187


R4188              INITVEL STORAGE.  ALSO USED BY P31,P34,P35,P74,P75,P10,P11,MIDGIM,S40.1 AND S40.9. (18D)

R4190                      (POSSIBLY RINIT & VINIT CAN OVERLAY DELVEET1 & 2 ABOVE)
 4191                          E4,1713  E4,1720   RINIT    ERASE            +5     I(6) ACTIVE VEHICLE POSITION
 4192                          E4,1721  E4,1726   VINIT    ERASE            +5     I(6) ACTIVE VEHICLE VELOCITY
 4193                      E4,1727  E4,1734   VIPRIME  ERASE           +5     I(6) NEW VEL REQUIRED AT INITIAL RADIUS.

R4194   BALLANGS-AUTOMATIC MANEUVER -- R60,(N18                               (3D)
A4196
 4197                      E4,1735  E4,1735   FCAIX    ERASE                  I(1)
 4198                      E4,1736  E4,1736   FDAIY    ERASE                  I(1)
 4199                      E4,1737  E4,1737   FDAIZ    ERASE                  I(1)
A4200

R4201           P34-P35 STORAGE.  DOWNLINKED.                                 (2D)

 4203                      E4,1740  E4,1741   DELVTPF  ERASE           +1     I(2) DELTA V FOR TPF
A4204

R4205           LPS20.1 STORAGE.  CALLED BY R65.                              (12D)

 4207                      E4,1742  E4,1747   LMPOS    ERASE           +5     I(6) TEMP. STORAGE FOR LM POS. VECTOR.
 4208                      E4,1750  E4,1755   LMVEL    ERASE           +5     I(6) TEMP. STORAGE FOR LM VEL. VECTOR.
A4209
R4210   INITVEL STORAGE.  ALSO USED BY P31,34,35,74,75,S40.1 AND DOWNLINKED.  (6D)

 4212                      E4,1756  E4,1763   DELVEET3 ERASE           +5     I(6) DELTA V IN INERTIAL COORDINATES.
A4213

R4214           SOME R04(V63)-R77 STORAGE.                                    (5D)

 4216                      E4,1764  E4,1764   RTSTDEX  ERASE                  B(1)
 4217                      E4,1765  E4,1765   RTSTMAX  ERASE                  B(1)
 4218                      E4,1766  E4,1766   RTSTBASE ERASE                  B(1)
 4219                      E4,1767  E4,1767   RTSTLOC  ERASE                  B(1)
 4220                      E4,1770  E4,1770   RSAMPDT  ERASE                  B(1)
A4221

R4222           SECOND DPS GUIDANCE  (LUNAR LANDING) (OVERLAYS KALCMANU & P57) (6D)

 4224   REF   3 LAST  121  E4,1621            ANGTERM  =      GSAV            I(6)     GUIDANCE
A4225

A4226

R4227           ASCENT GUIDANCE FOR LUNAR LANDING                             (54D)

 4229   REF   2 LAST  121  E4,1653            AT       EQUALS UP1      +2     I(2)TMP ENGINE DATA -- THRUST ACC*2 (9)
 4230   REF   1            E4,1655            VE       EQUALS AT       +2     I(2)TMP  EXHAUST VELOCITY * 2(7)M/CS.
 4231   REF   1            E4,1657            TTO      EQUALS VE       +2     I(2)TMP  TAILOFF TIME * 2(17)CS.
 4232   REF   1            E4,1661            TBUP     EQUALS TTO      +2     I(2)TMP  (M/MDOT) * 2(17)CS.
 4233   REF   1            E4,1663            RDOTD    EQUALS TBUP     +2     I(2)TMP  TARGET VELOCITY COMPONENTS
 4234   REF   1            E4,1665            YDOTD    EQUALS RDOTD    +2     I(2)TMP SCALING IS 2(7)M/CS.
 4235   REF   1            E4,1667            ZDOTD    EQUALS YDOTD    +2     I(2)TMP
 4236   REF   1               E4,1671          /R/MAG    EQUALS ZDOTD    +2      I(2)TMP
 4237   REF   1               E4,1673          LAXIS     EQUALS /R/MAG   +2      I(6)TMP
A4238
A4239
 4240   REF   1               E4,1701          YDOT      =      LAXIS    +6      I(2)TMP VEL. NORMAL TO REF. PLANE*2(-7)
 4241   REF   1               E4,1703          ZDOT      EQUALS YDOT     +2      I(2)TMP  DOWN RANGE VEL *2(-7).
 4242   REF   1               E4,1705          GEFF      EQUALS ZDOT     +2      I(2)TMP  EFFECTIVE GRAVITY

R4243      THESE TWO GROUPS OF ASCENT GUIDANCE ARE SPLIT BY THE ASCENT-DESCENT  SERVICER SECTION FOLLOWING THIS SECTION

 4245   REF   1               E4,1725          Y         EQUALS /LAND/   +2      I(2)TMP  OUT-OF-PLANE DIST *2(24)M
 4246   REF   1               E4,1727          DRDOT     EQUALS Y        +2      I(2)TMP  RDOTD - RDOT
 4247   REF   1               E4,1731          DYDOT     EQUALS DRDOT    +2      I(2)TMP  YDOTD - YDOT
 4248   REF   1               E4,1733          DZDOT     EQUALS DYDOT    +2      I(2)TMP  ZDOTD - ZDOT
 4249   REF   1               E4,1735          PCONS     EQUALS DZDOT    +2      I(2)TMP  CONSTANT IN ATR EQUATION
 4250   REF   1               E4,1737          YCONS     EQUALS PCONS    +2      I(2)TMP  CONSTANT IN ATY EQUATION
 4251   REF   1               E4,1741          PRATE     EQUALS YCONS    +2      I(2)TMP  RATE COEFF. IN ATR EQUATION
 4252   REF   1               E4,1743          YRATE     EQUALS PRATE    +2      I(2)TMP  RATE COEFF. IN ATY EQUATION
 4253   REF   1               E4,1745          ATY       EQUALS YRATE    +2      I(2)TMP  OUT-OF-PLANE THRUST COMP.*2(9)
 4254   REF   1               E4,1747          ATR       EQUALS ATY      +2      I(2)TMP  RADIAL THRUST COMP.*2(9)
 4255   REF   1               E4,1751          ATP       EQUALS ATR      +2      I(2)TMP  DOWN-RANGE THRUST COMP
 4256   REF   1               E4,1753          YAW       EQUALS ATP      +2      I(2)TMP
 4257   REF   1               E4,1755          PITCH     EQUALS YAW      +2      I(2)RMP
A4258

R4259            SERVICER FOR LUNAR ASCENT AND DESCENT                           (14D)

 4261   REF   1               E4,1707          G(CSM)    EQUALS GEFF     +2      I(6) FOR UPDATE OF COMMAND MODULE STATE
A4262                                          R(CSM)    EQUALS R-OTHER               VECTORS BY LEM; ANALOGS OF GDT/2,
A4263                                          V(CSM)    EQUALS V-OTHER               R, AND V, RESPECTIVELY OF THE CSM
 4264   REF   1               E4,1715          WM        EQUALS G(CSM)   +6      I(6) TMP - LUNAR ROTATION VECTOR (SM)
 4265   REF   1               E4,1723          /LAND/    EQUALS WM       +6      B(2) LUNAR RADIUS AT LANDING SITE
A4266

R4267            NOTE:  R(CSM) AND V(CSM) DEFINED IN E3.
R4270            NOUN 26 ERASABLES       (UNSHARED)                              (3D)

 4272   REF   1               E4,1771          N26/PRI   EQUALS RSAMPDT  +1      B(1)  PRIO/DELAY
 4273   REF   1               E4,1772          N26/2CAD  EQUALS N26/PRI  +1      B(2)  JOB/TASK 2CADR
```

```
P5000              EBANK-5 ASSIGNMENTS

 5001                         E5,1400                  SETLOC 2400

R5002              W-MATRIX. ESSENTIALLY UNSHARABLE.                                   (162D)

 5004                         E5,1400  E5,1641   W       ERASE           +161D
 5005   REF    1              E5,1642            ENDW    EQUALS W        +162D

A5006


R5007   *******  OVERLAY NUMBER 1 IN EBANK 5   *******


R5008              W-MATRIX OVERLAY: PADLOADS -- LANDING, ABORTS                       (122D)
 5010   REF    2   LAST  125  E5,1400            VELBIAS  EQUALS W                     I(2) PL BIAS VALUE FOR VELOCITY.
A5011                                                                                  REASONABILITY TEST, 2(6) M/CS
R5012   PLEASE PRESERVE THE ORDER OF RBRFGX THROUGH TCGIAPPR.
 5013   REF    1              E5,1402            RBRFGX   EQUALS VELBIAS  +2           I(2)  POSITION TARGETS
 5014   REF    1              E5,1404            RAPFGX   EQUALS RBRFGX   +2           I(2)
 5015   REF    1              E5,1406            RBRFGZ   EQUALS RAPFGX   +2           I(2)
 5016   REF    1              E5,1410            RAPFGZ   EQUALS RBRFGZ   +2           I(2)
 5017   REF    1              E5,1412            VBRFGX   EQUALS RAPFGZ   +2           I(2)  VELOCITY TARGETS
 5018   REF    1              E5,1414            VAPFGX   EQUALS VBRFGX   +2           I(2)
 5019   REF    1              E5,1416            VBRFGZ   EQUALS VAPFGX   +2           I(2)
 5020   REF    1              E5,1420            VAPFGZ   EQUALS VBRFGZ   +2           I(2)
 5021   REF    1              E5,1422            ABRFGX   EQUALS VAPFGZ   +2           I(2)  ACCELERATION TARGETS
 5022   REF    1              E5,1424            AAPFGX   EQUALS ABRFGX   +2           I(2)
 5023   REF    1              E5,1426            ABRFGZ   EQUALS AAPFGX   +2           I(2)
 5024   REF    1              E5,1430            AAPFGZ   EQUALS ABRFGZ   +2           I(2)
 5025   REF    1              E5,1432            VBRFG*   EQUALS AAPFGZ   +2           I(2)  SCALED TARGETS FOR TTF/8CL
 5026   REF    1              E5,1434            VAPFG*   EQUALS VBRFG*   +2           I(2)
 5027   REF    1              E5,1436            ABRFG*   EQUALS VAPFG*   +2           I(2)
 5028   REF    1              E5,1440            AAPFG*   EQUALS ABRFG*   +2           I(2)
 5029   REF    1              E5,1442            JBRFG*   EQUALS AAPFG*   +2           I(2)
 5030   REF    1              E5,1444            JAPFG*   EQUALS JBRFG*   +2           I(2)
A5031                                                    * SEE PARAMETER TABLE IN LUNAR LANDING GUIDANCE EQUATIONS FOR
A5032                                                                      INDIRECT ADDRESSING INTO ABOVE AREA.

 5033   REF    1              E5,1446            GAINBRAK EQUALS JAPFG*   +2           I(2)  GAINS FOR GUIDANCE FRAME ERECTION
 5034   REF    1              E5,1450            GAINAPPR EQUALS GAINBRAK +2           I(2)
 5035   REF    1              E5,1452            TCGFBRAK EQUALS GAINAPPR +2           I(1)  TIME CRITERIA FOR GUIDANCE FRAME
 5036   REF    1              E5,1453            TCGIBRAK EQUALS TCGFBRAK +1           I(1)
 5037   REF    1              E5,1454            TCGFAPPR EQUALS TCGIBRAK +1           I(1)
 5038   REF    1              E5,1455            TCGIAPPR EQUALS TCGFAPPR +1           I(1)
 5039   REF    1              E5,1456            VIGN     EQUALS TCGIAPPR +1           I(2)  DESIRED SPEED FOR PDI
 5040   REF    1              E5,1460            RIGNX    EQUALS VIGN     +2           I(2)  DESIRED 'ALTITUDE' FOR IGNITION
 5041   REF    1              E5,1462            RIGNZ    EQUALS RIGNX    +2           I(2)  DESIRED GROUND RANGE FOR IGNITION
 5042   REF    1              E5,1464            KIGNX/B4 EQUALS RIGNZ    +2           I(2)
 5043  REF   1                 E5,1466        KIGNY/B8 EQUALS KIGNX/B4 +2     I(2)
 5044  REF   1                 E5,1470        KIGNV/B4 EQUALS KIGNY/B8 +2     I(2)
 5045  REF   1                 E5,1472        LOWCRIT  EQUALS KIGNV/B4 +2     B(1) (HIGHCRIT MUST FOLLOW LOWCRIT)
 5046  REF   1                 E5,1473        HIGHCRIT EQUALS LOWCRIT  +1     B(1)
 5047  REF   1                 E5,1474        TAUHZ    EQUALS HIGHCRIT +1     P66 HORIZONTAL
 5048  REF   1                 E5,1475        QHZ      EQUALS TAUHZ    +1         VELOCITY NULLING
 5049  REF   1                 E5,1476        AHZLIM   EQUALS QHZ      +1           CONSTANTS
 5050  REF   1                 E5,1477        2LATE466 EQUALS AHZLIM   +1     I(2) MIN ELAPSED TIME SINCE PIPTIME FRE
A5051                                                                         A P66(2 R/D) WILL BE OMITTED
 5052  REF   1                 E5,1503        DELQFIX  EQUALS 2LATE466 +4     I(2)  LR ALT. DATA REASONABILITY PARAM

A5053                                         ** NOTE: 6 ERASABLES HERE IN THIS "LANDING/ABORTS" OVERLAY ARE FREE
A5054                                                  THEY SHARE ONLY WITH W-MATRIX AND SYSTEM TEST ERASABLES     **

 5055  REF   1                 E5,1511        LRVMAX   EQUALS DELQFIX +6      B(1)   LR VEL WEIGHTING FUNCTIONS
 5056  REF   1                 E5,1512        LRVF     EQUALS LRVMAX   +1     B(1)   LR VEL WEIGHTING FUNCTIONS
 5057  REF   1                 E5,1513        LRWVZ    EQUALS LRVF     +1     B(1)   LR VEL WEIGHTING FUNCTIONS
 5058  REF   1                 E5,1514        LRWVY    EQUALS LRWVZ    +1     B(1)   LR VEL WEIGHTING FUNCTIONS
 5059  REF   1                 E5,1515        LRWVX    EQUALS LRWVY    +1     B(1)   LR VEL WEIGHTING FUNCTIONS
 5060  REF   1                 E5,1516        LRWVFZ   EQUALS LRWVX    +1     B(1)   LR VEL WEIGHTING FUNCTIONS
 5061  REF   1                 E5,1517        LRWVFY   EQUALS LRWVFZ   +1     B(1)   LR VEL WEIGHTING FUNCTIONS
 5062  REF   1                 E5,1520        LRWVFX   EQUALS LRWVFY   +1     B(1)   LR VEL WEIGHTING FUNCTIONS
 5063  REF   1                 E5,1521        LRWVFF   EQUALS LRWVFX   +1     B(1)   LR VEL WEIGHTING FUNCTIONS

 5064  REF   1                 E5,1522        ABSC0    EQUALS LRWVFF   +1     B(1)  ABSCISSAE DEFINING TERRAIN MODEL
 5065  REF   1                 E5,1523        ABSC1    EQUALS ABSC0    +1     B(1)
 5066  REF   1                 E5,1524        ABSC2    EQUALS ABSC1    +1     B(1)
 5067  REF   1                 E5,1525        ABSC3    EQUALS ABSC2    +1     B(1)
 5068  REF   1                 E5,1526        ABSC4    EQUALS ABSC3    +1     B(1)
 5069  REF   1                 E5,1527        SLOPE0   EQUALS ABSC4    +1     B(1)  SLOPES DEFINING TERRAIN MODEL
 5070  REF   1                 E5,1530        SLOPE1   EQUALS SLOPE0   +1     B(1)
 5071  REF   1                 E5,1531        SLOPE2   EQUALS SLOPE1   +1     B(1)
 5072  REF   1                 E5,1532        SLOPE3   EQUALS SLOPE2   +1     B(1)
 5073  REF   1                 E5,1533        SLOPE4   EQUALS SLOPE3   +1     B(1)

 5074  REF   5  LAST  100        0130         ABVEL*   EQUALS BUF             B(1)   LR TEMP
 5075  REF   6  LAST  126        0131         VSELECT* EQUALS BUF +1          B(1)   LR TEMP

 5076  REF   1                 E5,1534        RODSCALE EQUALS SLOPE4   +1     I(2) CLICK SCALE FACTOR FOR R.O.D.
 5077  REF   1                 E5,1535        TAUROD   EQUALS RODSCALE +1     I(2) TIME CONSTANT FOR R.O.D.
 5078  REF   1                 E5,1537        LAG/TAU  EQUALS TAUROD   +2     I(2) LAG TIME DIVIDED BY TAUROD (P66)
 5079  REF   1                 E5,1541        MINFORCE EQUALS LAG/TAU  +2     I(2) MINIMUM FORCE P66 WILL COMMAND.
 5080  REF   1                 E5,1543        MAXFORCE EQUALS MINFORCE +2     I(2) MAXIMUM FORCE P66 WILL COMMAND.
 5081  REF   1                 E5,1545        J1PARM   EQUALS MAXFORCE +2     I(2) PARAMETER SET # 1:
 5082  REF   1                 E5,1547        K1PARM   EQUALS J1PARM   +2     I(2)    ABORT ORBIT SEMI-MAJOR AXIS COMP
 5083  REF   1                 E5,1551        J2PARM   EQUALS K1PARM   +2     I(2) PARAMETER SET # 2:
 5084  REF   1                 E5,1553        K2PARM   EQUALS J2PARM   +2     I(2)    ABORT ORBIT SEMI-MAJOR AXIS COMP
 5085  REF   1                 E5,1555        THETCRIT EQUALS K2PARM   +2     I(2) CENTRAL ANGLE SWITCHING CRITERION.
 5086  REF   1                 E5,1557        RAMIN    EQUALS THETCRIT +2     I(2) MINIMUM ALLOWABLE APOLUNE.
 5087  REF   1                 E5,1561        YLIM     EQUALS RAMIN    +2     I(2) MAXIMUM CROSS-RANGE DIST. IN ABORTS
 5088   REF   1                E5,1563        ABTRDOT   EQUALS YLIM      +2     I(2) DESIRED RADIAL VEL. FOR ABORTS.
 5089   REF   1                E5,1565        COSTHET1  EQUALS ABTRDOT   +2     I(2) COS OF CONE 1 ANGLE FOR ABORTS
 5090   REF   1                E5,1567        COSTHET2  EQUALS COSTHET1  +2     I(2) COS OF CONE 2 ANGLE FOR ABORTS.
A5091

R5092            SOME VARIABLES FOR SECOND DPS GUIDANCE                             (38D)

 5094   REF   1                E5,1571        CG        EQUALS COSTHET2  +2     I(18D) GUIDANCE
 5095   REF   1                E5,1613        RANGEDSP  EQUALS CG        +18D   B(2) DISPLAY
 5096   REF   1                E5,1613        OUTOFPLN  EQUALS RANGEDSP         *** OUTOFPLN CAN OVERLAY RANGEDSP ***
 5097   REF   1                E5,1615        VBIAS     EQUALS OUTOFPLN  +2     I(6) PIPA BIAS EQUIV VELOCITY VECTOR
 5098   REF   1                E5,1623        RGU       EQUALS VBIAS     +6     I(6) UNSHARED POSITION, GUIDANCE COORDS
 5099   REF   1                E5,1631        DLAND     EQUALS RGU       +6     B(6) PL LANDING SITE CORRECTION,SM FRAME
 5100   REF   1                E5,1631        DLANDX    EQUALS DLAND
 5101   REF   2  LAST   127    E5,1633        DLANDY    EQUALS DLAND     +2
 5102   REF   3  LAST   127    E5,1635        DLANDZ    EQUALS DLAND     +4
A5103

A5104                                                  OVERLAYS OF THE BLOCK ABOVE (ASCENT AND DESCENT)

 5106   REF   2  LAST   127    E5,1571        JPARM     EQUALS CG               I(2) JPARM WILL EQUAL J1PARM OR J2PARM
 5107   REF   1                E5,1573        KPARM     EQUALS JPARM     +2     I(2) KPARM WILL EQUAL K1PARM OR K2PARM
 5108   REF   1                E5,1575        RP        EQUALS KPARM     +2     I(2) PREDICTED BURNOUT RADIUS-M*2(-24)
 5109   REF   1                E5,1577        QAXIS     EQUALS RP        +2     I(6) ASCENT CROSSRANGE HALF-UNIT VECTOR
 5110   REF   1                E5,1605        ZAXIS1    EQUALS QAXIS     +6     I(6) ASCENT DOWNRANGE HALF-UNIT VECTOR
 5111   REF   7  LAST   126       0130        L*WCR*T   =      BUF
 5112   REF   8  LAST   127       0131        H*GHCR*T  =      BUF +1
A5113

R5114            Q-SAVE REGISTER FOR ASCENT                     (1D)

 5115   REF   4  LAST   127    E5,1637        ASCSAVE   EQUALS DLAND     +6     I(1)TMP ASCENT Q-SAVE


R5116            ALIGNMENT/SYSTEST/CALCSMSC COMMON STORAGE.                         (36D)

 5118   REF   1                E5,1642        XSM       EQUALS ENDW             B(6)
 5119   REF   1                E5,1650        YSM       EQUALS XSM       +6     B(6)
 5120   REF   1                E5,1656        ZSM       EQUALS YSM       +6     B(6)

 5121   REF   1                E5,1664        XDC       EQUALS ZSM       +6     B(6)
 5122   REF   1                E5,1672        YDC       EQUALS XDC       +6     B(6)
 5123   REF   1                E5,1700        ZDC       EQUALS YDC       +6     B(6)

 5124   REF   2  LAST   127    E5,1664        XNB       =      XDC
 5125   REF   2  LAST   127    E5,1672        YNB       =      YDC
 5126   REF   1                E5,1700        ZNB       =      ZDC

R5127            MORE OVERLAYS TO ALIGNMENT /SYSTEST  (THESE ARE P52)               (6D)
```

```
 5129   REF   1                E5,1706          LANDLAT  EQUALS STARAD          (2) LATITUDE, LONGITUDE
 5130   REF   1                E5,1710          LANDLONG EQUALS LANDLAT  +2     (2)     AND ALTITUDE
 5131   REF   1                E5,1712          LANDALT  EQUALS LANDLONG +2     (2)     OF LANDING SITE
A5132

R5133            ALIGNMENT/SYSTEST COMMON STORAGE.                               (31D)

 5135   REF   2  LAST  127     E5,1706          STARAD   EQUALS ZDC      +6     I(18D)TMP
 5136   REF   2  LAST  128     E5,1730          STAR     EQUALS STARAD   +18D   I(6)
 5137   REF   1                E5,1736          GCTR     EQUALS STAR     +6     B(1)
 5138   REF   1                E5,1737          OGC      EQUALS GCTR     +1     I(2)
 5139   REF   1                E5,1741          IGC      EQUALS OGC      +2     I(2)
 5140   REF   1                E5,1743          MGC      EQUALS IGC      +2     I(2)

R5141            P57 ALIGNMENT (OVERLAY OF ALIGNMENT/SYSTEST COMMON STORAGE)     (12D)

 5143   REF   3  LAST  128     E5,1706          GACC     =      STARAD          (6) SS
 5144   REF   4  LAST  128     E5,1714          GOUT     =      STARAD   +6     (6) SS
A5145

R5146            OVERLAYS WITHIN ALIGNMENT/SYSTEST COMMON STORAGE                (24D)

 5148   REF   5  LAST  128     E5,1706          VEARTH   EQUALS STARAD           (6)TMP
 5149   REF   1                E5,1714          VSUN     EQUALS VEARTH   +6      (6)TMP
 5150   REF   1                E5,1722          VMOON    EQUALS VSUN     +6      (6)TMP
 5151   REF   1                E5,1730          SAX      EQUALS VMOON    +6      (6)TMP


R5152            P50'S,R50'S Q STORES.                                           (2D)

 5154   REF   1                E5,1745          QMIN     EQUALS MGC      +2     B(1)TMP
 5155   REF   1                E5,1746          QMAJ     EQUALS QMIN     +1     B(1)TMP
R5156

R5157          **** USED IN P50S ****    (SCATTERED OVERLAYS)                    (18D)
 5159   REF   2  LAST  128     E5,1706          CULTRIX  EQUALS VEARTH          VEARTH, VSUN, VMOON
A5160


R5161            ALIGNMENT STORAGE.                                              (23D)

 5163   REF   1                E5,1747          OGCT     EQUALS QMAJ     +1     I(6)
 5164   REF   1                E5,1755          BESTI    EQUALS OGCT     +6     I(1)
 5165   REF   1                E5,1756          BESTJ    EQUALS BESTI +1
 5166   REF   1                E5,1757          STARIND  EQUALS BESTJ +1
R5167        RETAIN THE ORDER OF STARSAV1 TO STARSAV2 +5 FOR DOWNLINK PURPOSES.
 5168   REF   1                E5,1760          STARSAV1 EQUALS STARIND  +1     I(6)
 5169   REF   1                E5,1766          STARSAV2 EQUALS STARSAV1 +6     I(6)
 5170   REF   1                E5,1774          TALIGN   EQUALS STARSAV2 +6     B(2) TIME OF IMU ALIGNMENT  (DOWNLINKED)
A5171
```

```
R5172            P32-35 + SERVICER                                     (2D)

 5174   REF   1              E5,1776          RTX1      EQUALS TALIGN   +2    I(1) X1  -2 EARTH, -10 MOON
 5175   REF   1              E5,1777          RTX2      EQUALS RTX1     +1    I(1) X2  0 EARTH, 2 MOON
A5176

 5177                           0026          ZPRIME    =       22D
 5178                           0020          COSTH     =       16D
 5179                           0022          SINTH     =       18D
 5180                           0024          THETA     =       20D
```

```
P5181  *******  OVERLAY NUMBER 2 IN EBANK 5  *******


R5182                 CONICS ROUTINE STORAGE.                                              (85D)

 5184  REF   2  LAST  127   E5,1642           DELX      EQUALS ENDW              I(2)TMP
 5185  REF   1              E5,1644           DELT      EQUALS DELX      +2      I(2)TMP
 5186  REF   1              E5,1646           URRECT    EQUALS DELT      +2      I(6)TMP
 5187                          0042           RCNORM    EQUALS 34D               I(2) TMP
R5188           NOTE: RCNORM (ABOVE) IS DEFINED IN VAC AREA

 5189  REF   1              E5,1654           R1VEC     EQUALS URRECT  +6        I(6) TMP
 5190  REF   1              E5,1662           R2VEC     EQUALS R1VEC     +6      I(6)TMP
 5191  REF   1              E5,1670           TDESIRED  EQUALS R2VEC     +6      I(2)TMP
 5192  REF   1              E5,1672           GEOMSGN   EQUALS TDESIRED  +2      I(1)TMP
 5193  REF   1              E5,1673           UN        EQUALS GEOMSGN   +1      I(6)TMP
 5194  REF   1              E5,1701           VTARGTAG  EQUALS UN        +6      I(1)TMP
 5195  REF   1              E5,1702           VTARGET   EQUALS VTARGTAG  +1      I(6)TMP
 5196  REF   1              E5,1710           RTNLAMB   EQUALS VTARGET   +6      I(1)TMP
 5197  REF   1              E5,1711           U2        EQUALS RTNLAMB   +1      I(6)TMP
 5198  REF   1              E5,1717           MAGVEC2   EQUALS U2        +6      I(2)TMP
 5199  REF   1              E5,1721           UR1       EQUALS MAGVEC2   +2      I(6)TMP
 5200  REF   1              E5,1727           SNTH      EQUALS UR1       +6      I(2)TMP
 5201  REF   1              E5,1731           CSTH      EQUALS SNTH      +2      I(2)TMP
 5202  REF   1              E5,1733           1-CSTH    EQUALS CSTH      +2      I(2)TMP
 5203  REF   1              E5,1735           CSTH-RHO  EQUALS 1-CSTH    +2      I(2)TMP
 5204  REF   1              E5,1737           P         EQUALS CSTH-RHO  +2      I(2)TMP
 5205  REF   1              E5,1741           R1A       EQUALS P         +2      I(2)TMP
 5206  REF   2  LAST  130   E5,1654           RVEC      EQUALS R1VEC             I(6)TMP
 5207  REF   1              E5,1743           VVEC      EQUALS R1A       +2      I(6)TMP
 5208  REF   2  LAST  130   E5,1710           RTNTT     EQUALS RTNLAMB           I(1)TMP
 5209  REF   1              E5,1751           ECC       EQUALS VVEC      +6      I(2)TMP
 5210  REF   3  LAST  130   E5,1710           RTNTR     EQUALS RTNLAMB           I(1)TMP
 5211  REF   4  LAST  130   E5,1710           RTNAPSE   EQUALS RTNLAMB           I(1)TMP
 5212  REF   2  LAST  130   E5,1717           R2        EQUALS MAGVEC2           I(2)TMP
 5213  REF   1              E5,1753           RTNPRM    EQUALS ECC       +2      I(1)TMP
 5214  REF   1              E5,1754           SGNRDOT   EQUALS RTNPRM    +1      I(1)TMP
 5215  REF   1              E5,1755           RDESIRED  EQUALS SGNRDOT   +1      I(2)TMP
 5216  REF   1              E5,1757           DELDEP    EQUALS RDESIRED  +2      I(2)TMP
 5217  REF   1              E5,1761           DEPREV    EQUALS DELDEP    +2      I(2)TMP
 5218  REF   2  LAST  130   E5,1757           TERRLAMB  EQUALS DELDEP            I(2)TMP
 5219  REF   1              E5,1761           TPREV     EQUALS DEPREV            I(2)TMP
 5220  REF   2  LAST  130   E5,1763           EPSILONL  EQUALS DEPREV    +2      I(2)TMP
 5221  REF   1              E5,1765           COGA      EQUALS EPSILONL  +2      I(2) COTAN OF INITIAL FLIGHT PATH ANGLE.
 5222  REF   1              E5,1765           INDEP     EQUALS COGA                   USED BY SUBROUTINE'ITERATOR'.
```

```
P5223   *******  OVERLAY NUMBER 3  IN EBANK 5   *******

R5224                INCORP STORAGE.                                                     (18D)

 5226   REF    3  LAST  130    E5,1642            ZI        EQUALS ENDW                  I(18)TMP

R5227                INCORP/LSR22.3 STORAGE.                                             (21D)

 5229   REF    1               E5,1664            DELTAX    EQUALS ZI          +18D      I(18)
 5230   REF    1               E5,1706            VARIANCE  EQUALS DELTAX      +18D      I(3)

R5231                MEASUREMENT INCORPORATICN -R22- STORAGE.                            (49D)

 5233   REF    1               E5,1711            GRP2SVQ   EQUALS VARIANCE +3           I(1)TMP QSAVE FOR RESTARTS
 5234   REF    1               E5,1712            OMEGAM1   EQUALS GRP2SVQ  +1           I(6)
 5235   REF    1               E5,1720            OMEGAM2   EQUALS OMEGAM1  +6           I(6)
 5236   REF    1               E5,1726            OMEGAM3   EQUALS OMEGAM2  +6           I(6)
 5237   REF    1               E5,1734            HOLDW     EQUALS OMEGAM3  +6           I(18)
A5238

 5239   REF    2  LAST  131    E5,1664            TRIPA     EQUALS DELTAX                I(3)TMP
 5240   REF    1               E5,1667            TEMPVAR   EQUALS TRIPA    +3           I(3)TMP

A5241


R5242                INCORPORATION/INTEGRATICN Q STORAGE.                                (1D)

 5244   REF    2  LAST  130    E5,1767            EGRESS    EQUALS COGA     +2           I(1)
A5245


A5246
```

```
P5247                  SYSTEM TEST ERASABLES.  CAN OVERLAY W MATRIX.                       (127D)

R5249    *******  OVERLAY NUMBER 0 IN EBANK 5  *******

 5250    REF   3  LAST  125   E5,1400               AZIMUTH  EQUALS W                      2
 5251    REF   1              E5,1402               LATITUDE EQUALS AZIMUTH  +2            2
 5252    REF   1              E5,1404               ERVECTOR EQUALS LATITUDE +2            6
 5253    REF   1              E5,1412               LENGTHOT EQUALS ERVECTOR +6            1
 5254    REF   1              E5,1413               LOSVEC   EQUALS LENGTHOT +1            6
 5255    REF   1              E5,1414               NDXCTR   EQUALS LOSVEC   +1            1
 5256    REF   1              E5,1415               PIPINDEX EQUALS NDXCTR   +1            1
 5257    REF   1              E5,1416               POSITON  EQUALS PIPINDEX +1            1
 5258    REF   1              E5,1417               QPLACE   EQUALS POSITON  +1            1
 5259    REF   1              E5,1420               QPLACES  EQUALS QPLACE   +1            1
 5260    REF   1              E5,1421               SOUTHDR  EQUALS QPLACES  +1            7
 5261    REF   1              E5,1430               TEMPTIME EQUALS SOUTHDR  +7            2
 5262    REF   1              E5,1432               TMARK    EQUALS TEMPTIME +2            2
 5263    REF   1              E5,1434               GENPL    EQUALS TMARK    +2
 5270    REF   1              E5,1440               TEMPADD  =      GENPL +4
 5271    REF   2  LAST  132   E5,1441               TEMP     =      GENPL +5
 5272    REF   3  LAST  132   E5,1442               NOBITS   =      GENPL +6
 5273    REF   4  LAST  132   E5,1443               CHAN     =      GENPL +7

 5274    REF   5  LAST  132   E5,1444               LOS1     =      GENPL +8D
 5275    REF   6  LAST  132   E5,1452               LOS2     =      GENPL +14D

 5283    REF   7  LAST  132   E5,1472               DATAPL   EQUALS GENPL +30D
 5287    REF   8  LAST  132   E5,1537               RESULTCT EQUALS GENPL +67D
 5290    REF   9  LAST  132   E5,1434               AINLA    =      GENPL                  110 DE  OR 156 OCT LOCATIONS

 5291    REF   1              E5,1434               WANGO    EQUALS AINLA                  VERT E ATE
 5292    REF   2  LAST  132   E5,1436               WANGI    EQUALS AINLA +2D              HORIZO TAL ERATE
 5293    REF   3  LAST  132   E5,1440               WANGT    EQUALS AINLA +4D              T
 5294    REF   1              E5,1440               TORQNDX  =      WANGT
 5295    REF   4  LAST  132   E5,1442               DRIFTT   EQUALS AINLA +6D
 5296    REF   5  LAST  132   E5,1444               ALX1S    EQUALS AINLA +8D
 5297    REF   6  LAST  132   E5,1445               CMPX1    EQUALS AINLA +9D              IND
 5298    REF   7  LAST  132   E5,1446               ALK      EQUALS AINLA +10D             GAINS
 5299    REF   8  LAST  132   E5,1462               VLAUNS   EQUALS AINLA +22D
 5300    REF   9  LAST  132   E5,1464               WPLATO   EQUALS AINLA +24D
 5301    REF  10  LAST  132   E5,1470               INTY     EQUALS AINLA +28D             SOUTH  IP INTE
 5302    REF  11  LAST  132   E5,1472               ANGZ     EQUALS AINLA +30D             EAST A IS
 5303    REF  12  LAST  132   E5,1474               INTZ     EQUALS AINLA +32D             EAST P P I
 5304    REF  13  LAST  132   E5,1476               ANGY     EQUALS AINLA +34D             SOUTH
 5305    REF  14  LAST  132   E5,1500               ANGX     EQUALS AINLA +36D             VE
 5306    REF  15  LAST  132   E5,1502               DRIFTO   EQUALS AINLA +38D             VERT
 5307    REF  16  LAST  132   E5,1504               DRIFTI   EQUALS AINLA +40D             SOU
 5308    REF  17  LAST  132   E5,1510               VLAUN    EQUALS AINLA +44D
 5309    REF  18  LAST  132   E5,1512               ACCWD    EQUALS AINLA +46D
 5310    REF  19  LAST  132   E5,1520            POSNV    EQUALS AINLA +52D
 5311    REF  20  LAST  133   E5,1522            DPIPAY   EQUALS AINLA +54D      SOUTH
 5312    REF  21  LAST  133   E5,1526            DPIPAZ   EQUALS AINLA +58D      NORTH  IP INCREMENT
 5313    REF  22  LAST  133   E5,1530            ALTIM    EQUALS AINLA +60D
 5314    REF  23  LAST  133   E5,1531            ALTIMS   EQUALS AINLA +61D       INDEX
 5315    REF  24  LAST  133   E5,1532            ALDK     EQUALS AINLA +62D       TIME  ONSTAN
 5316    REF  25  LAST  133   E5,1550            DELM     EQUALS AINLA +76D
 5317    REF  26  LAST  133   E5,1560            WPLATI   EQUALS AINLA +84D
 5318    REF  27  LAST  133   E5,1562            GEOCOMPS EQUALS AINLA +86D
 5319    REF  28  LAST  133   E5,1563            ERCOMP   EQUALS AINLA +87D
 5320    REF  29  LAST  133   E5,1571            ZERONDX  EQUALS AINLA +93D


 5321    REF   1              E5,1452            THETAN   =      ALK +4
 5322    REF   1              E5,1460            FILDELV  EQUALS THETAN   +6      AGS ALIGNMENT STORAGE
 5323    REF   1              E5,1462            INTVEC   EQUALS FILDELV  +2
 5324    REF  30  LAST  133   E5,1572            1SECXT   =      AINLA +94D
 5325    REF  31  LAST  133   E5,1573            ASECXT   =      AINLA +95D
 5326    REF  32  LAST  133   E5,1574            PERFDLAY EQUALS AINLA     +96D   B(2) DELAY TIME BEF. START DRIFT MEASURE
 5327    REF  33  LAST  133   E5,1576            OVFLOWCK EQUALS AINLA     +98D   (1) SET MEANS OVERFLOW IN IMU PERF TEST
A5328                                                                                 AND CAUSES TERMINATION
A5329

 5330                         E5,1777            END-E5   EQUALS 2777            END OF EBANK 5
```

```
P6000           EBANK-6 ASSIGNMENTS.

 6001                      E6,1400                      SETLOC 3000

R6002           DAP   PAD-LOADED   DATA.                                            (10D)

R6004      ALL OF THE FOLLOWING EXCEPT PITTIME AND ROLLTIME ARE INITIALIZED IN FRESH START TO PERMIT IMMEDIATE USE OF DAP

 6006                      E6,1400  E6,1400   HIASCENT ERASE                        (1) MASS AFTER STAGING, SCALE AT B16 KG.
 6007                      E6,1401  E6,1401   ROLLTIME ERASE                        (1) TIME TO TRIM Z GIMBAL IN R03, CSEC.
 6008                      E6,1402  E6,1402   PITTIME  ERASE                        (1) TIME TO TRIM Y GIMBAL IN R03, CSEC.
 6009                      E6,1403  E6,1403   DKTRAP   ERASE                        (1) DAP STATE          (POSSIBLE 77001
 6010                      E6,1404  E6,1404   DKOMEGAN ERASE                        (1)   ESTIMATOR PARA-     (VALUES 00012
 6011                      E6,1405  E6,1405   DKKAOSN  ERASE                        (1)      METERS FOR THE           00074
 6012                      E6,1406  E6,1406   LMTRAP   ERASE                        (1)         DOCKED AND            77001
 6013                      E6,1407  E6,1407   LMOMEGAN ERASE                        (1)            LEM-ALONE CASES    00000
 6014                      E6,1410  E6,1410   LMKAOSN  ERASE                        (1)               RESPECTIVELY    00074
 6015                      E6,1411  E6,1411   DKDB     ERASE                        (1) WIDTH OF DEADBAND FOR DOCKED RCS
A6016                                                                                   AUTOPILOT (DB=1.4DEG IN FRESH START)
A6017                                                                                   DEADBAND = PI/DKDB RAD.

R6018   PADLOADS FOR INITIALIZATION OF DAP BIAS ACCELERATION (AT P12 IGNITION)      (2D)

 6020                      E6,1412  E6,1412   IGNAOSQ  ERASE                        B(1)PL
 6021                      E6,1413  E6,1413   IGNAOSR  ERASE                        B(1)PL
A6022

R6023   AXIS TRANSFORMATION MATRIX - GIMBAL TO PILOT AXES:                          (5D)

 6025                      E6,1414  E6,1414   M11      ERASE                        SCALED AT 1
 6026                      E6,1415  E6,1415   M21      ERASE                        SCALED AT 1
 6027                      E6,1416  E6,1416   M31      ERASE
 6028                      E6,1417  E6,1417   M22      ERASE                        SCALED AT 1.
 6029                      E6,1420  E6,1420   M32      ERASE                        SCALED AT 1.

R6030   ANGLE MEASUREMENTS.                                                         (31D)

 6032                      E6,1421  E6,1425   OMEGAP   ERASE   +4                   BODY-AXIS ROT. RATES SCALED AT PI/4 AND
 6033   REF   1            E6,1422            OMEGAQ   EQUALS OMEGAP +1             BODY-AXIS ACCELERATIONS SCALED AT PI/8
 6034   REF   2  LAST  134 E6,1423            OMEGAR   EQUALS OMEGAP +2
R6035     RETAIN THE ORDER OF ALPHAQ AND ALPHAR FOR DOWNLINK PURPOSES.
 6036   REF   3  LAST  134 E6,1424            ALPHAQ   EQUALS OMEGAP +3
 6037   REF   4  LAST  134 E6,1425            ALPHAR   EQUALS OMEGAP +4
 6038                      E6,1426  E6,1427   OMEGAU   ERASE  +1
 6039   REF   1            E6,1427            OMEGAV   =       OMEGAU +1

 6040                      E6,1430  E6,1435   TRAPEDP  ERASE  +5
 6041   REF   1            E6,1431            TRAPEDQ  =       TRAPEDP +1
 6042   REF   2  LAST  134 E6,1432            TRAPEDR  =       TRAPEDP +2
 6043   REF   3  LAST  134 E6,1433            NPTRAPS  =       TRAPEDP +3
 6044   REF   4  LAST  134   E6,1434             NQTRAPS  =       TRAPEDP +4
 6045   REF   5  LAST  135   E6,1435             NRTRAPS  =       TRAPEDP +5
 6046   REF   1              E6,1427             EDOTP    =       EDOT
 6047                        E6,1436   E6,1437   EDOTQ    ERASE   +1
 6048   REF   1              E6,1437             EDOTR    =       EDOTQ +1          MANY SHARING NAMES
 6049   REF   2  LAST  135   E6,1436             QRATEDIF EQUALS  EDOTQ             ALTERNATIVE NAMES:
 6050   REF   1              E6,1437             RRATEDIF EQUALS  EDOTR             DELETE WHEN NO. OF REFERENCES = 0

 6051   REF   2  LAST  134   E6,1426             URATEDIF EQUALS  OMEGAU
 6052   REF   1              E6,1427             VRATEDIF EQUALS  OMEGAV
 6053                        E6,1440   E6,1442   OLDXFORP ERASE              +2     STORED CDU READINGS FOR STATE
 6054   REF   1              E6,1441             OLDYFORP EQUALS  OLDXFORP +1       DERIVATIONS: SCALED AT PI RADIANS (2'S)
 6055   REF   2  LAST  135   E6,1442             OLDZFORQ EQUALS  OLDXFORP +2
R6056   RATE-COMMAND AND MINIMUM IMPULSE MODES

 6057                        E6,1443   E6,1443   CH31TEMP ERASE
 6058                        E6,1444   E6,1444   STIKSENS ERASE
 6059                        E6,1445   E6,1445   TCP      ERASE
 6060                        E6,1446   E6,1453   DXERROR  ERASE   +5
 6061   REF   1              E6,1450             DYERROR  EQUALS  DXERROR +2
 6062   REF   2  LAST  135   E6,1452             DZERROR  EQUALS  DXERROR +4
 6063                        E6,1454   E6,1454   PLAST    ERASE
 6064                        E6,1455   E6,1455   QLAST    ERASE
 6065                        E6,1456   E6,1456   RLAST    ERASE
 6066                        E6,1457   E6,1457   TCQR     ERASE
R6067   OTHER VARIABLES.                                                            (5D)

 6069                        E6,1460   E6,1460   OLDPMIN  ERASE                     THESE THREE USED IN MIN IMPULSE MODE.
 6070                        E6,1461   E6,1461   OLDQRMIN ERASE
 6071   REF   1              E6,1736             TEMP31   EQUALS  DAPTEMP1

 6072                        E6,1462   E6,1463   SAVEHAND ERASE   +1
 6073                        E6,1464   E6,1464   PERROR   ERASE
 6074   REF   1              E6,1450             QERROR   EQUALS  DYERROR
 6075   REF   1              E6,1452             RERROR   EQUALS  DZERROR
R6076   JET STATE CHANGE VARIABLES- TIME (TOFJTCHG),JET BITS WRITTEN NOW            (10D)
R6078     (JTSCNNOW), AND JET BITS WRITTEN AT T6 RUPT (JTSATCHG).

 6079                        E6,1465   E6,1465   NXT6ADR  ERASE
 6080                        E6,1466   E6,1467   T6NEXT   ERASE   +1
 6081                        E6,1470   E6,1471   T6FURTHA ERASE   +1
 6082                        E6,1472   E6,1474   NEXTP    ERASE   +2
 6083   REF   1              E6,1473             NEXTU    =       NEXTP +1
 6084   REF   2  LAST  135   E6,1474             NEXTV    =       NEXTP +2
 6085                        E6,1475   E6,1476   -2JETLIM ERASE    +1               RATE COMMAND 4-JET RATE DIFFERENCE LIMIT
 6086   REF   1              E6,1476             -RATEDB  EQUALS  -2JETLIM +1       AND RATE DEADBAND FOR ASCENT OR DESCENT

 6087   REF   1              E6,1476             TARGETDB EQUALS  -RATEDB           MAN. CONTROL TARGET DB COMPLEMENT.

R6088        *** Q,R AXIS ERASABLES ***                                             (3)
```

```
 6090   REF  13  LAST   89      4733             PBIT     EQUALS BIT10
 6091   REF  14  LAST   89      4732             QRBIT    EQUALS BIT11
 6092   REF   1              E6,1750             UERROR   EQUALS DAPTREG5      U,V-AXES ATT ERROR FOR RCS CONTROL LAWS
 6093   REF   1              E6,1751             VERROR   =      UERROR +1
 6094                        E6,1477  E6,1477    RETJADR  ERASE
 6095   REF   1              E6,1741             TEMPNUM  EQUALS DAPTEMP4
 6096   REF   1              E6,1742             NUMBERT  EQUALS DAPTEMP5
 6097   REF   1              E6,1743             ROTINDEX EQUALS DAPTEMP6
 6098   REF   2  LAST  135   E6,1736             ROTEMP1  EQUALS DAPTEMP1
 6099   REF   1              E6,1737             ROTEMP2  EQUALS DAPTEMP2
 6100   REF   1              E6,1740             POLYTEMP EQUALS DAPTEMP3
 6101                        E6,1500  E6,1500    SENSETYP ERASE
 6102   REF   3  LAST  136   E6,1736             ABSTJ    EQUALS DAPTEMP1      ABS VALUE OF JET-FIRING TIME
 6103   REF   4  LAST  136   E6,1736             ABSEDOTP EQUALS DAPTEMP1
```

```
P6104   TRIM GIMBAL CONTROL LAW ERASABLES:                                  (11D)

 6106   REF   5  LAST  136  E6,1736             GTSTEMPS EQUALS DAPTEMP1        GTS IS PART OF THE JASK.
 6107   REF   1             E6,1740             SHFTFLAG EQUALS GTSTEMPS +2     COUNT BITS FOR GTSQRT SHIFTING.
 6108   REF   2  LAST  137  E6,1743             ININDEX  EQUALS GTSTEMPS +5     INDEX FOR SHIFT LOOP IN GTSQRT.

 6109   REF   1             E6,1505             SAVESR   EQUALS AXISCTR         CANNOT BE A DAPTEMP - GTS USES THEM ALL.

 6110   REF   3  LAST  137  E6,1745             SCRATCH  EQUALS GTSTEMPS +7     ROOTCYCL ERASABLE
 6111   REF   4  LAST  137  E6,1746             HALFARG  EQUALS GTSTEMPS +8D    ROOTCYCL ERASABLE.

 6112   REF   5  LAST  137  E6,1736             K2THETA  EQUALS GTSTEMPS        D.P., K*ERROR,  NEGUSUM
 6113   REF   6  LAST  137  E6,1740             KCENTRAL EQUALS GTSTEMPS +2     S.P., K FROM KQ OR KRDAP, AT PI/2(8)
 6114   REF   7  LAST  137  E6,1741             K2CNTRAL EQUALS GTSTEMPS +3     D.P., GTS SCRATCH CELLS.
 6115   REF   8  LAST  137  E6,1742             WCENTRAL EQUALS GTSTEMPS +4     S.P., OMEGA, AT PI/4 RAD/SEC
 6116   REF   9  LAST  137  E6,1743             ACENTRAL EQUALS GTSTEMPS +5     S.P., ALPHA, AT PI/4 RAD/SEC(2)
 6117   REF  10  LAST  137  E6,1744             DEL      EQUALS GTSTEMPS +6     S.P., SGN FUNCTION VALUE.
 6118   REF  11  LAST  137  E6,1745             A2CNTRAL EQUALS GTSTEMPS +7     D.P., GTS SCRATCH CELLS.
 6119   REF  12  LAST  137  E6,1747             QRCNTR   EQUALS GTSTEMPS +9D    S.P.,INDEX FOR GTS LOOP THROUGH Q,R AXES
 6120   REF  13  LAST  137  E6,1750             FUNCTION EQUALS GTSTEMPS +10D   D.P.,ARGUMENT FOR GRSQRT,SCRATCH FOR GTS

 6121                       E6,1501  E6,1503    NEGUQ    ERASE   +2             NEGATIVE OF Q-AXIS GIMBAL DRIVE
A6122                                                           NEGUQ +1          DEFINED AND USED ELSEWHERE
 6123   REF   1             E6,1503             NEGUR    EQUALS NEGUQ +2        NEGATIVE OF R-AXIS GIMBAL DRIVE

 6124                       E6,1504  E6,1506    KQ       ERASE   +2             S.P.,JERK TERM FOR GTS, AT PI/2(8)
 6125   REF   1             E6,1505             AXISCTR  EQUALS KQ       +1
 6126   REF   2  LAST  137  E6,1506             KRDAP    EQUALS KQ       +2     .3 ACCDOTR SCALED AT PI/2(8)

 6127                       E6,1507  E6,1512    ACCDOTQ  ERASE   +3             Q-JERK SCALED AT PI/2(7) UNSIGNED
 6128   REF   1             E6,1510             QACCDOT  EQUALS ACCDOTQ +1      Q-JERK SCALED AT PI/2(7) SIGNED
 6129   REF   2  LAST  137  E6,1511             ACCDOTR  EQUALS ACCDOTQ +2      R-JERK SCALED AT PI/2(7) UNSIGNED
 6130   REF   3  LAST  137  E6,1512             RACCDOT  EQUALS ACCDOTQ +3      R-JERK SCALED AT PI/2(7) SIGNED

 6131   REF   1             E6,1450             QDIFF    EQUALS QERROR          ATTITUDE ERRORS:
 6132   REF   1             E6,1452             RDIFF    EQUALS RERROR          SCALED AT PI RADIANS

A6133


R6134   TORQUE VECTOR RECONSTRUCTION VARIABLES:                             (17D)

 6136   REF   1             E6,1744             JETRATE  EQUALS DAPTREG1
 6137   REF   1             E6,1745             JETRATEQ EQUALS JETRATE +1      THE LAST CONTROL SAMPLE PERIOD OF 100 MS
 6138   REF   2  LAST  137  E6,1746             JETRATER EQUALS JETRATE +2      SCALED AT PI/4 RADIANS/SECOND

 6139                       E6,1513  E6,1520    DOWNTORK ERASE  +5              ACCUMULATED JET TORQUE COMMANDED ABOUT
 6140   REF   1             E6,1513             POSTORKP EQUALS DOWNTORK          +,-P, +,-U, +,-V RESPECTIVELY.
 6141   REF   2  LAST  137  E6,1514             NEGTORKP EQUALS DOWNTORK +1
 6142   REF   3  LAST  137  E6,1515             POSTORKU EQUALS DOWNTORK +2       NOT INITIALIZED; PERMITTED TO OVERFLOW
 6143   REF   4  LAST  137   E6,1516             NEGTORKU EQUALS DOWNTORK +3      SCALED AT 32 JET-SEC, OR ABOUT 2.0 JET-
 6144   REF   5  LAST  138   E6,1517             POSTORKV EQUALS DOWNTORK +4         MSEC PER BIT.
 6145   REF   6  LAST  138   E6,1520             NEGTORKV EQUALS DOWNTORK +5

 6146                        E6,1521  E6,1523    NO.PJETS ERASE  +2
 6147   REF   1              E6,1522             NO.UJETS =      NO.PJETS +1
 6148   REF   1              E6,1523             NO.VJETS =      NO.UJETS +1
 6149                        E6,1524  E6,1526    TJP      ERASE  +2
 6150   REF   1              E6,1525             TJU      =      TJP +1
 6151   REF   2  LAST  138   E6,1526             TJV      =      TJP +2

 6152                        E6,1527  E6,1527    L,PVT-CG ERASE
 6153                        E6,1530  E6,1533    1JACC    ERASE  +3
 6154   REF   1              E6,1531             1JACCQ   EQUALS 1JACC +1         SCALED AT PI/4 RADIANS/SECOND
 6155   REF   2  LAST  138   E6,1532             1JACCR   EQUALS 1JACC +2
 6156   REF   3  LAST  138   E6,1533             1JACCU   EQUALS 1JACC +3         FOR U,V-AXES THE SCALE FACTOR IS  DIFF:
A6157                                                                             SCALED AT PI/2 RADIANS/SECOND (FOR ASC)
R6158   ASCENT VARIABLES:                                                         (100)

A6160
 6161                        E6,1534  E6,1535    SKIPU    ERASE  +1
 6162   REF   1              E6,1535             SKIPV    =      SKIPU +1
R6163   THE FOLLOWING LM DAP ERASABLES ARE ZEROED IN THE STARTDAP SECTION OF THE DAPIDLER PROGRAM AND THE COASTASC
R6165   SECTION OF THE AOSTASK.  THE ORDER MUST BE PRESERVED FOR THE INDEXING METHODS WHICH ARE EMPLOYED IN THOSE
R6167   SECTIONS AND ELSEWHERE.

 6168                        E6,1536  E6,1543    AOSQ     ERASE  +5               OFFSET ACC. ESTIMATES, UPDATED IN D.P.,
 6169   REF   1              E6,1540             AOSR     EQUALS AOSQ +2          AND SCALED AT PI/2.
 6170   REF   2  LAST  138   E6,1542             AOSU     EQUALS AOSQ +4          UV-AXES OFFSET ACC. FROMED BY VECTOR
 6171   REF   3  LAST  138   E6,1543             AOSV     EQUALS AOSQ +5          ADDITION OF Q,R.  AT PI/2 RAD/SEC(2).

 6172                        E6,1544  E6,1545    AOSQTERM ERASE   +1              (.1-.05K)AOS
 6173   REF   1              E6,1545             AOSRTERM EQUALS AOSQTERM +1      SCALED AT PI/4 RADIANS/SECOND.

R6174   FOR TJET LAW SUBROUTINE:                                                  (TEMPS ONLY)

A6176                                            NUMBERT  EQUALS DAPTEMP5         DEFINED IN QRAXIS.
 6177   REF   6  LAST  137   E6,1736             EDOTSQ   EQUALS DAPTEMP1
 6178   REF   2  LAST  136   E6,1737             ROTSENSE EQUALS DAPTEMP2
 6179   REF   2  LAST  136   E6,1740             FIREFCT  EQUALS DAPTEMP3         LOOKED AT BY PAXIS.
 6180   REF   2  LAST  136   E6,1741             TTOAXIS  EQUALS DAPTEMP4
 6181   REF   2  LAST  136   E6,1743             ADRSDIF2 EQUALS DAPTEMP6
 6182   REF   2  LAST  137   E6,1744             HOLDQ    EQUALS DAPTREG1
 6183   REF   1              E6,1745             ADRSDIF1 EQUALS DAPTREG2
 6184   REF   1              E6,1746             HH       EQUALS DAPTREG3         DOUBLE PRECISION
A6185                                            HH  +1   EQUALS DAPTREG4
 6186   REF   1              E6,1751             E        EQUALS DAPTREG6         TIME SHARE WITH VERROR
 6187   REF   2  LAST  135   E6,1427             EDOT     EQUALS OMEGAV

R6188   INPUT TO TJET LAW (PERMANENT ERASABLES).                                  (480)
```

```
  6190  REF    1              E6,1525            TJETU     =        TJU              EQUATE NAMES.  INDEXED BY -1, 0, +1.
  6191                        E6,1546  E6,1625   BLOCKTOP  ERASE    +47D
 A6192                                                   * SEE AOSTASK AND AOSJOB LOG SECTION FOR ERASABLE DEFINITIONS
 A6193                                                                             IN THIS AREA.

  6194  REF    1              E6,1566            1/ANET1   =        BLOCKTOP +16D    THESE 8 PARAMETERS ARE SET UP BY 1/ACCS
  6195  REF    1              E6,1567            1/ANET2   =        1/ANET1 +1       FOR MINIMUM JETS ABOUT THE U-AXIS WHEN
  6196  REF    2  LAST   139  E6,1572            1/ACOAST  =        1/ANET1 +4       EDOT IS POSITIVE.  TJETLAW INDEXES BY
  6197  REF    3  LAST   139  E6,1574            ACCFCTZ1  =        1/ANET1 +6       ADRSDIFF FROM THESE REGISTERS TO PICK UP
  6198  REF    4  LAST   139  E6,1575            ACCFCTZ5  =        1/ANET1 +7       PARAMETERS FOR THE PROPER AXIS, NUMBER
  6199  REF    5  LAST   139  E6,1600            FIREDB    =        1/ANET1 +10D     OF JETS AND SIGN OF EDOT.  THERE ARE 48
  6200  REF    6  LAST   139  E6,1602            COASTDB   =        1/ANET1 +12D     REGISTERS IN ALL IN THIS BLOCK.
  6201  REF    7  LAST   139  E6,1604            AXISDIST  =        1/ANET1 +14D     FOUR NOT REFERENCED (P-AXIS) ARE FILLED
 A6202                                                                               IN BY THE FOLLOWING:
  6203  REF    2  LAST   139  E6,1546            ACCSWU    =        BLOCKTOP         SET BY 1/ACCS TO SHOW WHETHER MAXIMUM
  6204  REF    1              E6,1547            ACCSWV    =        ACCSWU +1        JETS ARE REQUIRED BECAUSE OF AOS.
  6205  REF    3  LAST   139  E6,1554            FLAT      =        BLOCKTOP +6      WIDTH OF MINIMUM IMPULSE ZONE.
  6206  REF    4  LAST   139  E6,1555            ZONE3LIM  =        BLOCKTOP +7      HEIGHT OF MINIMUM IMPULSE ZONE(AT 4 SEC)

  6207                        E6,1626  E6,1627   COEFFQ    ERASE    +1               COEFFQ AND COEFFR ARE USED IN ROT-TOUV
  6208  REF    1              E6,1627            COEFFR    EQUALS COEFFQ +1          TO RESOLVE Q,R COMPONENTS INTO U,V COMP.
 A6209

 R6210  VARIABLES FOR GTS-QRAXIS CONTROL EXCHANGE.                                   (4)

  6212  REF    2  LAST   137  E6,1502            ALLOWGTS  EQUALS NEGUQ +1           INSERT INTO UNUSED LOCATION
  6213                        E6,1630  E6,1630   COTROLER  ERASE                     INDICATES WHICH CONTROL SYSTEM TO USE.
  6214                        E6,1631  E6,1633   QGIMTIMR  ERASE             +2      Q-GIMBAL DRIVE ITMER, DECISECONDS.
  6215  REF    1              E6,1632            INGTS     EQUALS QGIMTIMR +1        INDICATOR OF CURRENT GTS CONTROL.
  6216  REF    2  LAST   139  E6,1633            RGIMTIMR  EQUALS QGIMTIMR +2        R-GIMBAL DRIVE TIMER, DECISECONDS.

 R6217  PLEASE RETAIN THE ORDER OF CDUXD THRU CDUZD FOR DOWNLINK PURPOSES.

 R6218             KALCMANU:DAP INTERFACE.                                           (9D)

  6220                        E6,1634  E6,1636   CDUXD     ERASE    +2               CDU DESIRED REGISTERS:
  6221  REF    1              E6,1635            CDUYD     EQUALS CDUXD +1           SCALED AT PI RADIANS (180 DEGREES)
  6222  REF    2  LAST   139  E6,1636            CDUZD     EQUALS CDUXD +2           (STORE IN 2S COMPLEMENT)

  6223                        E6,1637  E6,1641   DELCDUX   ERASE    +2               NEGATIVE OF DESIRED 100MS CDU INCREMENT:
  6224  REF    1              E6,1640            DELCDUY   EQUALS DELCDUX +1         SCALED AT PI RADIANS (180 DEGREES)
  6225  REF    2  LAST   139  E6,1641            DELCDUZ   EQUALS DELCDUX +2         (STORE IN 2S COMPLEMENT)

 R6226     RETAIN THE ORDER OF OMEGAPD TO OMEGARD FOR DOWNLINK PURPOSES.
  6227                        E6,1642  E6,1644   OMEGAPD   ERASE    +2               ATTITUDE MANEUVER DESIRED RATES:
  6228  REF    1              E6,1643            OMEGAQD   EQUALS OMEGAPD +1         (NOT EXPLICITLY REFERENCED IN GTS CNTRL)
  6229  REF    2  LAST   139  E6,1644            OMEGARD   EQUALS OMEGAPD +2         SCALED AT PI/4 RADIANS/SECOND

 R6230             KALCMANU STORAGE.                                                 (24D)
 6232                       E6,1645  E6,1674    MIS       ERASE            +23D    I(18D)
 6233    REF   1            E6,1667             COF       EQUALS MIS       +18D    I(6)

R6234              KALCMANU STORAGE.                                              (33D)

 6236                       E6,1675  E6,1733    BCDU      ERASE            +30D    B(3)
 6237    REF   1            E6,1700             KSPNDX    EQUALS BCDU      +3      B(1)
 6238    REF   1            E6,1701             KDPNDX    EQUALS KSPNDX    +1      B(1)

 6239    REF   1            E6,1702             TMIS      EQUALS KDPNDX    +1      I(18) MUST BE IN SAME BANK AS RCS DAP
 6240    REF   1            E6,1724             COFSKEW   EQUALS TMIS      +18D    I(6)  MUST BE IN SAME BANK AS RCS DAP
 6241    REF   1            E6,1732             CAM       EQUALS COFSKEW   +6      I(2)  MUST BE IN SAME BANK AS RCS DAP

 6242                       E6,1734  E6,1735    AM        ERASE            +1      I(2) THIS WAS ONCE IN E5 OVERLAYING OGC
A6243

R6244    FIRST-ORDER OVERLAYS IN KALCMANU                                          (25D)

 6246    REF   2  LAST  140  E6,1702             MFISYM    EQUALS TMIS              I
 6247    REF   3  LAST  140  E6,1702             TMFI      EQUALS TMIS              I
 6248    REF   4  LAST  140  E6,1702             NCDU      EQUALS TMIS              B
 6249    REF   5  LAST  140  E6,1705             NEXTIME   EQUALS TMIS      +3      B
 6250    REF   6  LAST  140  E6,1706             TTEMP     EQUALS TMIS      +4      B
 6251    REF   2  LAST  140  E6,1724             BRATE     EQUALS COFSKEW           B
 6252    REF   1             E6,1732             TM        EQUALS CAM               B
R6253    SECOND-ORDER OVERLAYS IN KALCMANU                                         (?)

 6255    REF   3  LAST  140  E6,1724             VECQTEMP =       COFSKEW

 6256    REF   3  LAST  139  E6,1634             DCDU     =       CDUXD
 6257    REF   3  LAST  139  E6,1637             DELDCDU  =       DELCDUX
 6258    REF   1             E6,1640             DELDCDU1 =       DELCDUY
 6259    REF   1             E6,1641             DELDCDU2 =       DELCDUZ

R6260    *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *

R6261    STORAGE FOR FINDCDUW

R6262             OVERLAYING KALCMANU STORAGE:                                    (26D)

 6264    REF   2  LAST  140  E6,1645             ECDUW     EQUALS MIS
 6265    REF   1             E6,1645             ECDUWUSR  EQUALS ECDUW             B(1)TMP
 6266    REF   1             E6,1646             QCDUWUSR  EQUALS ECDUWUSR +1       I(1)TMP
 6267    REF   1             E6,1647             NDXCDUW   EQUALS QCDUWUSR +1       B(1)TMP
 6268    REF   1             E6,1650             FLAGOODW  EQUALS NDXCDUW  +1       B(1)TMP
 6270    REF   1             E6,1651             UNFC/2    EQUALS FLAGOODW +1       I(6)IN
 6271   REF   1                E6,1657             UNWC/2   EQUALS UNFC/2    +6      I(6)IN
 6272   REF   1                E6,1665             UNFV/2   EQUALS UNWC/2    +6      I(6)S-S
 6273   REF   1                E6,1665             UNFVX/2  =      UNFV/2
 6274   REF   2  LAST   141    E6,1667             UNFVY/2  =      UNFV/2    +2
 6275   REF   3  LAST   141    E6,1671             UNFVZ/2  =      UNFV/2    +4
 6276   REF   4  LAST   141    E6,1673             -DELGMB  EQUALS UNFV/2    +6      B(3)TMP
 6277   REF   1                E6,1676             OGABIAS  EQUALS -DELGMB   +3      B(1)IN
R6278
R6279            DEFINED IN THE WORK AREA:                                           (18D)

 6281                            0000              UNX/2    =        0
 6282                            0006              UNY/2    =        6
 6283                            0014              UNZ/2    =        14
R6284
R6285   END OF FINDCDUW ERASABLES

R6286   *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *

R6287   * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *

R6288   STORAGE FOR P57

R6289            OVERLAYING KALCMANU AND FINDCDUW STORAGE:                           (12D)

 6291   REF   3  LAST   140    E6,1645             VEC1     EQUALS MIS               I(6)TMP
 6292   REF   1                E6,1653             VEC2     EQUALS VEC1      +6      I(6)TMP
R6293
R6294   END OF P57 ERASABLES

R6295   * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *

R6296   THE FOLLOWING ARE THE DAP REPLACEMENTS FOR THE ITEMPS AND RUPTREGS,NEEDED BECAUSE DAP IS NOW A TOB,JASK,JAB,TOSK
R6298   ...ANYWAY, THE DAP CAN NOW BE INTERRUPTED.                                   (18D)

 6300                          E6,1736  E6,1757    DAPTEMP1 ERASE  +17D
 6301   REF   7  LAST   138    E6,1737             DAPTEMP2 EQUALS DAPTEMP1 +1
 6302   REF   8  LAST   141    E6,1740             DAPTEMP3 EQUALS DAPTEMP1 +2
 6303   REF   9  LAST   141    E6,1741             DAPTEMP4 EQUALS DAPTEMP1 +3
 6304   REF  10  LAST   141    E6,1742             DAPTEMP5 EQUALS DAPTEMP1 +4
 6305   REF  11  LAST   141    E6,1743             DAPTEMP6 EQUALS DAPTEMP1 +5
 6306   REF  12  LAST   141    E6,1744             DAPTREG1 EQUALS DAPTEMP1 +6
 6307   REF   3  LAST   138    E6,1744             OLDSENSE EQUALS DAPTREG1          B(1)TMP RCS JET CONTROL
 6308   REF  13  LAST   141    E6,1745             DAPTREG2 EQUALS DAPTEMP1 +7
 6309   REF  14  LAST   141    E6,1746             DAPTREG3 EQUALS DAPTEMP1 +8D
 6310   REF  15  LAST   141    E6,1747             DAPTREG4 EQUALS DAPTEMP1 +9D
 6311   REF  16  LAST   141    E6,1750             DAPTREG5 EQUALS DAPTEMP1 +10D
 6312   REF  17  LAST   141    E6,1751             DAPTREG6 EQUALS DAPTEMP1 +11D

 6313   REF  13  LAST   141    E6,1752             DAPARUPT EQUALS DAPTEMP1 +12D
 6314   REF   1                E6,1753             DAPLRUPT EQUALS DAPARUPT +1
```

```
L        ERASABLE ASSIGNMENTS                                                                    USER'S PAGE NO.  51        E0 S4

 6315   REF   2  LAST  141   E6,1754               DAPBQRPT EQUALS DAPARUPT +2
 6316   REF   3  LAST  142   E6,1756               DAPZRUPT EQUALS DAPARUPT +4

A6317                                                                                       (DAPZRUPT IS ALSO TASK-IN-PROGRESS FLAG)
A6318


R6319              NEEDLER(ATTITUDE ERROR EIGHT BALL DISPLAY) STORAGE.                     (6D)

 6321   REF   3  LAST   97      0061               T5TEMP   EQUALS ITEMP1
 6322   REF   3  LAST   97      0063               DINDX    EQUALS ITEMP3
 6323                        E6,1760  E6,1762      AK       ERASE  +2                      NEEDLER ATTITUDE INPUTS, SCALED AT 180
 6324   REF   1              E6,1761               AK1      EQUALS AK +1                   DEGREES.  P,Q,R AXES IN AK,AK1,AK2.
 6325   REF   2  LAST  142   E6,1762               AK2      EQUALS AK +2

 6326                        E6,1763  E6,1765      EDRIVEX  ERASE  +2                      NEEDLER DISPLAY REGS AT 1800 DEGREES.
 6327   REF   1              E6,1764               EDRIVEY  EQUALS EDRIVEX +1              SO THAT 384 BITS REPRESENT 42 3/16 DEG.
 6328   REF   2  LAST  142   E6,1765               EDRIVEZ  EQUALS EDRIVEX  +2


R6329              DOCKED JET INHIBITION COUNTERS                                          (3D)

 6331                        E6,1766  E6,1770      PJETCTR  ERASE  +2
 6332   REF   1              E6,1767               UJETCTR  EQUALS PJETCTR +1
 6333   REF   2  LAST  142   E6,1770               VJETCTR  EQUALS PJETCTR +2

R6334   V47 (R47) AGS INITIALIZATION STORAGE -PAD LOADED.                                  (2D)

 6336                        E6,1771  E6,1772      AGSK     ERASE           +1             I(2) PL

R6337   WINDOW BIAS PADLOAD                                                                (1D)

 6339                        E6,1773  E6,1773      AZBIAS   ERASE                          B(1) PL LPD AZIMUTH BIAS, UNITS - PI RAD

R6340              DAP PERMANENT STORAGE                                                   (1D)

 6342                        E6,1774  E6,1774      RCSFLAGS ERASE                          AUTOPILOT FLAG WORD
A6343                                                                                      BIT  ASSIGNMENTS:
A6344                                                                                       1) ALTERYZ SWITCH (ZEROOR1)
A6345                                                                                       2) NEEDLER SWITCH
A6346                                                                                       3) NEEDLER SWITCH
A6347                                                                                       4) NEEDLER SWITCH
A6348                                                                                       5) NEEDLER SWITCH
A6349                                                                                       9) JUST-IN-DETENT SWITCH
A6350                                                                                      10) PBIT - MANUAL CONTROL SWITCH
A6351                                                                                      11) QRBIT- MANUAL CONTROL SWITCH
A6352                                                                                      12) PSKIP CONTROL (PJUMPADR)
A6353                                                                                      13) 1/ACCJOB CONTROL (ACCSET)
```

```
 6354   REF   1              E6,1775            END-E6    EQUALS RCSFLAGS +1     NEXT AVAILABLE LOC IN E6.
```

```
P7000                 EBANK-7 ASSIGNMENTS

 7001                      E7,1400                    SETLOC 3400


R7002            P35 CONSTANTS.        -PAD LOADED-                                   (4D)

 7004                      E7,1400  E7,1401   ATIGINC  ERASE  +1                      B(2)PL  *MUST BE AT 1400 FOR SYSTEMSTEST
 7005                      E7,1402  E7,1403   PTIGINC  ERASE  +1                      B(2)PL


R7006            AOTMARK STORAGE.      -PAD LOADED-                                   (12D)

 7008                      E7,1404  E7,1411   AOTAZ    ERASE  +5                      B(6)PL
 7009                      E7,1412  E7,1417   AOTEL    ERASE  +5                      B(6)PL

R7010            LANDING RADAR.        -PAD LOADED-                                   (3D)

 7012                      E7,1420  E7,1420   LRHMAX   ERASE                          B(1)
 7013                      E7,1421  E7,1421   LRWH     ERASE                          B(1)
A7014


R7015            THROTTLE STORAGE.     -PAD LOADED-                                   (1D)

 7017                      E7,1422  E7,1422   ZOOMTIME ERASE                          B(1)PL TIME OF DPS THROTTLE-UP COMMAND

R7018            P63 AND P64 CONSTANTS.   -PAD LOADED-                                (4D)

 7020                      E7,1423  E7,1423   TENDBRAK ERASE                          B(1) LANDING PHASE SWITCHING CRITERION
 7021                      E7,1424  E7,1424   TENDAPPR ERASE                          B(1) LANDING PHASE SWITCHING CRITERION
 7022                      E7,1425  E7,1425   DELTTFAP ERASE                          B(1) INCREMENT ADDED TO TTF/8 WHEN
A7023                                                                                       SWITCHING FROM P63 TO P64
 7024                      E7,1426  E7,1426   LEADTIME ERASE                          B(1)  TIME INCREMENT SPECIFYING HOW MUCH
A7025                                                                                       GUIDANCE IS PROJECTED FORWARD.
A7026

R7027            LANDING RADAR      -PAD LOADED-                                      (2D)

 7029                      E7,1427  E7,1427   RPCRTIME ERASE                          B(1) REPOSITIONING CRITERION  (TIME)
 7030                      E7,1430  E7,1430   RPCRTQSW ERASE                          B(1) REPOSITIONING CRITERION (ANGLE)
A7031

R7032            ASTEER    -PAD LOADED-                                               (2D)

 7034                      E7,1431  E7,1432   TNEWA    ERASE  +1                      I(2)PL  LAMBERT CYCLE PERIOD
A7035

R7036            P22 STORAGE  - OVERLAYS LANDING PADLOADS -                           (5D)
```

```
 7038 REF   1            E7,1423             REPOSCNT EQUALS TENDBRAK         B(1)TMP  COUNTS NUMBER OF PASSES THROUGH
A7039                                                                                  REPOSITION ROUTINE.
 7040 REF   1            E7,1424             REPOSTM  EQUALS REPOSCNT +1      I(2)TMP  PRESENT TIME PLUS INCREMENTS OF
A7041                                                                                  TEN SECONDS.
 7042 REF   1            E7,1426             DELTATM  EQUALS REPOSTM  +2      I(2)TMP  TIME INTERVAL FOR RUNNING
A7043                                                                                  DESIGNATE TASK.
A7044

R7045 *** RETAIN THE ORDER OF DELVSLV, TIG, RTARG, DELLT4 FOR UPDATE. ***


R7046           P40S, P32-P35  P72-P75 STORAGE                                (6D)

 7048                    E7,1433  E7,1440  DELVLVC  ERASE           +5        I(6) DELTA VELOCITY - LOCAL VERTICAL COO
 7049 REF   1            E7,1433           DELVSLV  =       DELVLVC           (TEMP STORAGE OF SAME VECTOR)   -RDINATE
A7050


R7051           P30-P40 INTERFACE UNSHARED.                                   (2D)

R7053 ******* NOTE:  TIG IS USED BY ALL POWERED FLIGHT PROGRAMS        *******
R7054 *******            INCLUDING P12, ABORTS, AND LUNAR LANDING.  ********

 7055                    E7,1441  E7,1442  TIG      ERASE           +1        B(2)
A7056

R7057           INITVEL STORAGE:  USED BY P34,35,74,75, P40-42                (8D)

 7059                    E7,1443  E7,1450  RTARG    ERASE           +5        I(6) TARGET VECTOR
 7060                    E7,1451  E7,1452  DELLT4   ERASE           +1        I(2) TIME DIFFERENCE
A7061

R7062           LANDING RADAR - R12   (OVERLAY)                               (2D)

 7064 REF   1            E7,1451           HLROFF   EQUALS DELLT4             B(1),I(2) TMP  NO LANDING RADAR UPDATES
A7065                                                                                        BELOW THIS ALTITUDE.


R7066           CLOKTASK, BURNBABY                                            (3D)

 7068                    E7,1453  E7,1454  TTOGO    ERASE           +1        B(2)
 7069                    E7,1455  E7,1455  WHICH    ERASE                     B(1)
A7070

R7071           ***  R21  ***                                                 (1D)

 7073                    E7,1456  E7,1456  LOSCOUNT ERASE                     B(1)
A7074

R7075           LSR22.3 (RNDEZVOUS NAVIGATION) AND
```

```
R7076            LANDING  RADAR -- VELUPDAT (SERVICER), P63, AND R12.              (4D)

R7078   ***** NOTE: AOG, AMG, AND AIG ARE USED BY LANDING RADAR AS WELL AS RR.
R7079   *****       R12DL STORES CDUS THERE FOR DOWNLINKING ON DESCENT/ASCENT DL
R7080   *****       MOREOVER, TRKMKCNT SHARES WITH VSELECT, ALSO SET UP BY R12DL
R7081   *****           (DOWNLINKED ON THE DESCENT/ASCENT LIST AS THE
R7082   *****             LOW ORDER PART OF AOG TELEMETRY WORD)
R7083   *****                AND USED IN SERVICER, P63 RESTART, AND R12READ.

R7084      RETAIN THE ORDER OF AIG TO TRKMKCNT FOR DOWNLINK PURPOSES.
 7085                          E7,1457  E7,1457   AIG       ERASE                        B(1)OUT  GIMBAL ANGLES
 7086                          E7,1460  E7,1460   AMG       ERASE                        B(1)OUT  (MUST BE
 7087                          E7,1461  E7,1461   AOG       ERASE                        B(1)OUT   CONSECUTIVE)

 7088                          E7,1462  E7,1462   TRKMKCNT ERASE                         B(1)TMP  TEMPORARY MARK STORAGE.
 7089   REF    1               E7,1462            MARKCTR  =       TRKMKCNT


 7090   REF    2  LAST  146    E7,1462            VSELECT   EQUALS TRKMKCNT              B(1) X,Y OR Z LR BEAM ASSOC WITH VMEAS.


R7091            P32-P35, P72-P75 STORAGE.  -PERMANENT-                                  (6)

 7093                          E7,1463  E7,1463   NORMEX    ERASE                        B(1) PRM SAVE FOR Q
 7094                          E7,1464  E7,1464   QSAVED    ERASE                        B(1) PRM SAVE FOR Q
 7095                          E7,1465  E7,1465   RTRN      ERASE                        B(1) PRM SAVE FOR Q
 7096                          E7,1466  E7,1467   NN        ERASE              +1        B(2)
 7097                          E7,1470  E7,1470   SUBEXIT   ERASE                        B(1) PRM SAVE Q


 7098                          E7,1471            E7OVERLA EQUALS                        START OF E7 OVERLAYS.
 7099   REF    1               E7,1471            WHOCARES EQUALS E7OVERLA               DUMMY FOR EBANK INSENSITIVE 2CADRS

R7100            LUNAR LANDING OVERLAYS                                                  (6D)

 7102   REF    1               E7,1463            /AFC/     EQUALS NORMEX                B(2)TMP    THROTTLE
 7103   REF    1               E7,1465            FCODD     EQUALS /AFC/       +2        B(2)TMP    THROTTLE
 7104   REF    1               E7,1467            FP        EQUALS FCODD       +2        B(2)TMP    THROTTLE
A7105
```

```
P7106    *******  OVERLAY NUMBER 0 IN EBANK 7  *******
A7107


R7108    RENDEZVOUS GUIDANCE STORAGE -P32....P35-                          (89D)

 7110    REF    1                 E7,1611             TSTRT     EQUALS DELDV                 MIDCOURSE START TIME
 7111    REE    1                 E7,1573             TDEC2     EQUALS DELVCSI               TEMP STORAGE EOR INTEGRATION TIME INPUT
 7112    PEE    1                 E7,1575             KT        EQUALS DELVTPI               TEMP STCRAGE EOR MIDCOURSE DELTA TIME
 7113                             E7,1471  E7,1476    VACT1     ERASE  +5D                   VELOCITY VECTOR OF ACTIVE  AT CSI TIME
 7114                             E7,1477  E7,1504    RPASS1    ERASE  +5D                   POSITION VECTOR OE PASSIVE AT CSI TIME
 7115                             E7,1505  E7,1512    VPASS1    FRASE  +5D                   VELOCITY VECTOR OF PASSIVE AT CSI TIME
 7116                             E7,1513  E7,1520    VACT2     ERASE  +5D                   VELOCITY VFCTOR OE ACTIVE  AT CDH TIME
 7117                             E7,1521  E7,1526    RPASS2    ERASE  +5D                   POSITION VECTOR OE PASSIVE AT CDH TIME
 7118                             E7,1527  E7,1534    VPASS2    ERASE  +5D                   VELOCITY VECTOR OE PASSIVE AT CDH TIME
 7119                             E7,1535  E7,1542    RACT3     ERASE  +5D                   POSITION VECTOR OF ACTIVE  AT TPI TIME
 7120                             E7,1543  E7,1550    VACT3     ERASE  +5D                   VELOCITY VFCTOR OF ACTIVE  AT TPI TIME
 7121                             E7,1551  E7,1556    RPASS3    ERASE  +5D                   POSITION VECTOR OF PASSIVE AT TPI TIME
 7122                             E7,1557  E7,1564    VPASS3    ERASE  +5D                   VELOCITY VECTOR OE PASSIVE AT TPI TIME
 7123                             E7,1565  E7,1572    VACT4     ERASE  +5D                   VELOCITY VECTOR OE ACTIVE  AT INTERCEPT
 7124    RFF    1                 E7,1543             UNVFC     EQUALS VACT3                 CDHMVR UNIT VECTOR TEMP STORAGE.
 7125                             E7,1573  E7,1574    DELVCSI   ERASE  +1D                   THRUST VALUE AT CSI
 7126                             E7,1575  E7,1576    DELVTPI   ERASE  +1D                   THRUST VALUE AT TPI OR MID
 7127                             E7,1577  E7,1600    DIEEALT   ERASE  +1D                   ALT DIFEFRENCE AT CDH
 7128                             E7,1601  E7,1602    PCSTCSI   ERASE  +1                    PERIGEE ALTITUDE AETER CSI MANEUVER
 7129                             E7,1603  E7,1604    POSTCDH   ERASE  +1                    PERIGEE ALTITUDE AETER CDH MANEUVER
 7130                             E7,1605  E7,1606    PUSTTPI   ERASE  +1                    PERIGEE ALTITUDE AFTER TPI MANEUVER
 7131    REF    1                 E7,1605             LOOPCT    EQUALS POSTTPI               CSI NEWTON ITERATION COUNTER
 7132    RFF    1                 E7,1603             HAEPA1    EQUALS POSTCDH               HALE PERIOD
 7133                             E7,1607  E7,1610    GAMPREV   ERASE  +1                    PREVIOUS GAMMA
 7134    REE    2  LAST   147     E7,1575             DVPREV    EQUALS DELVTPI               PREVIOUS DELVCSI
 7135                             E7,1611  E7,1612    DELDV     ERASE  +1D
 7136                             E7,1613  E7,1614    CSIALRM   ERASE  +1                    FIRST SOLUTION ALARM
 7137                             E7,1615  E7,1615    VERBNOUN  ERASE
 7138    REE    1                 E7,1613             TITER     EQUALS CSIALRM               ITERATION COUNTER
 7139                             E7,1616  E7,1617    RDOTV     ERASE  +1
 7140    REE    1                 E7,1505             VAPREC    EQUALS VPASS1                I(6) S-S PREC VEC EOR NOM TPI TIME(ACT V
 7141    REF    1                 E7,1477             RAPREC    EQUALS RPASS1                I(6) S-S PREC VEC FOR NOM TPI TIME(ACT V
 7142    REE    1                 E7,1527             VPPREC    EQUALS VPASS2                I(6) S-S PREC VEC EOR NOM TPI TIME(PASS
 7143    REF    1                 E7,1521             RPPREC    EQUALS RPASS2                I(6) S-S PREC VEC EOR NOM TPI TIME(PASS
 7144    REE    3  LAST   147     E7,1575             DELEL     EQUALS DELVTPI               I(2) S-S
 7145    REE    2  LAST   147     E7,1573             SECMAX    EQUALS DELVCSI               I(2) S-S MAX STOP SIZE FOR ROUTINE
 7146    REF    2  LAST   147     E7,1605             DELTEEO   EQUALS POSTTPI               I(2) S-S BACK VALUES OE DELTA TIME
 7147                             E7,1620  E7,1621    CENTANG   ERASE               +1       I(2) S-S CENTRAL ANGLE COVERED(TPI-TPE)

A7148


R7149           SOME P47 STORAGE                                                   (6D)
```

```
 7151                     E7,1622  E7,1627   DELVIMU  ERASE  +5               I(6)DSP N83 FOR P47 DELTA V IN BODY COOR
A7152

R7153            P34-35-40-41-42 INTERFACE                                     (2D)

 7155                     E7,1630  E7,1631   TPASS4   ERASE  +1               INTERCEPT TIME
A7156

R7157            P30-P40-41-42 COMMON STORAGE                                  (1D)

 7159                     E7,1632  E7,1632   QTEMP    ERASE                   I(1)TMP COMMON RETURN SAVE REGISTER.


A7160
R7161            P32,33,34 STORAGE.                                            (6D)

 7163                     E7,1633  E7,1634   TCSI     ERASE           +1      B(2) TMP CSI TIME IN CENTISECONDS
 7164                     E7,1635  E7,1636   TTPI     ERASE           +1      B(2) TMP TPI TIME IN CENTISECONDS
 7165                     E7,1637  E7,1640   TTPIO    ERASE           +1      B(2) TMP TTPI STORAGE FOR RECYCLE

R7166            P30,P40 INTERFACE.                                            (20D)

 7168                     E7,1641  E7,1664   RTIG     ERASE  +19D             I(6)TMP
 7169   REF   1           E7,1647            VTIG     EQUALS RTIG     +6      I(6)TMP
 7170   REF   1           E7,1655            DELVSIN  EQUALS VTIG     +6      I(6)TMP
 7171   REF   1           E7,1663            DELVSAB  EQUALS DELVSIN  +6      I(2)TMP
 7172   REF   1           E7,1663            VGDISP   =      DELVSAB

R7173            P40-P42 TEMPORARY                                             (1D)

 7175                     E7,1665  E7,1665   QTEMP1   ERASE                   I(1)TMP HOLDS RETURN.
A7176

R7177            R52 TEMPORARY                                                 (1D)

 7179   REF   1           E7,1665            SAVQR52  EQUALS QTEMP1

R7180            INITVEL STORAGE.  (IN OVERLAY 0 AND OVERLAY 1.                (2D)
R7182                   (CALLS LAMBERT, CONIC SUBROUTINES)

 7183   REF   1           E7,1565            VTPRIME  EQUALS VACT4            TOTAL VELOCITY AT DESIRED RADIUS
 7184   REF   1           E7,1616            ITCTR    EQUALS RODTV            ITERATION COUNTER
 7185                     E7,1666  E7,1667   COZY4    ERASE           +1      COS OF ANGLE WHEN ROTATION STARTS
 7186   REF   1           E7,1607            INTIME   EQUALS GAMPREV          TIME OF RINIT
A7187
```

```
R7188               PERIAPO STORAGE. (2D)                                                   (2D)

 7190                                E7,1670  E7,1671   XXXALT    ERASE            +1       RADIUS TO LAUNCH PAD OR LANDING SIGHT

R7191               S40.1 STORAGE.                                                          (12D)

 7193                                E7,1672  E7,1705   UT        ERASE            +11D     I(6)    THRUST DIRECTION
 7194    REF   1                     E7,1700            VGTIG     EQUALS UT        +6       I(6)OUT
 7195    REF   1                     E7,1700            VGPREV    =      VGTIG
R7196    ASTEER STORAGE.                                                                    (22D)

 7198                                E7,1706  E7,1733   VG        ERASE            +21D     I(6)
 7199    REF   1                     E7,1714            RMAG      EQUALS VG        +6       I(2)
 7200    REF   1                     E7,1716            MUASTEER  EQUALS RMAG      +2       I(2)
 7201    REF   1                     E7,1720            MU/A      EQUALS MUASTEER  +2       I(2)
 7202    REF   1                     E7,1722            RTMAG     EQUALS MU/A      +2       I(2)
 7203    REF   1                     E7,1724            R1C       EQUALS RTMAG     +2       I(6)
 7204    REF   1                     E7,1732            SS        EQUALS R1C       +6       I(2)

R7205               ASTEER                                                                  (11D)

 7207    REF   2    LAST  148        E7,1655            IC        =      DELVSIN            I(6)   CHORD VECTOR:  RTARG VEC - POS VEC
 7208    REF   1                     E7,1762            TIGSAVE   =      P21TIME            I(2)   USED TO DETERMINE WHEN YOU
 7209    REF   1                     E7,1764            TIGSAVEP  =      SCAXIS             I(2)     WANT TO DO ASTEER NEXT
 7210    REF   2    LAST  149        E7,1766            MUSCALE   =      SCAXIS +2          I(1)   HOLDS INDEX VALUE
R7211

R7212               P40 STORAGE.                                                            (8D)

R7214                     F,MDOT,AND TDECAY MUST BE CONTIGUOUS FOR VLOAD.
 7215                                E7,1734  E7,1741   F         ERASE  +5                 I(2)TMP THRUST MAG 10**4 NEWTONS (B-7)
 7216    REF   1                     E7,1736            MDOT      EQUALS F         +2       I(2)TMP MASS CHNG RATE, KG/CS AT 2**3.
 7217    REF   1                     E7,1740            TDECAY    EQUALS MDOT      +2       I(2)IN  DELTA-T TAILOFF, (2**28)CS.
 7218                                E7,1742  E7,1743   VEX       ERASE            +1       I(2) EXHAUST VELOCITY FOR TGO COMPUTAT'N
A7219


R7220               MIDTOAV1(2) STORAGE. (CALLED BY P40,P41,P42)                            (1D)

 7222                                E7,1744  E7,1744   IRETURN1 ERASE                      B(1)     RETURN FROM MIDTOAV1 AND 2
A7223
```

```
P7224   ******* OVERLAY  NUMBER 1 IN FBANK 7  *******
A7225

R7226            INITVEL  (CALLED BY P34,35,38,39,10,11,S40.9,S40.1)             (6D)

 7228   REF   1              E7,1471            RTARG1   EQUALS VACT1            I(6)S TEMP STORAGE OF RTARG
A7229

R7230            P35-P40 INTERFACE.                                              (6D)

 7232   REF   2  LAST  147   E7,1505            VPASS4   EQUALS VPASS1           I(6)TMP VELOCITY OF PASSIVE AT INTERCEPT

R7233            LAT - LONG TEMPORARIES. CAN OVERLAY WITH S40.1                  (3D)

 7235   REF   2  LAST  149   E7,1672            ERADM    EQUALS UT               I(2)
 7236   REF   1              E7,1674            INCORPEX EQUALS ERADM    +2      I(1)

R7237            LRS24.1 STORAGE. (CAN SHARE WITH P30'S)                         (40D)

 7239   REF   1              E7,1675            RLMSRCH  EQUALS INCORPEX +1      I(6) TMP LM POSITION VECTOR
 7240   REF   1              E7,1703            VXRCM    EQUALS RLMSRCH  +6      I(6)    CM V X R VECTOR
 7241   REF   1              E7,1711            LOSDESRD EQUALS VXRCM    +6      I(6)    DESIRED LOS VECTOR
 7242   REF   1              E7,1717            UXVECT   EQUALS LOSDESRD +6      I(6)    X-AXIS SRCH PATTERN COORDS
 7243   REF   1              E7,1725            UYVECT   EQUALS UXVECT   +6      I(6)    Y-AXIS SRCH PATTERN COORDS
 7244   REF   1              E7,1733            DATAGOOD EQUALS UYVECT   +6      B(1)DSP FOR R1 - ALL 1-S WHEN LOCKON
 7245   REF   1              E7,1734            OMEGDISP EQUALS DATAGOOD +1      B(2)    ANGLE OMEGA DISPLAYED IN R2
 7246   REF   1              E7,1734            OMEGAD   =      OMEGDISP                 PINBALL DEFINITION.
 7247   REF   2  LAST  150   E7,1736            NSRCHPNT EQUALS OMEGDISP +2      B(1)TMP SEARCH PATTERN POINT COUNTER.
 7248   REF   1              E7,1737            SAVLEMV  EQUALS NSRCHPNT +1      I(6) S-S SAVES LOSVEL


A7249
```

```
P7250    ******* OVERLAY NUMBER 2 IN EBANK 7  *******
A7251


R7252              INCDPP STORAGE IN E7.                                          (47D)

 7254    REF   2  LAST  146   E7,1471            TX789    EQUALS E7OVERLA         I(6)
 7255    REF   1              E7,1477            GAMMA    EQUALS TX789    +6      I(3)
 7256    REF   1              E7,1502            OMEGA    EQUALS GAMMA    +3      I(18)
 7257    REF   1              E7,1524            BVECTOR  EQUALS OMEGA    +18D    I(18)
 7258    REF   1              E7,1546            DELTAQ   EQUALS BVECTOR  +18D    I(2)
R7259              AOTMARK STORAGE                                                (3D)

 7261    REF   1              E7,1550            WHATMARK EQUALS DELTAQ   +2      B(1)TMP  SIGHTING TECHNIQUE DETERMINATOR
 7262    REF   1              E7,1551            XYMARK   EQUALS WHATMARK +1      B(1)TMP  MARK IDENTIFICATION REGISTER
 7263    REF   1              E7,1552            MKDEX    EQUALS XYMARK   +1      B(1)TMP INDEX FOR AOTMARK
A7264

R72643             P50S, AOTMARK                                                  (14D)

 72646   REF   2  LAST  151   E7,1524            XPLANE   EQUALS BVECTOR          I(6)TMP MARK PLANE
 72647   REF   1              E7,1532            YPLANE   EQUALS XPLANE   +6      I(6)TMP MARK PLANE
 72648   REF   2  LAST  149   E7,1762            XMKCNTR  EQUALS P21TIME          B(1)  X SIGHTING MK CNTR
 72649   REF   3  LAST  151   E7,1763            YMKCNTR  EQUALS P21TIME +1       B(1)  Y SIGHTING MK CNTR


R7265              PLANET STORAGE.                                                (8D)

 7267    REF   1              E7,1553            PLANVEC  EQUALS MKDEX    +1      (6) REFER VECTOR OF PLANET
 7268    REF   1              E7,1561            TSIGHT   EQUALS PLANVEC  +6      (2) TIME OF MARK OR EST TIME OF MARK
A7269


R72691             AOTMARK STORAGE                                                (15D)

 72693   REF   1              E7,1563            THETEST  EQUALS TSIGHT   +2      I(2)TMP  STAR VECTOR COMPUTATION TMP
 72694   REF   1              E7,1565            ESTER1   EQUALS THETEST  +2      I(2)TMP  STAR VECTOR COMPUTATION TMP
 72695   REF   1              E7,1567            ESTER2   EQUALS ESTER1   +2      I(2)TMP  STAR VECTOR COMPUTATION TMP
 72696   REF   1              E7,1571            DELTHET  EQUALS ESTER2   +2      I(2)TMP  STAR VECTOR COMPUTATION TMP
 72697   REF   1              E7,1573            NOMKCNT  EQUALS DELTHET  +2      B(1)TMP  MARK SET REJECT CTR
 72698   REF   1              E7,1574            BODY     EQUALS NOMKCNT  +1      I(6)TMP STAR VEC IN NAV BASE COOR
R7270              LRS22.3 STORAGE. (CAN SHARE WITH P30'S AND OVERLAY LRS24.1     (30D).

 7272    REF   2  LAST  150   E7,1675            LGRET    EQUALS RLMSRCH          I(1) TMP
 7273    REF   1              E7,1675            RDRET    EQUALS LGRET            B(1)  TEMP RETURN.
 7274    REF   2  LAST  151   E7,1675            IGRET    EQUALS LGRET            B(1)  TEMP RETURN.
 7275    REF   1              E7,1676            MX       EQUALS RDRET    +1      I(6)
 7276    REF   1              E7,1704            MY       EQUALS MX +6            I(6)
 7277    REF   1              E7,1712            MZ       EQUALS MY +6            I(6)
 7278    REF   1              E7,1720            SCALSHFT EQUALS MZ       +6      B(1) SCALE SHIFT FOR EARTH/MOON
```

```
L       ERASABLE ASSIGNMENTS                                                                    USER'S PAGE NO.  61       FO S4

 7279   REF   1              E7,1721             RXZ       EQUALS SCALSHFT +1      I(2)
 7280   REF   1              E7,1723             ULC       EQUALS RXZ      +2      I(6)
 7281   REF   1              E7,1731             SINTHETA  EQUALS ULC      +6      I(2)

R7282        ***** IN OVERLAY ONE *****

R7283             R22 / NOUN 49 DISPLAY

 7284   REF   1              E7,1746             N49FLAG   EQUALS RDOTMSAV         B(1)S    FLAG INDICATING V0649 RESPONSE
A7285

R7286             LRS22.1 STORAGE. (MUST NOT SHARE WITH R30'S)                     (13D)

R7288             (OUTPUTS ARE TO LRS22.3)

 7289   REF   1              E7,1733             RRTRUN    EQUALS SINTHETA +2      B(2)OUT  RR TRUNION ANGLE
 7290   REF   1              E7,1735             RRSHAFT   EQUALS RRTRUN   +2      B(2)OUT RRSHAFT ANGLE
 7291   REF   1              E7,1737             LRS22.1X  EQUALS RRSHAFT  +2      B(1)TMP
 7292   REF   1              E7,1740             RRBORSIT  EQUALS LRS22.1X +1      I(6) TMP RADAR BORESIGHT VECTOR.
 7293   REF   1              E7,1746             RDOTMSAV  EQUALS RRBORSIT +6      B(2) S     RR RANGE-RATE(FPS)
A7294

R7295             LRS22.1  (SAME AS PREVIOUS SECTION) ALSO DOWNLINK FOR RR  (R29)(10D)   CANNOT SHARE WITH L.A.D.

R7297             NOTE: MKTIME IS USED BY LANDING AS WELL AS REND RADAR.

 7298   REF   2  LAST  152   E7,1750             RDOTM     EQUALS RDOTMSAV +2      B(2)OUT  RANGE-RATE READING
 7299   REF   1              E7,1752             TANGNB    EQUALS RDOTM    +2      B(2)TMR  RR GIMBAL ANGLES
R7300             RETAIN THE ORDER OF MKTIME TO RM FOR DOWNLINK PURPOSES
 7301   REF   1              E7,1754             MKTIME    EQUALS TANGNB   +2      B(2) TIME OF RADAR READING (RR AND LR)
 7302   REF   1              E7,1756             RM        EQUALS MKTIME   +2      I(2)OUT  RANGE READING
 7303   REF   1              E7,1760             RANGRDOT  EQUALS RM       +2      B(2) DOWNLINKED RAW RANGE AND RRATE
A7304
R7305             LANDING OVERLAY                                                  (1D)

 7307   REF   2  LAST  152   E7,1750             THRDISP   EQUALS RDOTM            B(1) PERCENT OF FTR I 10,500 LBS.


 7308   REF   2  LAST  152   E7,1752             GTCTIME   EQUALS TANGNB           B(2)  STATE VECTOR TIME CORRESPONDING
A7309                                                                                TO FP -- GUIDANCE THRUST COMMAND
R7310
R7311             R61LEM - PREFERRED TRACKING ATTITUDE ROUTINE  **IN OVERLAY ONE*
R7312                    (CALLED BY R20,R22LEM,LSR22.3)                            (1D)

 7314   REF   2  LAST  152   E7,1745             R65CNTR   EQUALS RRBORSIT +5      B(1)SS  COUNT NUMBER OF TIMES PREFERRED
A7315                                                                                      TRACKING ROUTINE IS TO CYCLE
A7316

R7317             P21 STORAGE                                                      (2D)
```

```
 7319   REF   1                E7,1762            P21TIME  EQUALS RANGRDOT +2     I(2)TMP
A7320

R7321              INPUTS TO VECPOINT. CALLED BY R60-65 (ATTITUDE MANEUVERS)      (12D)
 7323   REF   4  LAST  151     E7,1764            SCAXIS   EQUALS P21TIME  +2     I(6)
 7324   REF   3  LAST  149     E7,1772            POINTVSM EQUALS SCAXIS   +6     I(6)
A7325
```

```
P7326   *******  OVERLAY NUMBER 3 IN EBANK 7  *******
A7327


R7328              SERVICER STORAGE                                                (6D)

 7330   REF   3  LAST  151   E7,1471              ABVEL     EQUALS E7OVERLA         B(2)  DISPLAY
 7331   REF   1              E7,1473              HDOTDISP  EQUALS ABVEL     +2     B(2)  DISPLAY
 7332   REF   1              E7,1475              TTFDISP   EQUALS HDOTDISP  +2     B(2)  DISPLAY
A7333

R7334              ASCENT GUIDANCE FOR LUNAR LANDING                               (2D)

 7336   REF   2  LAST  154   E7,1473              RDOT      EQUALS HDOTDISP         I(2)


R7337              BURN PROG STORAGE.                                              (2D)

 7339   REF   1              E7,1477              SAVET-30  EQUALS TTFDISP   +2     B(2)TMP TIG-30 RESTART
A7340

R7341              SERVICER STORAGE.                                               (69D)

 7343   REF   1              E7,1501              VGBODY    EQUALS SAVET-30  +2     B(6)OUT SET.BY S41.1 VG LEM, SC.COORDS
 7344   REF   1              E7,1501              DELVCTL   =      VGBODY
 7345   REF   2  LAST  154   E7,1507              DVTOTAL   EQUALS VGBODY    +6     B(2) DISPLAY NOUN
 7346   REF   1              E7,1511              GOBLTIME  EQUALS DVTOTAL   +2     B(2) NOMINAL TIG FOR CALC. OF GOBLATE.
 7347   REF   1              E7,1513              ABDVCONV  EQUALS GOBLTIME  +2     I(2)
 7348   REF   1              E7,1515              DVCNTR    EQUALS ABDVCONV  +2     B(1)
 7349   REF   1              E7,1516              TGO       EQUALS DVCNTR    +1     B(2)
 7350   REF   1              E7,1520              R         EQUALS TGO       +2     I(6)
 7351   REF   1              E7,1520              UNITGOBL  EQUALS R                I(6)
 7352   REF   2  LAST  154   E7,1526              V         EQUALS R         +6
 7353   REF   1              E7,1526              DELVREF   EQUALS V                I(6)
 7354   REF   1              E7,1534              HCALC     EQUALS DELVREF   +6     B(2)      LR
 7355   REF   1              E7,1536              UNIT/R/   EQUALS HCALC     +2     I(6)
R7356                  (THE FOLLOWING SERVICER ERASABLES CAN BE SHARED WITH SECOND DPS GUIDANCE STORAGE)

 7358   REF   1              E7,1544              RN1       EQUALS UNIT/R/   +6     B(6)
 7359   REF   1              E7,1552              VN1       EQUALS RN1       +6     I(6)                           (IN ORDER  )
 7360   REF   1              E7,1560              PIPTIME1  EQUALS VN1       +6     B(2)                           (   FOR    )
 7361   REF   1              E7,1562              GDT1/2    EQUALS PIPTIME1  +2     I(6)                           (  COPY    )
 7362   REF   1              E7,1570              MASS1     EQUALS GDT1/2    +6     I(2)                           (  CYCLE   )
 7363   REF   1              E7,1570              DVCNTR1   EQUALS MASS1            B(1)TMP  RESTART REG FOR DVCNTR
 7364   REF   2  LAST  154   E7,1572              R1S       EQUALS MASS1     +2     I(6)
 7365   REF   1              E7,1600              V1S       EQUALS R1S       +6     I(6)


R7366              P71 RESTART PROTECTION                                          (2D)
```

```
 7368   REF   3  LAST  154   E7,1501            TG01      EQUALS VGBODY            B(2)TMP


R7369               ALIGNMENT/S40.2.3 COMMON STORAGE.                              (18D)

 7371   REF   1              E7,1606            XSMD      EQUALS VIS        +6     I(6)
 7372   REF   2  LAST    1   E7,1614            YSMD      EQUALS XSMD       +6     I(6)
 7373   REF   1              E7,1622            ZSMD      EQUALS YSMD       +6     I(6)

 7374   REF   3  LAST  155   E7,1606            XSCREF    =      XSMD
 7375   REF   2  LAST  155   E7,1614            YSCREF    =      YSMD
 7376   REF   1              E7,1622            ZSCREF    =      ZSMD

 7377   REF   2  LAST  155   E7,1630            END-ALIG EQUALS ZSMD        +6     NEXT AVAIL ERASABLE AFTER ALIGN/S40.2,3


R7378               **** P22 ****                                                  (34D)

 7380   REF   1              E7,1630            RSUBL     EQUALS END-ALIG          I(6)S-S  LM POSITION VECTOR
 7381   REF   1              E7,1636            UCSM      EQUALS RSUBL      +6     I(6)S-S  VECTOR U
 7382   REF   1              E7,1644            NEWVEL    EQUALS UCSM       +6     I(6)S-S  TERMINAL VELOCITY VECTOR
 7383   REF   1              E7,1652            NEWPOS    EQUALS NEWVEL     +6     I(6)S-S  TERMINAL POSITION VECTOR
 7384   REF   1              E7,1660            LNCHTM    EQUALS NEWPOS     +6     I(2)S-S EST. LAUNCH TIME FOR LEM
 7385   REF   1              E7,1662            TRANSTM   EQUALS LNCHTM     +2     I(2)S-S TRANSFER TIME
 7386   REF   1              E7,1664            NCSMVEL   EQUALS TRANSTM    +2     I(6)S-S NEW CSM VELOCITY
A7387

R7388               *****  P21  *****                                              (18D)

 7390   REF   1                 1162            P21ORIG   =      DISPDEX
 7391   REF   3  LAST  151   E7,1675            P21BASER EQUALS RLMSRCH            I(6)TMP
 7392   REF   1              E7,1703            P21BASEV EQUALS P21BASER +6        I(6)TMP
 7393   REF   1              E7,1711            P21VEL    EQUALS P21BASEV +6       I(2)TMP  *** NOUN 91 ***
 7394   REF   1              E7,1713            P21GAM    EQUALS P21VEL     +2     I(2)TMP  *** NOUN 91 ***
 7395   REF   1              E7,1715            P21ALT    EQUALS P21GAM     +2     I(2)TMP  *** NOUN 91 ***
A7396
```

```
P7397   *******  OVERLAY NUMBER 4 IN EBANK 7  *******
A7398

R7399   VARIABLES FOR SECOND DPS GUIDANCE (THE LUNAR LANDING)                        (80D)

R7401   THESE ERASABLES MAY BE SHARED WITH CARE

 7402   REF   2  LAST  154   E7,1544             OURTEMPS =      RN1            OVERLAY LAST PART OF SERVICER
 7403   REF   1              E7,1544             LANDTEMP =      OURTEMPS       B(6)     GUIDANCE
 7404   REF   1              E7,1552             TTF/8TMP =      LANDTEMP +6    B(2)    GUIDANCE
 7405   REF   1              E7,1554             ELINCR   =      TTF/8TMP +2    B(2)    GUIDANCE
 7406   REF   1              E7,1556             AZINCR   =      ELINCR   +2    B(2)    GUIDANCE
 7407   REF   1              E7,1560             KEEP-2   =      AZINCR   +2    B(2)    TO PREVENT PIPTIME1 OVERLAY
 7408   REF   1              E7,1562             TABLTTF  =      KEEP-2    +2   B(2)    GUIDANCE
 7409   REF   1              E7,1573             TPIPOLD  =      TABLTTF  +9D   B(2)    GUIDANCE
 7410   REF   1              E7,1621             E2DPS    EQUALS OURPERMS
R7411


R7412   THESE ERASABLES MUST NOT OVERLAY GOBLTIME OR SERVICER
A7413
 7414   REF   4  LAST  155   E7,1606             PIFPSET  =      XSMD           B(1)    THROTTLE
 7415   REF   1              E7,1607             RTNHOLD  =      PIFPSET  +1    B(1)    THROTTLE
 7416   REF   1              E7,1610             FWEIGHT  =      RTNHOLD  +1    B(2)    THROTTLE
 7417   REF   1              E7,1612             PIF      =      FWEIGHT  +2    B(2)   THROTTLE
 7418   REF   1              E7,1614             PSEUDO55 =      PIF      +2    B(1)   THROTTLE DOWNLINK
 7419   REF   1              E7,1615             FC       =      PSEUDO55 +1    B(2)    THROTTLE
 7420   REF   1              E7,1617             TTHROT   =      FC       +2    B(1)    THROTTLE
 7421   REF   1              E7,1620             FCOLD    =      TTHROT   +1    B(1)    THROTTLE
A7422


R7423   THESE ERASABLES SHOULD NOT BE SHARED DURING P63, P64, P65, P66, P67

 7424   REF   1              E7,1621             OURPERMS =      FCOLD    +1    MUSTN'T OVERLAY OURTEMPS OR SERVICER
 7425   REF   2  LAST  156   E7,1621             WCHPHOLD =      OURPERMS       B(1)    GUIDANCE
 7426   REF   1              E7,1622             511CTR   =      WCHPHOLD +1    B(1) R12 - CONTROLS 511 ALARM
 7427   REF   1              E7,1623             FLPASS0  =      511CTR +1      B(1) GUIDANCE
 7428   REF   1              E7,1623             CNTTHROT EQUALS FLPASS0        B(1) CNT THROTS BETWEEN OMISSIONS OF P66
 7429   REF   2  LAST  156   E7,1624             TPIP     =      FLPASS0  +1    B(2)
 7430   REF   1              E7,1626             VGU      =      TPIP     +2    B(6)    GUIDANCE
 7431   REF   1              E7,1634             LAND     =      VGU      +6    B(6)    GUIDANCE    CONTIGUOUS
 7432   REF   1              E7,1642             TTF/8    =      LAND     +6    B(2)    GUIDANCE     CONTIGUOUS
 7433   REF   1              E7,1644             AZINCR1  =      TTF/8    +2    B(1)    REDESIGNATOR
 7434   REF   1              E7,1645             ELINCR1  =      AZINCR1  +1    B(1)    REDESIGNATOR
 7435   REF   1              E7,1646             ZERLINA  =      ELINCR1  +1    B(1)    REDESIGNATOR
 7436   REF   1              E7,1647             ELVIRA   =      ZERLINA  +1    B(1)    REDESIGNATOR
 7437   REF   1              E7,1650             LRPOS    =      ELVIRA   +1    B(1)    LAST LR ANTENNA POSITION
A7438
A7439                                            ** NOTE: GAP OF 1 SP LOCATION HERE IN THIS P63 THRU P66 OVERLAY **
```

```
 7440   REF   1              E7,1652          VMEAS     =      LRPOS     +2    B(2) LR VELOCITY READ BY BEAM X, Y OR Z.
 7441   REF   1              E7,1654          HMEAS     =      VMEAS     +2    B(2)    LR
 7442   REF   1              E7,1656          VN2       =      HMEAS     +2    B(6)    LR
 7443   REF   1              E7,1656          GNUR      =      VN2             B(6)     LR
 7444   REF   2  LAST  157   E7,1656          GNUV      =      VN2             B(6)     LR
 7445   REF   3  LAST  157   E7,1664          DELTAH    =      VN2       +6    B(2)    DISPLAY
 7446   REF   1              E7,1666          FUNNYDSP  =      DELTAH    +2    B(2)    DISPLAY
 7447   REF   1              E7,1670          EOURPERM EQUALS FUNNYDSP +2     NEXT AVAILABLE ERASABLE AFTER OURPERMS
 7448   REF   1              E7,1456          OVFRET   EQUALS LOSCOUNT        B(1) RETURN FROM DESCENT OVERFLOW SUBRO

P7449

R7450   (ERASABLES WHICH OVERLAY THE ABOVE BLOCK)

 7451   REF   2  LAST  156   E7,1644          VDGVERT   =      AZINCR1         B(2)  DESIRED VERTICAL VELOCITY - P66
 7452   REF   2  LAST  156   E7,1646          NIGNLOOP  =      ZERLINA         B(1)   IGNALG
 7453   REF   2  LAST  156   E7,1647          NGUIDSUB  =      ELVIRA          B(1)   IGNALG
 7454   REF   2  LAST  157   E7,1666          TREDES    =      FUNNYDSP        B(1)    DISPLAY
 7455   REF   3  LAST  157   E7,1667          LOOKANGL  =      FUNNYDSP +1     B(1)    DISPLAY
A7456

R7457   THE END OF THE LUNAR LANDING ERASABLES
A7458


R7459             R12     (FOR LUNAR LANDING)                                 (6D)

 7461   REF   1              E7,1670          LRLCTR   EQUALS EOURPERM        B(1) LR DATA TEST
 7462   REF   1              E7,1671          LRRCTR   EQUALS LRLCTR   +1     B(1)
 7463   REF   1              E7,1672          LRMCTR   EQUALS LRRCTR   +1     B(1)
 7464   REF   1              E7,1673          LRSCTR   EQUALS LRMCTR   +1     B(1)
 7465   REF   1              E7,1674          STILBADH EQUALS LRSCTR   +1     B(1)
 7466   REF   1              E7,1675          STILBADV EQUALS STILBADH +1     B(1)
A7467


R7468             LANDING ANALOGS DISPLAY STORAGE.                            (32D)

 7470   REF   1              E7,1676          G-VBIASX  =      STILBADV +1     B(1)    ACC DUE TO GRAVITY AND PIPA BIAS
 7471   REF   1              E7,1677          G-VBIASY  =      G-VBIASX +1     B(1)    ACC DUE TO GRAVITY AND PIPA BIAS
 7472   REF   1              E7,1700          G-VBIASZ  =      G-VBIASY +1     B(1)    ACC DUE TO GRAVITY AND PIPA BIAS
 7473   REF   1              E7,1701          VSURFACE  =      G-VBIASZ +1     B(6)    LUNAR SURFACE VELOCITY
 7474   REF   1              E7,1707          HCALCLAD  =      VSURFACE +6     B(2)    ALTITUDE IN UNITS OF 2(15) M
 7475   REF   1              E7,1711          HDOTLAD   =      HCALCLAD +2     B(2)    ALTRATE IN UNITS OF 2(5) M/CS
 7476   REF   1              E7,1713          DALTRATE  =      HDOTLAD  +2     B(1)    DALTRATE UNITS OF 2(-9) M/CS/CS
 7477   REF   1              E7,1714          RUNITX    =      DALTRATE +1     B(1)    X-COMPONENT OF UNIT/R/ FULL-SIZE
 7478   REF   1              E7,1715          RUNITY    =      RUNITX   +1     B(1)    Y-COMPONENT OF UNIT/R/ FULL-SIZE
 7479   REF   1              E7,1716          RUNITZ    =      RUNITY   +1     B(1)    Z-COMPONENT OF UNIT/R/ FULL-SIZE
 7480   REF   1              E7,1717          DT        =      RUNITZ   +1     B(1)    TIME SINCE LAST PIPTIME
 7481   REF   1              E7,1720          VVECTX    =      DT       +1     B(2)    X-COMPONENT OF SM REL. VELOCITY
 7482   REF   1                E7,1722         VVECTY    =      VVECTX    +2     B(2)     Y-COMPONENT OF SM REL. VELOCITY
 7483   REF   1                E7,1724         VVECTZ    =      VVECTY    +2     B(2)     Z-COMPONENT OF SM REL. VELOCITY
 7484   REF   1                E7,1726         ALTRATE   =      VVECTZ    +2     B(2)     ALTRATE IN UNITS OF 2(5) M/CS
 7485   REF   1                E7,1730         ALTITUDE  =      ALTRATE   +2     B(2)     ALTITUDE IN UNITS OF 2(15) M
 7486   REF   1                E7,1732         LATVMETR  =      ALTITUDE  +2     B(1)     LATERAL VELOCITY METER INDICATOR
 7487   REF   1                E7,1733         FORVMETR  =      LATVMETR  +1     B(1)     FORWARD VELOCITY METER INDICATOR
 7488   REF   1                E7,1734         FORVEL    =      FORVMETR  +1     B(2)     FORWARD VELOCITY FOR DSKY (N60)
 7489   REF   2  LAST  158     E7,1722         PIPCTR1   =      VVECTY           B(1)     TEMPORARY FOR PIPCTR
A7490

 7491   REF   4  LAST  142        0063         ALTRTEMP  =      ITEMP3           B(2)     ALTITUDE-RATE TEMPORARY
 7492   REF   5  LAST  158        0063         ALTTEMP   =      ITEMP3           B(2)     ALTITUDE TEMPORARY
 7493   REF   6  LAST  158        0063         VHY       =      ITEMP3           B(2)     VELOCITY ALONG UHYP (I.E. SM-Y)
 7494   REF   2  LAST   97        0065         VHZ       =      ITEMP5           B(2)     VELOCITY ALONG UHZP
 7495   REF   1                   0070         FORVTEMP  =      RUPTREG1         B(2)     FORWARD VELOCITY TEMPORARY
 7496   REF   1                   0072         LATVEL    =      RUPTREG3         B(2)     LATERAL VELOCITY TEMPORARY
A7497


R74971               DOWNLINK QTY -- GOOD THROUGHOUT LANDING -- LOADED IN SERVICER     (2D)

 74973  REF   1                E7,1736         TRUDELH  EQUALS FORVEL     +2      I(2)DNLK  TRUE DELTA H FOR DOWNLINK,
A74974                                                                                  LOADED BEFORE ENTERING TERRAIN MODEL


R7498   P66 ERASABLES (HORIZONTAL VELOCITY NULLING GUIDANCE)
 7499   REF   2  LAST  145     E7,1433         VHZC     EQUALS DELVLVC           B(6) VELOCITY HORIZONTAL COMMAND
A74995


R7500                P66 ERASABLES (R.O.D.)                                            (1D)

 7502   REF   1                E7,1746         RODCOUNT EQUALS R65CNTR   +1      B(1)     ROD CLICK COUNTER
A7503

R7504                P66 ERASABLES (R.O.D.)                                            (14D)

R7506   **** NOTE: OLDPIPAX,Y,Z AND DELVROD MUST BE KEPT ADJACENT AND IN THAT ORDER FOR P66 INITIALIZATIONS ****

 7508   REF   2  LAST  152     E7,1756         RODSCAL1 EQUALS RM                  B(1)
 7509   REF   1                E7,1757         LASTTPIP EQUALS RODSCAL1 +1         I(2)
 7510   REF   1                E7,1761         THISTPIP EQUALS LASTTPIP +2         B(2)
 7511   REF   1                E7,1763         OLDPIPAX EQUALS THISTPIP +2         B(1)
 7512   REF   1                E7,1764         OLDPIPAY EQUALS OLDPIPAX +1         B(1)
 7513   REF   1                E7,1765         OLDPIPAZ EQUALS OLDPIPAY +1         B(1)
 7514   REF   1                E7,1766         DELVROD  EQUALS OLDPIPAZ +1         B(6)
A7515


R75151               TERRAIN MODEL TEMPORARY -- LOADED IN SERVICER                     (2D)
```

```
L        ERASABLE ASSIGNMENTS                                                             USER'S PAGE NO.  68       EO S4

 75153  REF   1              E7,1766            TEMDELH  EQUALS DELVROD         I(2)TMP  STORES TRUE DELTAH IN TER. MOD.


R7516            NOUN 63 COMPONENT                                              (2D)
 7518   REF   2  LAST  159   E7,1774            HCALC1   EQUALS DELVROD  +6     I(2)
A7519

R7520   LANDING RADAR DOWNLINK                                                  (2D)
 7522   REF   1              E7,1776            HMEASDL  EQUALS HCALC1   +2     B(2)
A7523
```

```
P7524   *******  OVERLAY NUMBER 5 IN EBANK 7  *******
A7525

R7526            ASCENT GUIDANCE ERASABLES.                                    (21D)

 7528   REF   2  LAST  155   E7,1630        RCO      EQUALS END-ALIG           I(2)TMP  TARGET RADIUS AND OUT-OF-PLANE
 7529   REF   1              E7,1632        YCO      EQUALS RCO       +2       I(2)TMP  DISTANCE, SCALED AT 2(24).
 7530   REF   1              E7,1634        1/DV1    EQUALS YCO       +2       B(2)TMP  ATMAG
 7531   REF   1              E7,1636        1/DV2    EQUALS 1/DV1     +2       B(2)TMP  ATMAG
 7532   REF   1              E7,1640        1/DV3    EQUALS 1/DV2     +2       B(2)TMP  ATMAG
 7533   REF   1              E7,1642        XRANGE   EQUALS 1/DV3     +2       B(2)TMP
 7534   REF   1              E7,1644        ENGOFFDT EQUALS XRANGE    +2       B(1)TMP
 7535   REF   1              E7,1645        VGVECT   EQUALS ENGOFFDT +1        I(6)OUT  VELOCITY-TO-BE-GAINED
 7536   REF   1              E7,1653        TXO      EQUALS VGVECT   +6        I(2)TMP  TIME AT WHICH X-AXIS OVERRIDE
A7537                                                                          IS ALLOWED.

 7538   REF   3  LAST  154   E7,1570        1/DVO    EQUALS MASS1              B(2)TMP  ATMAG TEMPORARY


R7539   END OF THE ASCENT GUIDANCE ERASABLES.

 7540                        E7,1777        END-E7   EQUALS 3777               **LAST LOCATION USED IN E7 **
A7541
```

```
R0002    THIS LIST IS MAINTAINED TO ENSURE THAT CERTAIN ERASABLE LOCATIONS
R0003    ARE LOCATED AT A SPECIFIED DISTANCE FROM ANOTHER ERASABLE LOCATION
R0004    AS REQUIRED BY THE STRUCTURE OF THE DOWNLINK LISTS:
R0005           1. IF A LOCATION IS THE SECOND PART OF A DOWNLINK WORD, IT MUST
R0006              BE CONTIGUOUS TO THE LOCATION THAT IS THE FIRST PART.
R0007           2. IF A LOCATION IS NOT THE FIRST WORD OF AN NDNADR IT
R0008              MUST BE AT A SPECIFIC NUMBER OF LOCATIONS FROM THE FIRST
R0009              LOCATION IN THE INSTRUCTION.
R0010           3. OTHER NAMES MAY BE GIVEN TO LOCATIUNS IN THE DOWNLIND LISTS
R0011              THAT ARE NOT REFERENCED IN THE LISTS. THESE MUST NOT BE MOVED.
R0012    THIS IS ACCOMPLISHED USING THE INSTRUCTION    CHECK=    .
R0013    THIS INSTRUCTION GIVES A CUSS IN THE ASSEMBLY IF THE LOCATION OF THE
R0014    FIRST TAG FIELD IS NOT EQUAL TO THE LOCATION OF THE SECOND TAG FIELD.
R0015    THE INSTRUCTION HAS NO OTHER EFFECT ON THE ASSEMBLY OR CODE.

R0016    THIS LIST SHOULD BE UPDATED FOR ANY CHANGES TO THE DOWNLINK LISTS.

R0017    THIS LIST IS MAINTAINED BY  SUMNER ROSENBERG


 0018    REF   1                   0025             TIME1     CHECK= TIME2 +1
 0019    REF   1                   0033             CDUY      CHECK= CDUX +1
 0020    REF   1                   0034             CDUZ      CHECK= CDUY +1
 0021    REF   1                   0035             CDUT      CHECK= CDUZ +1
 0022    REF   1                   0037             PIPAX     CHECK= CDUS +1
 0023    REF   1                   0040             PIPAY     CHECK= PIPAX +1
 0024    REF   1                   0041             PIPAZ     CHECK= PIPAY +1
 0025    REF   1                   0111             DAPBOOLS  CHECK= RADMODES +1
 0026    REF   2  LAST    98       0113             LASTXCMD  CHECK= LASTYCMD +1
 0027    REF   1                   0321             THETAD    CHECK= REDOCTR +1
 0028    REF   1                   0375             FAILREG   CHECK= CHANBKUP +1
 0029    REF   2  LAST   107       1170             UPOLDMOD  CHECK= COMPNUMB +1
 0030    REF   2  LAST   107       1171             UPVERB    CHECK= UPOLDMOD +1
 0031    REF   2  LAST   107       1172             UPCOUNT   CHECK= UPVERB +1
 0032    REF   2  LAST   107       1173             UPBUFF    CHECK= UPCOUNT +1
 0033    REF   2  LAST   108       1241             SPIRAL    CHECK= CURSOR +1
 0034    REF   1                   1300             IMODES33  CHECK= IMODES30 +1
 0035    REF   1                   1327             CSMMASS   CHECK= LEMMASS +1
 0036    REF   2  LAST   111       1331             DNRRDOT   CHECK= DNRRANGE +1
 0037    REF   2  LAST   111       1334             DNLRVELY  CHECK= DNLRVELX +1
 0038    REF   2  LAST   111       1335             DNLRVELZ  CHECK= DNLRVELY +1
 0039    REF   2  LAST   111       1336             DNLRALT   CHECK= DNLRVELZ +1
 0040    REF   1                   1356             DUMLOOPS  CHECK= SERVDURN +1
 0041    REF   2  LAST   121    E4,1635             ZNBSAV    CHECK= YNBSAV +6
 0042    REF   2  LAST   128    E5,1741             IGC       CHECK= OGC +2
 0043    REF   2  LAST   128    E5,1743             MGC       CHECK= IGC +2
 0044    REF   2  LAST   128    E5,1756             BESTJ     CHECK= BESTI +1
 0045    REF   5  LAST   134    E6,1422             OMEGAQ    CHECK= OMEGAP +1
 0046    REF   1                E6,1423             OMEGAR    CHECK= OMEGAQ +1
 0047    REF   1                E6,1425             ALPHAR    CHECK= ALPHAQ +1
```

```
L        CHECK EQUALS LIST                                                                       USER'S PAGE NO.   2       FO S4

 0048    REF   1                 E6,1514          NEGTORKP CHECK= POSTORKP +1
 0049    REF   1                 E6,1516          NEGTORKU CHECK= POSTORKU +1
 0050    REF   1                 E6,1517          POSTORKV CHECK= NEGTORKU +1
 0051    REF   1                 E6,1520          NEGTORKV CHECK= POSTORKV +1
 0052    REF   4  LAST  140      E6,1635          CDUYD    CHECK= CDUXD +1
 0053    REF   1                 E6,1636          CDUZD    CHECK= CDUYD +1
 0054    REF   3  LAST  139      E6,1643          OMEGAQD  CHECK= OMEGAPD +1
 0055    REF   1                 E6,1644          OMEGARD  CHECK= OMEGAQD +1
 0056    REF   1                 E7,1460          AMG      CHECK= AIG +1
 0057    REF   1                 E7,1462          TRKMKCNT CHECK= AOG +1
 0058    REF   2  LAST  162      E7,1462          VSELECT  CHECK= AOG +1
 0059    REF   2  LAST  158      E7,1733          FORVMETR CHECK= LATVMETR +1
 0060    REF  16  LAST   98         0074          FLAGWRD0 CHECK= STATE
 0061    REF   2  LAST  161         0110          FLGWRD12 CHECK= RADMODES
 0062    REF   1                    0111          FLGWRD13 CHECK= DAPBOOLS
 0063    REF   4  LAST  101         0321          CPHI     CHECK= THETAD
 0064    REF   5  LAST  162         0322          CTHETA   CHECK= THETAD +1
 0065    REF   6  LAST  162         0323          CPSI     CHECK= THETAD +2
 0066    REF   4  LAST  101         0324          DELVX    CHECK= DELV
 0067    REF   5  LAST  162         0326          DELVY    CHECK= DELV +2
 0068    REF   6  LAST  162         0330          DELVZ    CHECK= DELV +4
 0071    REF   2  LAST  102         0334          CTLIST   CHECK= DNLSTCOD +1
 0072    REF   1                    0372          CADRMARK CHECK= CADRFLSH +1
 0073    REF   2  LAST  162         0373          TEMPFLSH CHECK= CADRFLSH +2
 0074    REF   5  LAST  108         1235          STARCODE CHECK= AOTCODE
 0075    REF   1                 E3,1570          TETCSM   CHECK= T-OTHER
 0076    REF   2  LAST  162      E3,1570          TETOTHER CHECK= T-OTHER
 0077    REF   2  LAST  116      E3,1715          R(CSM)   CHECK= R-OTHER
 0078    REF   2  LAST  116      E3,1723          V(CSM)   CHECK= V-OTHER
 0079    REF   2  LAST  162      E6,1513          DOWNTORK CHECK= POSTORKP
 0080    REF   5  LAST  162      E6,1634          DCDU     CHECK= CDUXD
 0081    REF   2  LAST    1      E7,1433          DELVLVC  CHECK= DELVSLV
 0083    REF   3  LAST  146      E7,1462          MARKCTR  CHECK= TRKMKCNT
 0084    REF   2  LAST  149      E7,1700          VGPREV   CHECK= VGTIG
 0085   *REF   1                    1260          CH6MASK  CHECK= CH5MASK +1

*** END OF LUMERASE.176 ***
```

```
 0001                              4000                  SETLOC 4000

 00015  REF   1                                          COUNT* $$/RUPTS       FIX-FIX LEAD INS
 0002                              4000   0 0004 0       INHINT                GO
 0003   REF   1                    4001   3 4054 1       CAF     GOBB
 0004   REF   1                    4002  56 006 1        XCH     BBANK
 0005   REF   1                    4003   1 2671 1       TCF     GOPROG

 0006   REF   1                    4004  52 011 0        DXCH    ARUPT         T6RUPT
 0007                              4005   0 0006 1       EXTEND
 0008   REF   1                    4006   3 4056 0       DCA     T6ADR
 0009                              4007  52 006 0        DTCB

 0010   REF   2  LAST  163         4010  52 011 0        DXCH    ARUPT         T5RUPT - AUTOPILOT
 0011                              4011   0 0006 1       EXTEND
 0012   REF   1                    4012   3 1263 1       DCA     T5ADR
 0013                              4013  52 006 0        DTCB

 0014   REF   3  LAST  163         4014  52 011 0        DXCH    ARUPT         T3RUPT
 0015   REF   1                    4015   3 4057 1       CAF     T3RPTBB
 0016   REF   2  LAST  163         4016  56 006 1        XCH     BBANK
 0017   REF   1                    4017   1 3412 1       TCF     T3RUPT

 0018   REF   4  LAST  163         4020  52 011 0        DXCH    ARUPT         T4RUPT
 0019   REF   1                    4021   3 4064 1       CAF     T4RPTBB
 00195  REF   3  LAST  163         4022  56 006 1        XCH     BBANK
 0020   REF   1                    4023   1 2000 1       TCF     T4RUPT

 0023   REF   5  LAST  163         4024  52 011 0        DXCH    ARUPT         KEYRUPT1
 0024   REF   1                    4025   3 4060 0       CAF     KEYRPTBB
 0025   REF   4  LAST  163         4026  56 006 1        XCH     BBANK
 0026   REF   1                    4027   1 3257 0       TCF     KEYRUPT1

 0027   REF   6  LAST  163         4030  52 011 0        DXCH    ARUPT         KEYRUPT2
 0028   REF   1                    4031   3 4061 1       CAF     MKRUPTBB
 0029   REF   5  LAST  163         4032  56 006 1        XCH     BBANK
 0030   REF   1                    4033   1 2354 0       TCF     MARKRUPT

 0031   REF   7  LAST  163         4034  52 011 0        DXCH    ARUPT         UPRUPT
 0032   REF   1                    4035   3 4060 0       CAF     UPRPTBB
 0033   REF   6  LAST  163         4036  56 006 1        XCH     BBANK
 0034   REF   1                    4037   1 3302 1       TCF     UPRUPT

 0035   REF   8  LAST  163         4040  52 011 0        DXCH    ARUPT         DOWNRUPT
 0036   REF   1                    4041   3 4062 1       CAF     DWNRPTBB
 0037   REF   7  LAST  163         4042  56 006 1        XCH     BBANK
 0038   REF   1                    4043   1 3507 1       TCF     DODOWNTM

 0039   REF   9  LAST  163         4044  52 011 0        DXCH    ARUPT         RADAR RUPT
 0040   REF   1                    4045   3 4063 0       CAF     RDRPTBB
 0041   REF   8  LAST  163       4046  56 006 1              XCH     BBANK
 0042   REF   1                  4047  1 3157 0              TCF     RADAREAD

 0043   REF  10  LAST  163       4050  52 011 0              DXCH    ARUPT             RUPT10 IS USED ONLY BY LANDING GUIDANCE
 0044   REF   1                  4051  3 4065 0              CA      RUPT10BB
 0045   REF   9  LAST  164       4052  56 006 1              XCH     BBANK
 0046   REF   1                  4053  1 2302 0              TCF     PITFALL


 0047   REF   1             E3,1400                          EBANK=  LST1              RESTART USES E0, E3
 0048   REF   2  LAST  163       4054    12103 0  GOBB       BBCON   GOPROG

 0049   REF   1             E6,1464                          EBANK=  PERROR
 0050   REF   1                  4055    02117 1  T6ADR      2CADR   DOT6RUPT
 0050   REF   1                  4056    36106 0

 0051   REF   2  LAST  164  E3,1400                          EBANK=  LST1
 0052   REF   2  LAST  163       4057    02103 1  T3RPTBB    BBCON   T3RUPT

 0053   REF   1                  0073                        EBANK=  KEYTEMP1
 0054   REF   2  LAST  163       4060    10100 1  KEYRPTBB   BBCON   KEYRUPT1

 0055   REF   1             E7,1404                          EBANK=  AOTAZ
 0056   REF   2  LAST  163       4061    16107 0  MKRUPTBB   BBCON   MARKRUPT

 0057   REF   2  LAST  163       4060             UPRPTBB    =       KEYRPTBB

 0058   REF   1                  0340                        EBANK=  DNTMBUFF
 0059   REF   2  LAST  163       4062    12100 0  DWNRPTBB   BBCON   DODOWNTM

 0060   REF   1             E7,1453                          EBANK=  TTOGO
 0061   REF   2  LAST  164       4063    52107 0  RDRPTBB    BBCON   RADAREAD

 0062   REF   1             E6,1414                          EBANK=  M11
 0063   REF   2  LAST  163       4064    14106 0  T4RPTBB    BBCON   T4RUPT

 00631  REF   3  LAST  157  E7,1647                          EBANK=  ELVIRA
 00632  REF   2  LAST  164       4065    22107 1  RUPT10BB   BBCON   PITFALL
 0001                          12,2000                         BANK    12
 0001C1  REF    1              06,2000                         SETLOC  T4RUP
 000102                        06,2000                         BANK

 0002    REF    2  LAST   164  E6,1414                         EBANK=  M11
 00025   REF    1                                              COUNT*  $$/T4RPT
 0003    REF    1              06,2000  54 016 1  T4RUPT       TS      BANKRUPT

 0004                          06,2001  0 0006 1               EXTEND
 0005    REF    1              06,2002  22 012 1               QXCH    QRUPT

 0007    REF    1              06,2003  11'310 0               CCS     DSRUPTSW        GOES 7(-1)0 AROUND AND AROUND
 0008    REF    1              06,2004  1 2010 0               TCF     NORMT4 +1
 0009    REF    2  LAST   165  06,2005  1 2007 0               TCF     NORMT4

 0010    REF    1              06,2006  1 2134 1               TCF     QUIKDSP

 0015    REF    1              06,2007  3 4750 1  NORMT4       CAF     SEVEN
 0016    REF    2  LAST   158  06,2010  54 070 1               TS      RUPTREG1
 0017    REF    2  LAST   165  06,2011  55'310 0               TS      DSRUPTSW

 0019                             4066                         BLOCK   02
 0019C1  REF    1                 4000                         SETLOC  FFTAG10
 0019C2                           4066                         BANK

 0019C4  REF    1                                              COUNT*  $$/T4RPT
 0020    REF    1                 7750            100MRUPT =           OCT37766        (DEC 16374)
R0023    RELTAB IS A PACKED TABLE. RELAYWORD CODE IN UPPER 4 BITS, RELAY CODE
R0024    IN LOWER 5 BITS.

 0025                             4066   04025 1  RELTAB       OCT     04025
 0026                             4067   10003 0               OCT     10003
 0027                             4070   14031 0               OCT     14031
 0028                             4071   20033 0               OCT     20033
 0029                             4072   24017 1               OCT     24017
 0030                             4073   30036 1               OCT     30036
 0031                             4074   34034 1               OCT     34034
 0032                             4075   40023 1               OCT     40023
 0033                             4076   44035 1               OCT     44035
 0034                             4077   50037 0               OCT     50037
 0035                             4100   54000 0               OCT     54000
 0036                             4101   60000 1  RELTAB11     OCT     60000
```

```
P0037             SWITCHED-BANK PORTION.

 0038                                12,2000                         BANK    12
 003801 REF    2  LAST  165          06,2000                         SETLOC T4RUP
 003802                              06,2012                         BANK

 0039   REF    2 LAST  165 TO  165:     10     10*                   COUNT* $$/T4RPT
 0042   REF    1                     06,2012  11'035 1  CDRVE        CCS     DSPTAB +11D
 0043   REF    1                     06,2013  0 2063 0               TC      DSPOUT
 0044   REF    2  LAST  166          06,2014  0 2063 0               TC      DSPOUT

 0045   REF    2  LAST  166          06,2015  57'035 0               XCH     DSPTAB +11D
 0046   REF    1                     06,2016  7 4347 1               MASK    LOW11
 0047   REF    3  LAST  166          06,2017  55'035 1               TS      DSPTAB +11D
 0048   REF    1                     06,2020  6 4101 0               AD      RELTAB11
 0049                                06,2021  0 0006 1               EXTEND
 00491  REF    1                     06,2022  01 010 1               WRITE   OUTO
 00492  REF    1                     06,2023  0 2071 0               TC      HANG20
```

```
P0050   DSPOUT PROGRAM. PUTS OUT DISPLAYS.

 0055   REF   1                06,2024  55'015 0  DSPOUTSB TS      NOUT
 0056   REF   1                06,2025  4 4746 1           CS      ZERO
 0057   REF   1                06,2026  54 073 1           TS      DSRUPTEM        SET TO -0 FOR 1ST PASS THRU DSPTAB
 0058   REF   1                06,2027  56 775 1           XCH     DSPCNT
 0059   REF   1                06,2030  6 4745 0           AD      NEG0            TO PREVENT +0
 0060   REF   2  LAST  167     06,2031  54 775 0           TS      DSPCNT
 0061   REF   3  LAST  167     06,2032  50 775 1  DSPSCAN  INDEX   DSPCNT
 0062   REF   4  LAST  166     06,2033  11'022 1           CCS     DSPTAB
 0063   REF   4  LAST  167     06,2034  10 775 0           CCS     DSPCNT          IF DSPTAB ENTRY +, SKIP
 0064   REF   1                06,2035  1 2030 1           TCF     DSPSCAN -2      IF DSPCNT +, TRY AGAIN
 0065   REF   1                06,2036  1 2047 1           TCF     DSPLAY          IF DSPTAB ENTRY -, DISPLAY
 0066                          06,2037   00012 1  TABLNTH  OCT     12              DEC 10   LENGTH OF DSPTAB
 0067   REF   2  LAST  167     06,2040  10 073 1           CCS     DSRUPTEM        IF DSRUPTEM=+0,2ND PASS THRU DSPTAB
 0068                          06,2041   37764 0  120MRUPT DEC     16372           (DSPCNT = 0). +0 INTO NOUT.
 0069   REF   2  LAST  167     06,2042  55'015 0           TS      NOUT
 0070   REF   2  LAST   95     06,2043  0 0002 0           TC      Q
 0071   REF   3  LAST  167     06,2044  54 073 1           TS      DSRUPTEM        IF DSRUPTEM=-0,1ST PASS THRU DSPTAB
 0072   REF   1                06,2045  3 2037 1           CAF     TABLNTH         (DSPCNT=0). +0 INTO DSRUPTEM. PASS AGAIN
 0073   REF   2  LAST  167     06,2046  1 2031 0           TCF     DSPSCAN -1

 0074   REF   1                06,2047  6 4744 1  DSPLAY   AD      ONE
 0075   REF   5  LAST  167     06,2050  50 775 1           INDEX   DSPCNT
 0076   REF   5  LAST  167     06,2051  55'022 1           TS      DSPTAB          REPLACE POSITIVELY
 0077   REF   2  LAST  166     06,2052  7 4347 1           MASK    LOW11           REMOVE BITS 12 TO 15
 0078   REF   4  LAST  167     06,2053  54 073 1           TS      DSRUPTEM
 0079   REF   1                06,2054  3 4341 0           CAF     HI5
 0080   REF   6  LAST  167     06,2055  50 775 1           INDEX   DSPCNT
 0081   REF   1                06,2056  7 4066 1           MASK    RELTAB          PICK UP BITS 12 TO 15 OF RELTAB ENTRY
 0082   REF   5  LAST  167     06,2057  6 0073 0           AD      DSRUPTEM
 0083                          06,2060  0 0006 1           EXTEND
 0084   REF   2  LAST  166     06,2061  01 010 1           WRITE   OUT0

 00841  REF   1                06,2062  1 6760 1           TCF     Q+1


 00842  REF   1                06,2063  10 101 0  DSPOUT   CCS     FLAGWRD5        IS DSKY FLAG ON
 00843  REF   2  LAST  167     06,2064  3 4746 0           CAF     ZERO            NO
 00844  REF   1                06,2065  1 2130 0           TCF     NODSPOUT        NO
 00845  REF   3  LAST  167     06,2066  11'015 0           CCS     NOUT            YES
 00846  REF   1                06,2067  0 2024 0           TC      DSPOUTSB
 00847  REF   2  LAST  167     06,2070  1 2130 0           TCF     NODSPOUT        NO DISPLAY REQUESTS

 0085   REF   1                06,2071  4 2171 0  HANG20   CS      14,11,9
 0086   REF   3  LAST  165     06,2072  27'310 0           ADS     DSRUPTSW

 0087   REF   1                06,2073  3 7752 0           CAF     20MRUPT

 0088   REF   1                06,2074  54 027 0  SETTIME4 TS      TIME4
```

```
P00861  THE STATUS OE THE PRCCEED PUSFBUTTON IS MCNITORED EVERY 120 MILLISECONDS VIA THE CHANNEL 32 BIT 14 INBIT.
R008812 THE STATF OE THIS INBIT IS COMPARED WITH ITS STATE DURING THE PREVIOUS T4RUPT AND IS PROCESSED AS FOLLOWS.

R008814     IF PREV ON AND NOW ON     -   BYPASS
R008815     IF PREV ON AND NOW OFF    -   UPDATE IMODES33
RC08816     IF PREV OEF AND NOW ON    -   UPDATE IMODES33 AND PROCESS VIA PINBALL
R008817     IF PREV (FF AND NOW OFE   -   BYPASS

R008818 THE LCGIC EMPLOYFD REQUIRES ONLY 9 MCT (APPROX. 108 MICROSECONDS) CF COMPUTER TIMF WHEN NO CHANGES OCCUR.


 00882  REF   1                 06,2075  3 1300 0  PROCEEDE CA      IMODES33        MCNITIOR FOR PROCEED BUTTON
 008821                         06,2076  0 CC06 1           EXTEND
 008822 REE   1                 C6,2077  06 C32 0           RXOR    CHAN32
 008823 REF  14  LAST   89      06,2100  7 4727 0           MASK    BIT14
 008824                         06,2101  0 CC06 1           EXTEND
 008825 REF   1                 06,2102  1 2116 1           BZE     T4JUMP          NO CHANGE

 008826 PEE   2  LAST  168      06,2103  23'300 0           LXCH    IMODES33
 008827                         06,2104  0 0006 1           EXTEND
 008828 RFF   1                 06,2105  06 001 0           RXOR    LCHAN
 008829 REE   3  LAST  168      06,2106  55'300 1           TS      IMUDES33        UPDATE IMODES33
 00883  REE  15  LAST  168      06,2107  7 4727 0           MASK    BIT14
 008831 REE   1                 C6,2110  10 000 0           CCS     A
 003832 REF   2  LAST  168      06,2111  1 2116 1           TCF     T4JUMP          WAS ON - NOW OEE

 008833 REF   1                 06,2112  3 4346 1           CAE     CHRPRIO         WAS OEE - NOW ON
 008834 REE   1                 06,2113  0 5063 1           TC      NOVAC
 008835 REF   1                    0776                     EBANK=  DSPCOUNT
 008836 REF   1                 06,2114   03501 0           2CADR   PROCKEY
 008836 RFF   1                 06,2115   6C101 1
```

```
P0089              JUMP TO APPROPRIATE ONCE-PER SECOND (.96 SEC ACTUALLY) ACTIVITY

 0090   REF   3  LAST   165    06,2116  50 070 0  T4JUMP    INDEX   RUPTREG1
 0091                          06,2117   1 2120 1           TCF     +1

 0092   REF   1                06,2120   0 3213 1           TC      RCSMONIT
 0093   REF   1                06,2121   1 3035 0           TCF     RRAUTCHK
 0094   REF   1                06,2122   1 2172 0           TCF     IMUMON
 0095   REF   1                06,2123   1 3167 0           TCF     DAPT4S
 0096   REF   2  LAST   169    06,2124   0 3213 1           TC      RCSMONIT
 0097   REF   2  LAST   169    06,2125   1 3035 0           TCF     RRAUTCHK
 0098   REF   2  LAST   169    06,2126   1 2172 0           TCF     IMUMON
 0099   REF   2  LAST   169    06,2127   1 3167 0           TCF     DAPT4S

 0102   REF   1                   7752            20MRUPT   =       OCT37776        (DEC 16382)
```

```
P0150               ADDITIONAL ROUTINES FOR 20MS. KEYBOARD ACTIVITY

 0151                          06,2130  0 C006 1  NLDSPOUT EXTEND
 0152  REF    3  LAST  167     06,2131  01 010 1           WRITE   OUTO

 0153  RFF    1                06,2132  3 2041 0           CAF     120MRUPT          SET FOR NEXT CDRIVE
 0154  RFF    1                06,2133  1 2074 1           TCF     SETTIME4

 0155  REF   16  LAST  168     06,2134  3 4727 1  QUIKDSP  CAF     BIT14
 01551 REF    4  LAST  167     06,2135  7 1310 0           MASK    DSRUPTSW
 01552                         06,2136  0 0006 1           FXTEND
 01553 REF    1                06,2137  1 2165 0           BZF     QUIKUFF           WROTE LAST TIME, NOW TURN OFF RELAYS.

 01555 REF    4  LAST  167     06,2140  11'015 0           CCS     NOUT
 0156  REF    2  LAST  167     06,2141  0 2C24 0           TC      DSPOUTSB
 0157  REF    1                C6,2142  1 2152 1           TCF     NODSPY            NOUT=0 OR BAD RETURN FROM DSPOUTSB
 01575 REF   17  LAST  170     06,2143  4 4727 0           CS      BIT14             GOOD RETURN (WE DISPLAYED SOMETHING)
 01577 REF    5  LAST  170     06,2144  27'310 0  QUIKRUPT ADS     DSRUPTSW

 0158  REF    2  LAST  167     06,2145  3 7752 0           CAF     20MRUPT
 0159  REF    2  LAST  167     06,2146  54 C27 0           TS      TIME4

 0160  PFF   11  LAST   89     06,2147  3 4734 0           CAF     BIT9
 0161  RFF    6  LAST  170     06,2150  27'310 0           ADS     DSRUPTSW

 0162  REF    1                C6,2151  0 5272 0           TC      RESUME

 0163                          06,2152  0 0006 1  NODSPY   EXTEND
 0164  RFF    4  LAST  170     06,2153  01 C10 1           WRITE   OUTO

 0165  REF    3  LAST  170     06,2154  3 7752 0  SYNCT4   CAF     20MRUPT
 0166  RFF    3  LAST  170     06,2155  26 C27 0           ADS     TIMF4

 0167  RFF   12  LAST  170     06,2156  3 4734 0           CAF     BIT9
 0168  REF    7  LAST  170     06,2157  27'310 0           ADS     DSRUPTSW

 0169  REF    8  LAST  170     06,2160  11'310 0           CCS     DSRUPTSW
 0170  REF    2  LAST  170     06,2161  0 5272 0           TC      RESUME
 0171                          06,2162   37737 0  OCT37737 OCT     37737
 0172  REF    1                06,2163  0 2154 0           TC      SYNCT4
 0173  REF    3  LAST  170     06,2164  0 5272 0           TC      RESUME

 0174                          06,2165  0 0006 1  QUIKOFF  EXTEND
 0175  REF    5  LAST  170     06,2166  01 010 1           WRITE   OUTO
 0176  REF   18  LAST  170     06,2167  3 4727 1           CAF     BIT14             RESET DSRUPTSW TO SEND DISPLAY NEXT PASS
 0177  REF    1                06,2170  1 2144 0           TCF     QUIKRUPT

 0179                          06,2171   22400 0  14,11,9  OCT     22400
```

```
L        T4RUPT PROGRAM                                                                           USER'S PAGE NO.   7       E6 S4

P0300    PROGRAM NAME:  IMUMON

R0301    FUNCTIONAL DESCRIPTION:  THIS PROGRAM IS ENTERED EVERY 480 MS.  IT DETECTS CHANGES OF THE IMU STATUS BITS IN
R0303    CHANNEL 30 AND CALLS THE APPROPRIATE SUBROUTINES.  THE BITS PROCESSED AND THEIR RELEVANT SUBROUTINES ARE:

R0305                FUNCTION                BIT    SUBROUTINE CALLED
R0306                --------                ---    -----------------
R0307                TEMP IN LIMITS           15    TLIM
R0308                ISS TURN-ON REQUEST      14    ITURNON
R0309                IMU FAIL                 13    IMUFAIL (SETISSW)
R0310                IMU CDU FAIL             12    ICDUFAIL (SETISSW)
R0311                IMU CAGE                 11    IMUCAGE
R0312                IMU OPERATE               9    IMUOP

R0313                THE LAST SAMPLED STATE OF THESE BITS IS LEFT IN IMODES30.  ALSO, EACH SUBROUTINE CALLED FINDS THE NEW
R0315    VALUE OF THE BIT IN A, WITH Q SET TO THE PROPER RETURN LOCATION, NXTIFAIL.

R0317    CALLING SEQUENCE:  T4RUPT EVERY 480 MILLISECONDS.

R0318    JOBS OR TASKS INITIATED:  NONE.

R0319    SUBROUTINES CALLED:  TLIM, ITURNON, SETISSW, IMUCAGE, IMUOP.

R0320    ERASABLE INITIALIZATION:
R0321            FRESH START OR RESTART WITH NO GROUPS ACTIVE: C(IMODES30) = OCT 37411.
R0323            RESTART WITH ACTIVE GROUPS: C(IMODES30) = (B(IMODES30)AND(OCT 00035)) PLUS OCT 37400.
R0325                                        THIS LEAVES IMU FAIL BITS INTACT.

R0326    ALARMS:  NONE.

R0327    EXIT:  TNONTEST.

R0328    OUTPUT:  UPDATED IMODES30 WITH CHANGES PROCESSED BY APPROPRIATE SUBROUTINE.

 0330    REF   2  LAST  161   06,2172  3 1277 1  IMUMON   CA      IMODES30        SEE IF THERE HAS BEEN A CHANGE IN THE
 0331                         06,2173  0 0006 1           EXTEND                  RELEVANT BITS OF CHAN 30.
 0332    REF   1              06,2174  06 030 1           RXOR    CHAN30
 0333    REF   1              06,2175  7 2761 1           MASK    30RDMSK
 0334                         06,2176  0 0006 1           EXTEND
 0335    REF   1              06,2177  1 2227 0           BZF     TNONTEST        NO CHANGE IN STATUS.

 0336    REF   4  LAST  169   06,2200  54 070 1           TS      RUPTREG1        SAVE BITS WHICH HAVE CHANGED.
 0337    REF   3  LAST  171   06,2201  23'277 1           LXCH    IMODES30        UPDATE IMODES30.
 0338                         06,2202  0 0006 1           EXTEND
 0339    REF   2  LAST  168   06,2203  06 001 0           RXOR    LCHAN
 0340    REF   4  LAST  171   06,2204  55'277 0           TS      IMODES30

 0341    REF   2  LAST  167   06,2205  4 4744 0           CS      ONE
 0342    REF   5  LAST  171   06,2206  56 070 0           XCH     RUPTREG1
 0343                         06,2207  0 0006 1           EXTEND
 0344   REF   1                06,2210  6 2514 0             BZMF   TLIM              CHANGE IN IMU TEMP.
 0345   REF   1                06,2211  1 2213 1             TCF    NXTIFBIT          BEGIN BIT SCAN.

 0346   REF   3  LAST  171     06,2212  6 4744 1   -1        AD     ONE               (RE-ENTERS HERE FROM NXTIFAIL.)
 0347   REF   6  LAST  171     06,2213  24 070 0  NXTIFBIT   INCR   RUPTREG1          ADVANCE BIT POSITION NUMBER.
 0348                          06,2214  6 0000 1   +1        DOUBLE
 0349   REF   2  LAST  168     06,2215  54 000 0             TS     A                 SKIP IF OVERFLOW.
 0350   REF   2  LAST  172     06,2216  1 2213 1             TCF    NXTIFBIT          LOOK FOR BIT.

 0351   REF   1                06,2217  56 071 1             XCH    RUPTREG2          SAVE OVERFLOW-CORRECTED DATA.
 0352   REF   7  LAST  172     06,2220  50 070 0             INDEX  RUPTREG1          SELECT NEW VALUE OF THIS BIT.
 0353   REF  10  LAST  170     06,2221  3 4727 1             CAF    BIT14
 0354   REF   5  LAST  171     06,2222  7 1277 0             MASK   IMODES30
 0355   REF   8  LAST  172     06,2223  50 070 0             INDEX  RUPTREG1
 0356   REF   1                06,2224  0 2755 1             TC     IFAILJMP

 0357   REF   2  LAST  172     06,2225  10 071 0  NXTIFAIL   CCS    RUPTREG2          PROCESS ANY ADDITIONAL CHANGES.
 0358   REF   3  LAST  172     06,2226  1 2212 0             TCF    NXTIFBIT -1
```

```
P0359    PROGRAM NAME:  TNONTEST.

R0360    FUNCTIONAL DESCRIPTION:  THIS PROGRAM HONORS REQUESTS FOR ISS INITIALIZATION.  ISS TURN-ON (CHANNEL 30 BIT 14)
R0362    AND ISS OPERATE (CHANNEL 30 BIT 9) REQUESTS ARE TREATED AS A PAIR AND PROCESSING TAKES PLACE .480 SECONDS
R0364    AFTER EITHER ONE APPEARS.  THIS INITIALIZATION TAKES ON ONE OF THE FOLLOWING THREE FORMS:

R0366              1)  ISS TURN-ON:  IN THIS SITUATION THE COMPUTER IS OPERATING WHEN THE ISS IS TURNED ON.  NOMINALLY,
R0368              BOTH ISS TURN-ON AND ISS OPERATE APPEAR.  THE PLATFORM IS CAGED FOR 90 SECONDS AND THE ICDU'S ZEROED
R0370              SO THAT AT THE END OF THE PROCESS THE GIMBAL LOCK MONITOR WILL FUNCTION PROPERLY.

R0372              2)  ICDU INITIALIZATION:  IN THIS CASE THE COMPUTER WAS PROBABLY TURNED ON WITH THE ISS IN OPERATE OR
R0374              A FRESH START WAS DONE WITH THE ISS IN OPERATE.  IN THIS CASE ONLY ISS OPERATE IS ON.  THE ICDU'S ARE
R0376              ZEROED SO THE GIMBAL LOCK MONITOR WILL FUNCTION.  AN EXCEPTION IS IF THE ISS IS IN GIMBAL LOCK AFTER
R0378              A RESTART, THE ICDU'S WILL NOT BE ZEROED.

R0379              3)  RESTART WITH RESTARTABLE PROGRAM USING THE IMU:  IN THIS CASE, NO INITIALIZATION TAKES PLACE SINCE
R0381              IT IS ASSUMED THAT THE USING PROGRAM DID THE INITIALIZATION AND THEREFORE T4RUPT SHOULD NOT INTERFERE.

R0383    IMODES30 BIT 7 IS SET = 1 BY THE FIRST BIT (CHANNEL 30 BIT 14 OR 9) WHICH ARRIVES.  FOLLOWING THIS, TNONTEST IS
R0385    ENTERED, FINDS BIT 7 = 1 BUT BIT 8 = 0, SO IT SETS BIT 8 = 1 AND EXITS.  THE NEXT TIME IT FINDS BIT 8 = 1 AND
R0387    PROCEEDS, SETTING BITS 8 AND 7 = 0.  AT PROCTNON, IF ISS TURN-ON REQUEST IS PRESENT, THE ISS IS CAGED (ZERO +
R0389    COARSE).  IF ISS OPERATE IS NOT PRESENT PROGRAM ALARM 00213 IS ISSUED.  AT THE END OF A 90 SECOND CAGE, BIT 2
R0391    OF IMODES30 IS TESTED.  IF IT IS = 1, ISS TURN-ON WAS NOT PRESENT FOR THE ENTIRE 90 SECONDS.  IN THAT CASE, IF
R0393    THE ISS TURN-ON REQUEST IS PRESENT THE 90 SECOND WAIT IS REPEATED, OTHERWISE NO ACTION OCCURS UNLESS A PROGRAM
R0395    WAS WAITING FOR THE INITIALIZATION IN WHICH CASE THE PROGRAM IS GIVEN AN IMUSTALL ERROR RETURN.  IF THE DELAY
R0397    WENT PROPERLY, THE ISS DELAY OUTBIT IS SENT AND THE ICDU'S ZEROED.  A TASK IS INITIATED TO REMOVE THE PIPA FAIL
R0399    INHIBIT BIT IN 10.24 SECONDS.  IF A MISSION PROGRAM WAS WAITING IT IS INFORMED VIA ENDIMU.

R0401    AT PROCTNON, IF ONLY ISS OPERATE IS PRESENT (OPONLY), THE CDU'S ARE ZEROED UNLESS THE PLATFORM IS IN COARSE
R0403    ALIGN (= GIMBAL LOCK HERE) OR A MISSION PROGRAM IS USING THE IMU (IMUSEFLG = 1).

R0405    CALLING SEQUENCE:  T4RUPT EVERY 480 MILLISECONDS AFTER IMUMON.

R0406    JOBS OR TASKS INITIATED:  1) ENDTNON, 90 SECONDS AFTER CAGING STARTED.  2) ISSUP, 4 SECONDS AFTER CAGING DONE.
R0408              3) PFAILOK, 10.24 SECONDS AFTER INITIALIZATION COMPLETED.  4) UNZ2, 320 MILLISECONDS AFTER ZEROING
R0410              STARTED.

R0411    SUBROUTINES CALLED:  CAGESUB, CAGESUB2, ZEROICDU, ENDIMU, IMUBAD, NOATTOFF, SETISSW, VARDELAY.

R0413    ERASABLE INITIALIZATION:  SEE IMUMON.

R0414    ALARMS:  PROGRAM ALARM 00213 IF ISS TURN-ON REQUESTED WITHOUT ISS OPERATE.

R0416    EXIT:  ENDTNON EXITS TO C33TEST.  TASKS HAVING TO DO WITH INITIALIZATION EXIT AS FOLLOWS:  MISSION PROGRAM
R0418    WAITING AND INITIALIZATION COMPLETE, EXIT TO ENDIMU, MISSION PROGRAM WAITING AND INITIALIZATION FAILED, EXIT TO
R0420    IMUBAD, IMU NOT IN USE, EXIT TO TASKOVER.

R0421    OUTPUT:  ISS INITIALIZED.

 0422    REF   6  LAST  172   06,2227  4 1277 0  TNONTEST CS      IMODES30        AFTER PROCESSING ALL CHANGES, SEE IF IT
 0423    REF  15  LAST   90   06,2230  7 4736 0             MASK     BIT7           IS TIME TO ACT ON A TURN-ON SEQUENCE.
 0424    REF   3  LAST  172   06,2231  10 000 0             CCS      A
 0425    REF   1              06,2232  1 2374 1             TCF      C33TEST        NO - EXAMINE CHANNEL 33.

 0426    REF  14  LAST   89   06,2233  3 4735 1             CAF      BIT8           SEE IF FIRST SAMPLE OR SECOND.
 0427    REF   7  LAST  173   06,2234  7 1277 0             MASK     IMODES30
 0428    REF   4  LAST  174   06,2235  10 000 0             CCS      A
 0429    REF   1              06,2236  1 2242 0             TCF      PROCTNON       REACT AFTER SECOND SAMPLE.

 0430    REF  15  LAST  174   06,2237  3 4735 1             CAF      BIT8           IF FIRST SAMPLE, SET BIT TO REACT NEXT
 0431    REF   8  LAST  174   06,2240  27'277 0             ADS      IMODES30       TIME.
 0432    REF   2  LAST  174   06,2241  1 2374 1             TCF      C33TEST

R0433             PROCESS IMU TURN-ON REQUESTS AFTER WAITING 1 SAMPLE FOR ALL SIGNALS TO ARRIVE.

 0435    REF   1              06,2242  4 2777 0  PROCTNON   CS       BITS7&8
 0436    REF   9  LAST  174   06,2243  7 1277 0             MASK     IMODES30
 0437    REF  10  LAST  174   06,2244  55'277 0             TS       IMODES30
 0438    REF  20  LAST  172   06,2245  7 4727 0             MASK     BIT14          SEE IF TURN-ON REQUEST.
 0439    REF   5  LAST  174   06,2246  10 000 0             CCS      A
 0440    REF   1              06,2247  1 2347 1             TCF      OPONLY         OPERATE ON ONLY.

 0441    REF  11  LAST  174   06,2250  4 1277 0             CS       IMODES30       IF TURN-ON REQUEST, WE SHOULD HAVE IMU
 0442    REF  13  LAST  170   06,2251  7 4734 1             MASK     BIT9           OPERATE.
 0443    REF   6  LAST  174   06,2252  10 000 0             CCS      A
 0444                         06,2253  1 2256 0             TCF      +3

 0445    REF   1              06,2254  0 5571 1             TC       ALARM          ALARM IF NOT.
 0446                         06,2255   00213 1             OCT      213

 0447    REF   1              06,2256  0 2735 1    +3       TC       CAGESUB
 0448    REF   1              06,2257  3 3005 1             CAF      90SECS
 0449    REF   1              06,2260  0 5205 0             TC       WAITLIST
 0450    REF   3  LAST  165   E6,1414                       EBANK=   M11
 0451    REF   1              06,2261   02266 1             2CADR    ENDTNON
 0451    REF   1              06,2262   14106 0

 0452    REF   3  LAST  174   06,2263  1 2374 1             TCF      C33TEST

 0453    REF   2  LAST  174   06,2264  3 3005 1  RETNON     CAF      90SECS
 0454    REF   1              06,2265  0 5226 1             TC       VARDELAY

 0455    REF  14  LAST   90   06,2266  4 4743 1  ENDTNON    CS       BIT2           RESET TURN-ON REQUEST FAIL BIT.
 0456    REF  12  LAST  174   06,2267  7 1277 0             MASK     IMODES30
 0457    REF  13  LAST  174   06,2270  57'277 1             XCH      IMODES30
 0458    REF  15  LAST  174   06,2271  7 4743 1             MASK     BIT2           IF IT WAS OFF, SEND ISS DELAY COMPLETE.
 0459                         06,2272  0 0006 1             EXTEND
 0460    REF   1              06,2273  1 2306 1             BZF      ENDTNON2

 0461    REF  21  LAST  174   06,2274  3 4727 1             CAF      BIT14          IF IT WAS ON AND TURN-ON REQUEST NOW
 0462   REF  14  LAST  174   06,2275  7 1277 0             MASK    IMODES30       PRESENT, RE-ENTER 90 SEC DELAY IN WL.
 0463                        06,2276  0 0006 1             EXTEND
 0464   REF   1              06,2277  1 2264 1             BZF     RETNON

 0465   REF   1              06,2300  4 0074 0             CS      FLAGWRD0       IF IT IS NOT ON NOW, SEE IF A PROG WAS
 0466   REF   1              06,2301  7 4735 0             MASK    IMUSEBIT       WAITING.
 0467   REF   7  LAST  174   06,2302  10 000 0             CCS     A
 0468   REF   1              06,2303  1 5263 1             TCF     TASKOVER
 0469   REF   1              06,2304  0 4626 1             TC      POSTJUMP
 0470   REF   1              06,2305   17656 1             CADR    IMUBAD         UNSUCCESSFUL TURN-ON.

 0471   REF  13  LAST   89   06,2306  3 4726 0  ENDTNON2   CAF     BIT15          SEND ISS DELAY COMPLETE.
 0472                        06,2307  0 0006 1             EXTEND
 0473   REF   1              06,2310  05 012 1             WOR     CHAN12

 0474   REF   1              06,2311  0 4665 0             TC      IBNKCALL       TURN OFF NO ATT LAMP.
 0475   REF   1              06,2312   17253 0             CADR    NOATTOFF

 0476   REF   1              06,2313  0 5461 1  UNZ2       TC      ZEROICDU

 0477   REF   1              06,2314  4 4754 1             CS      BITS4&5        REMOVE ZERO AND COARSE.
 0478                        06,2315  0 0006 1             EXTEND
 0479   REF   2  LAST  175   06,2316  03 012 1             WAND    CHAN12

 0480   REF  15  LAST  136   06,2317  3 4732 0             CAF     BIT11          WAIT 10 SECS FOR CTRS TO FIND GIMBALS
 0481   REF   2  LAST  174   06,2320  0 5226 1             TC      VARDELAY

 0482   REF   1              06,2321  4 2774 0  ISSUP      CS      OCT54          REMOVE CAGING, IMU FAIL INHIBIT, AND
 0483   REF  15  LAST  175   06,2322  7 1277 0             MASK    IMODES30       ICDUFAIL INHIBIT FLAGS.
 0484   REF  16  LAST  175   06,2323  55'277 0             TS      IMODES30

 0485   REF  13  LAST   90   06,2324  4 4737 1             CS      BIT6           ENABLE DAP
 0486   REF   4  LAST  168   06,2325  7 1300 1             MASK    IMODES33
 0487   REF   5  LAST  175   06,2326  55'300 1             TS      IMODES33

 04871  REF   1              06,2327  4 0076 1             CS      FLAGWRD2       TEST DRIFTFLG: IF ON, DO NOTHING BECAUSE
 04872  REF   1              06,2330  7 4726 1             MASK    DRFTBIT        IMUCOMP SHOULD BE ALL SET UP(RESTART
 04873                       06,2331  0 0006 1             EXTEND                 WITH IMUSE DOWN).  IF OFF, SET DRIFTFLG
 04874                       06,2332  1 2336 1             BZF     +4             AND 1/PIPADT TO GET FREEFALL IMUCOMP
 04875  REF   2  LAST  175   06,2333  26 076 1             ADS     FLAGWRD2       GOING (FRESH START OR ISS TURN-ON).
 04876  REF   1              06,2334  3 0025 0             CA      TIME1
 04877  REF   1              06,2335  57'074 0             XCH     1/PIPADT       CANNOT GET HERE IF RESTART WITH IMUSE UP

 0488   REF   1              06,2336  0 2703 1             TC      SETISSW        ISS WARNING MIGHT HAVE BEEN INHIBITED.

 0489   REF  14  LAST  175   06,2337  4 4726 1             CS      BIT15          REMOVE IMU DELAY COMPLETE DISCRETE.
 0490                        06,2340  0 0006 1             EXTEND
 0491   REF   3  LAST  175   06,2341  03 012 1             WAND    CHAN12

 0492   REF   1              06,2342  3 4774 1             CAF     4SECS          DONT ENABLE PROG ALARM ON PIP FAIL FOR
 0493   REF   2  LAST  174   06,2343  0 5205 0             TC      WAITLIST         ANOTHER 4 SECS.
 0494   REF   1              E3,1474                       EBANK=  CDUIND
 0495   REF   1              06,2344   03241 0             2CADR   PFAILOK
 0495   REF   1              06,2345   16103 1

 0499   REF   2  LAST  175   06,2346  1 5263 1             TCF     TASKOVER

 0502   REF  13  LAST   90   06,2347  3 4741 1  OPONLY     CAF     BIT4             IF OPERATE ON ONLY, AND WE ARE IN COARSE
 0503                        06,2350  0 0006 1             EXTEND                   ALIGN, DONT ZERO THE CDUS BECAUSE WE
 0504   REF   4  LAST  175   06,2351  02 C12 0             RAND    CHAN12           MIGHT BE IN GIMBAL LOCK
 0505   REF   8  LAST  175   06,2352  10 000 0             CCS     A
 0506   REF   4  LAST  174   06,2353  1 2374 1             TCF     C33TEST

 0507   REF   2  LAST  175   06,2354  3 4735 1             CAF     IMUSEBIT         OTHERWISE, ZERO THE COUNTERS.
 0508   REF   2  LAST  175   06,2355  7 0074 0             MASK    FLAGWRD0         UNLESS SOMEONE IS USING THE IMU.
 0509   REF   9  LAST  176   06,2356  10 C00 0             CCS     A
 0510   REF   5  LAST  176   06,2357  1 2374 1             TCF     C33TEST

 0511   REF   1              06,2360  0 2746 0             TC      CAGESUB2         SET TURNON FLAGS.

 05115  REF   2  LAST  175   06,2361  0 4665 0  ISSZERO    TC      IBNKCALL         TURN OFF NO ATT LAMP
 05116  REF   2  LAST  175   06,2362   17253 0             CADR    NOATTOFF             IMU CAGE OFF ENTRY

 0512   REF  12  LAST   90   06,2363  3 4740 0             CAF     BIT5             ISS CDU ZERO
 0513                        06,2364  0 0C06 1             EXTEND
 0514   REF   5  LAST  176   06,2365  05 012 1             WOR     CHAN12

 05141  REF   2  LAST  175   06,2366  0 5461 1             TC      ZEROICDU
 0515   REF  14  LAST  175   06,2367  3 4737 0             CAF     BIT6             WAIT 300 MS FOR AGS TO RECEIVE SIGNAL.
 0516   REF   3  LAST  176   06,2370  0 5205 0             TC      WAITLIST
 0517   REF   4  LAST  174   E6,1414                       EBANK=  M11
 0518   REF   1              06,2371   C2313 1             2CADR   UNZ2
 0518   REF   1              06,2372   14106 0

 0519   REF   6  LAST  176   06,2373  1 2374 1             TCF     C33TEST
```

```
P0520    PROGRAM NAME:  C33TEST

R0521    FUNCTIONAL DESCRIPTION:  THIS PROGRAM MONITORS THREE FLIP-FLOP INBITS OF CHANNEL 33 AND CALLS THE APPROPRIATE
R0523    SUBROUTINE TO PROCESS A CHANGE.  IT IS ANALOGOUS TO IMUMON, WHICH MONITORS CHANNEL 30, EXCEPT THAT IT READS
R0525    CHANNEL 33 WITH A WAND INSTRUCTION BECAUSE A 'WRITE' PULSE IS REQUIRED TO RESET THE FLIP-FLOPS.  THE BITS
R0527    PROCESSED AND THE SUBROUTINES CALLED ARE:

R0528              BIT    FUNCTION                 SUBROUTINE
R0529              ---    --------                 ----------
R0530               13    PIPA FAIL                PIPFAIL
R0531               12    DOWNLINK TOO FAST        DNTMFAST
R0532               11    UPLINK TOO FAST          UPTMFAST

R0533    UPON ENTRY TO THE SUBROUTINE, THE NEW BIT STATE IS IN A.

R0534    CALLING SEQUENCE:  EVERY 480 MILLISECONDS AFTER TNONTEST.

R0535    JOBS OR TASKS INITIATED:  NONE.

R0536    SUBROUTINES CALLED:  PIPFAIL, DNTMFAST AND UPTMFAST ON BIT CHANGES.

R0537    ERASABLE INITIALIZATION:  C(IMODES33) = OCT 16000 ON A FRESH START OR RESTART, THEREFORE, THESE ALARMS WILL
R0539    REAPPEAR IF THE CONDITIONS PERSIST.

R0540    ALARMS:  NONE.

R0541    EXIT:  GLOCKMON.

R0542    OUTPUT:  UPDATED BITS 13, 12 AND 11 OF IMODES33 WITH CHANGES PROCESSED.

 0543    REF   6  LAST  175   06,2374  3 1300 0  C33TEST  CA     IMODES33        SEE IF RELEVANT CHAN 33 BITS HAVE
 0544    REF   1              06,2375  7 5017 0           MASK   33RDMSK
 0545    REF   2  LAST   95   06,2376  54 001 1           TS     L               CHANGED.
 0546    REF   2  LAST  177   06,2377  3 5017 1           CAF    33RDMSK
 0547                         06,2400  0 0006 1           EXTEND
 0548    REF   1              06,2401  03 033 1           WAND   CHAN33          RESETS FLIP-FLOP INPUTS
 0549                         06,2402  0 0006 1           EXTEND
 0550    REF   3  LAST  171   06,2403  06 001 0           RXOR   LCHAN
 0551                         06,2404  0 0006 1           EXTEND
 0552    REF   1              06,2405  1 2434 1           BZF    GLOCKMON        ON NO CHANGE.

 0553    REF   9  LAST  172   06,2406  54 070 1           TS     RUPTREG1        SAVE BITS WHICH HAVE CHANGED.
 0554    REF   7  LAST  177   06,2407  23'300 0           LXCH   IMODES33
 0555                         06,2410  0 0006 1           EXTEND
 0556    REF   4  LAST  177   06,2411  06 001 0           RXOR   LCHAN
 0557    REF   8  LAST  177   06,2412  55'300 1           TS     IMODES33        UPDATED IMODES33.

 0558    REF   3  LAST  167   06,2413  3 4746 0           CAF    ZERO
 0559    REF  10  LAST  177   06,2414  56 070 0           XCH    RUPTREG1
 0560                         06,2415  6 0000 1           DOUBLE
 0561    REF   1                06,2416  1 2421 0             TCF     NXTIBT +1        SCAN FOR BIT CHANGES.

 0562    REF   4  LAST  172     06,2417  6 4744 1   -1        AD      ONE
 0563    REF  11  LAST  177     06,2420  24 070 0  NXTIBT     INCR    RUPTREG1
 0564                           06,2421  6 0000 1   +1        DOUBLE
 0565    REF  10  LAST  176     06,2422  54 000 0             TS      A                (CODING IDENTICAL TO CHAN 30).
 0566    REF   2  LAST  178     06,2423  1 2420 1             TCF     NXTIBT

 0567    REF   3  LAST  172     06,2424  56 071 1             XCH     RUPTREG2
 0568    REF  12  LAST  178     06,2425  50 070 0             INDEX   RUPTREG1         GET NEW VALUE OF BIT WHICH CHANGED.
 0569    REF  16  LAST   89     06,2426  3 4730 1             CAF     BIT13
 0570    REF   9  LAST  177     06,2427  7 1300 1             MASK    IMODES33
 0571    REF  13  LAST  178     06,2430  50 070 0             INDEX   RUPTREG1
 0572    REF   1                06,2431  0 2763 1             TC      C33JMP

 0573    REF   4  LAST  178     06,2432  10 071 0  NXTFL33    CCS     RUPTREG2         PROCESS POSSIBLE ADDITIONAL CHANGES.
 0574    REF   3  LAST  178     06,2433  1 2417 0             TCF     NXTIBT -1
```

```
P0575   PROGRAM NAME:  GLOCKMON

R0576   FUNCTIONAL DESCRIPTION:  THIS PROGRAM MONITORS THE CDUZ COUNTER TO DETERMINE WHETHER THE ISS IS IN GIMBAL LOCK
R0578   AND TAKES ACTION IF IT IS.  THREE REGIONS OF MIDDLE GIMBAL ANGLE (MGA) ARE USED:

R0580            1) ABS(MGA) LESS THAN OR EQUAL TO 70 DEGREES - NORMAL MODE.
R0581            2) ABS(MGA) GREATER THAN 70 DEGREES AND LESS THAN OR EQUAL TO 85 DEGREES - GIMBAL LOCK LAMP TURNED ON.
R0583            3) ABS(MGA) GREATER THAN 85 DEGREES - ISS PUT IN COARSE ALIGN AND NO ATT LAMP TURNED ON.

R0585   CALLING SEQUENCE:  EVERY 480 MILLISECONDS AFTER C33TEST.

R0586   JOBS OR TASKS INITIATED:  NONE.

R0587   SUBROUTINES CALLED:  1) SETCOARS WHEN ABS(MGA) GREATER THAN 85 DEGREES AND ISS NOT IN COARSE ALIGN.
R0589                        2) LAMPTEST BEFORE TURNING OFF GIMBAL LOCK LAMP.

R0590   ERASABLE INITIALIZATION:
R0591            1) FRESH START OR RESTART WITH NO GROUPS ACTIVE:  C(CDUZ) = 0, IMODES30 BIT 6 = 0, IMODES33 BIT 1 = 0.
R0593            2) RESTART WITH GROUPS ACTIVE:  SAME AS FRESH START EXCEPT C(CDUZ) NOT CHANGED SO GIMBAL MONITOR
R0595                                            PROCEEDS AS BEFORE.

R0596   ALARMS:  1) MGA REGION (2) CAUSES GIMBAL LOCK LAMP TO BE LIT.
R0597            2) MGA REGION (3) CAUSES THE ISS TO BE PUT IN COARSE ALIGN AND THE NO ATT LAMP TO BE LIT IF EITHER NOT
R0599               SO ALREADY.

 0600   REF   2  LAST  161    06,2434  10 034 1  GLOCKMON CCS     CDUZ
 0601   REF   1               06,2435  1 2441 0           TCF     GLOCKCHK          SEE IF MAGNITUDE OF MGA IS GREATER THAN
 0602   REF   1               06,2436  1 2465 0           TCF     SETGLOCK          70 DEGREES.
 0603   REF   2  LAST  179    06,2437  1 2441 0           TCF     GLOCKCHK
 0604   REF   2  LAST  179    06,2440  1 2465 0           TCF     SETGLOCK

 0605   REF   1               06,2441  6 2512 0  GLOCKCHK AD      -70DEGS
 0606                         06,2442  0 0006 1           EXTEND
 0607   REF   3  LAST  179    06,2443  6 2464 0           BZMF    SETGLOCK -1       NO LOCK.

 0608   REF   1               06,2444  6 2513 1           AD      -15DEGS           SEE IF ABS(MGA) GREATER THAN 85 DEGREES.
 0609                         06,2445  0 0006 1           EXTEND
 0610   REF   1               06,2446  6 2462 0           BZMF    NOGIMRUN

 0611   REF  14  LAST  176    06,2447  3 4741 1           CAF     BIT4              IF SO, SYSTEM SHOULD BE IN COARSE ALIGN
 0612                         06,2450  0 0006 1           EXTEND                    TO PREVENT GIMBAL RUNAWAY.
 0613   REF   6  LAST  176    06,2451  02 012 0           RAND    CHAN12
 0614   REF  11  LAST  178    06,2452  10 000 0           CCS     A
 0615   REF   2  LAST  179    06,2453  1 2462 1           TCF     NOGIMRUN

 0616   REF   3  LAST  176    06,2454  0 4665 0           TC      IBNKCALL
 0617   REF   1               06,2455   17131 1           CADR    SETCOARS

 06173  REF   1               06,2456  3 6263 0           CAF     SIX               ENABLE ISS ERROR COUNTERS IN 60 MS
 06174  REF   4  LAST  176    06,2457  0 5205 0           TC      WAITLIST
 06175  REF   2  LAST  176   E3,1474                       EBANK= CDUIND
 06176  REF   1              06,2460   03125 1             2CADR  CA+ECE
 06176  REF   1              06,2461   16103 1
 0618   REF  15  LAST  176   06,2462  3 4737 0  NCGIMRUN CAF      BIT6           TURN ON GIMBAL LOCK LAMP.
 0619   REF   4  LAST  179   06,2463  1 2465 0           TCF      SETGLOCK

 0620   REF   4  LAST  177   06,2464  3 4746 0   -1      CAF      ZERO
 0621   REF   6  LAST  167   06,2465  6 1035 0  SETGLOCK AD       DSPTAB +11D    SEE IF PRESENT STATE OF GIMBAL LOCK LAMP
 0622   REF  16  LAST  180   06,2466  7 4737 1           MASK     BIT6           AGREES WITH DESIRED STATE BY HALF ADDING
 0623                        06,2467  0 0006 1           EXTEND                  THE TWO.
 0624   REF   1              06,2470  1 3006 0           BZF      GLOCKOK        OK AS IS.

 0625   REF   7  LAST  180   06,2471  7 1035 1           MASK     DSPTAB +11D    IF OFF, DONT TURN ON IF IMU BEING CAGED.
 0626   REF  12  LAST  179   06,2472  10 000 0           CCS      A
 0627   REF   1              06,2473  1 2507 0           TCF      GLAMPTST       TURN OFF UNLESS LAMP TEST IN PROGRESS.

 0628   REF  17  LAST  180   06,2474  3 4737 0           CAF      BIT6
 0629   REF  17  LAST  175   06,2475  7 1277 0           MASK     1MODES30
 0630   REF  13  LAST  180   06,2476  10 000 0           CCS      A
 0631   REF   2  LAST  180   06,2477  1 3006 0           TCF      GLOCKOK

 0632   REF   8  LAST  180   06,2500  4 1035 1  GLINVERT CS       DSPTAB +11D    INVERT GIMBAL LOCK LAMP.
 0633   REF  18  LAST  180   06,2501  7 4737 1           MASK     BIT6
 0634   REF  15  LAST  175   06,2502  6 4726 0           AD       BIT15          TO INDICATE CHANGE IN DSPTAB +11D.
 0635   REF   9  LAST  180   06,2503  57'035 0           XCH      DSPTAB +11D
 0636   REF   1              06,2504  7 2162 1           MASK     OCT37737
 0637   REF  10  LAST  180   06,2505  27'035 1           ADS      DSPTAB +11D
 0638   REF   3  LAST  180   06,2506  1 3006 0           TCF      GLOCKOK

 0639   REF   1              06,2507  0 2766 1  GLAMPTST TC       LAMPTEST       TURN OFF UNLESS LAMP TEST IN PROGRESS.
 0640   REF   4  LAST  180   06,2510  1 3006 0           TCF      GLOCKOK
 0641   REF   1              06,2511  1 2500 1           TCF      GLINVERT

 0642                        06,2512   63434 1  -70DEGS  DEC      -.38888        -70 DEGREES SCALED IN HALF-REVOLUTIONS.
 0643                        06,2513   75252 0  -15DEGS  DEC      -.08333
```

```
P0644   PROGRAM NAME:  TLIM.

R0645   FUNCTIONAL DESCRIPTION:  THIS PROGRAM MAINTAINS THE TEMP LAMP (BIT 4 OF CHANNEL 11) ON THE DSKY TO AGREE WITH
R0647   THE TEMP SIGNAL FROM THE ISS (BIT 15 OF CHANNEL 30).  HOWEVER, THE LIGHT WILL NOT BE TURNED OFF IF A LAMP TEST
R0649   IS IN PROGRESS.

R0650   CALLING SEQUENCE:  CALLED BY IMUMON ON A CHANGE OF BIT 15 OF CHANNEL 30.

R0651   JOBS OR TASKS INITIATED:  NONE.

R0652   SUBROUTINES CALLED:  LAMPTEST.

R0653   ERASABLE INITIALIZATION:  FRESH START AND RESTART TURN THE TEMP LAMP OFF.

R0655   ALARMS:  TEMP LAMP TURNED ON WHEN IMU TEMP GOES OUT OF LIMITS.

R0656   EXIT:  NXTIFAIL.

R0657   OUTPUT:  SERVICE OF TEMP LAMP.                                                    IN A, EXCEPT FOR TLIM.

 0659   REF   1                06,2514  7 4724 0  TLIM      MASK    POSMAX            REMOVE BIT FROM WORD OF CHANGES AND SET
 0660   REF   5  LAST  176     06,2515  54 071 0            TS      RUPTREG2          DSKY TEMP LAMP ACCORDINGLY.

 0661   REF  18  LAST  180     06,2516  11'277 0            CCS     IMODES30
 0662   REF   1                06,2517  1 2525 0            TCF     TEMPOK
 0663   REF   2  LAST  181     06,2520  1 2525 0            TCF     TEMPOK

 0664   REF  15  LAST  179     06,2521  3 4741 1            CAF     BIT4              TURN ON LAMP.
 0665                          06,2522  0 0006 1            EXTEND
 0666   REF   1                06,2523  05 011 1            WOR     DSALMOUT
 0667   REF   1                06,2524  1 2225 1            TCF     NXTIFAIL

 0668   REF   2  LAST  180     06,2525  0 2766 1  TEMPOK    TC      LAMPTEST          IF TEMP NOW OK, DONT TURN OFF LAMP IF
 0669   REF   2  LAST  181     06,2526  1 2225 1            TCF     NXTIFAIL          LAMP TEST IN PROGRESS.

 0670   REF  16  LAST  181     06,2527  4 4741 0            CS      BIT4
 0671                          06,2530  0 0006 1            EXTEND
 0672   REF   2  LAST  181     06,2531  03 011 1            WAND    DSALMOUT          TURN OFF LAMP
 0673   REF   3  LAST  181     06,2532  1 2225 1            TCF     NXTIFAIL
```

```
P0674    PROGRAM NAME:  ITURNON.

R0675    FUNCTIONAL DESCRIPTION:  THIS PROGRAM IS CALLED BY IMUMON WHEN A CHANGE OF BIT 14 OF CHANNEL 30 (ISS TURN-ON
R0677    REQUEST) IS DETECTED.  UPON ENTRY, ITURNON CHECKS IF A TURN-ON DELAY SEQUENCE HAS FAILED, AND IF SO, IT EXITS.
R0679    IF NOT, IT CHECKS WHETHER THE TURN-ON REQUEST CHANGE IS TO ON OR OFF.  IF ON, IT SETS BIT 7 OF IMODES30 TO 1 SO
R0681    THAT TNONTEST WILL INITIATE THE ISS INITIALIZATION SEQUENCE.  IF OFF, THE TURN-ON DELAY SIGNAL, CHANNEL 12 BIT
R0683    15, IS CHECKED AND IF IT IS ON, ITURNON EXITS.  IF THE DELAY SIGNAL IS OFF, PROGRAM ALARM 00207 IS ISSUED, BIT 2
R0685    OF IMODES30 IS SET TO 1 AND THE PROGRAM EXITS.
R0686              THE SETTING OF BIT 2 OF IMODES30 (ISS DELAY SEQUENCE FAIL) INHIBITS THIS ROUTINE AND IMUOP FROM
R0688    PROCESSING ANY CHANGES.  THIS BIT WILL BE RESET BY THE ENDTNON ROUTINE WHEN THE CURRENT 90 SECOND DELAY PERIOD
R0690    ENDS.

R0691    CALLING SEQUENCE:  FROM IMUMON WHEN ISS TURN-ON REQUEST CHANGES STATE.

R0692    JOBS OR TASKS INITIATED:  NONE.

R0693    SUBROUTINES CALLED:  ALARM, IF THE ISS TURN-ON REQUEST IS NOT PRESENT FOR 90 SECONDS.

R0695    ERASABLE INITIALIZATION:  FRESH START AND RESTART SET BIT 15 OF CHANNEL 12 AND BITS 2 AND 7 OF IMODES30 TO 0,
R0697    AND BIT 14 OF IMODES30 TO 1.

R0698    ALARMS:  PROGRAM ALARM 00207 IS ISSUED IF THE ISS TURN-ON REQUEST SIGNAL IS NOT PRESENT FOR 90 SECONDS.

R0700    EXIT:  NXTIFAIL.

R0701    OUTPUT:  BIT 7 OF IMODES30 TO START ISS INITIALIZATION, OR BIT 2 OF IMODES30 AND PROGRAM ALARM 00207 TO INDICATE
R0703    A FAILED TURN-ON SEQUENCE.

 0704    REF  16  LAST  174    06,2533  3 4743 0  ITURNON   CAF    BIT2               IF DELAY REQUEST HAS GONE OFF
 0705    REF  19  LAST  181    06,2534  7 1277 0            MASK   IMODES30           PREMATURELY, DO NOT PROCESS ANY CHANGES
 0706    REF  14  LAST  180    06,2535  10 000 0            CCS    A                  UNTIL THE CURRENT 90 SEC WAIT EXPIRES.
 0707    REF   4  LAST  181    06,2536  1 2225 1            TCF    NXTIFAIL

 0708    REF  22  LAST  174    06,2537  3 4727 1            CAF    BIT14              SEE IF JUST ON OR OFF.
 0709    REF  20  LAST  182    06,2540  7 1277 0            MASK   IMODES30
 0710                          06,2541  0 0006 1            EXTEND
 0711    REF   1               06,2542  1 2556 1            BZF    ITURNON2           IF JUST ON.

 0712    REF  16  LAST  180    06,2543  3 4726 0            CAF    BIT15
 0713                          06,2544  0 0006 1            EXTEND                    SEE IF DELAY PRESENT DISCRETE HAS BEEN
 0714    REF   7  LAST  179    06,2545  02 012 0            RAND   CHAN12             SENT. IF SO, ACTION COMPLETE
 0715                          06,2546  0 0006 1            EXTEND
 0716                          06,2547  1 2551 0            BZF    +2
 0717    REF   5  LAST  182    06,2550  1 2225 1            TCF    NXTIFAIL

 0718    REF  17  LAST  182    06,2551  3 4743 0            CAF    BIT2               IF NOT, SET BIT TO INDICATE REQUEST NOT
 0719    REF  21  LAST  182    06,2552  27'277 0            ADS    IMODES30           PRESENT FOR FULL DURATION.
 0720    REF   2  LAST  174    06,2553  0 5571 1            TC     ALARM
 0721                          06,2554   00207 1            OCT    207
 0722    REF   6  LAST  182    06,2555  1 2225 1            TCF    NXTIFAIL
 0723    REF  22  LAST  182   06,2556  4 1277 0  ITURNON2 CS       IMODES30         SET BIT7 TO INDICATE WAIT OF 1 SAMPLE
 0724    REF  16  LAST  174   06,2557  7 4736 0           MASK     BIT7
 0725    REF  23  LAST  183   06,2560  27'277 0           ADS      IMODES30
 0726    REF   1              06,2561  3 2564 1           CAF      RRINIT
 07261   REF   3  LAST  162   06,2562  54 110 0           TS       RADMODES
 0727    REF   7  LAST  182   06,2563  1 2225 1           TCF      NXTIFAIL

 07271                        06,2564   00102 1  RRINIT   OCT      00102
```

```
R0728    PROGRAM NAME:  IMUCAGE.

R0729    FUNCTIONAL DESCRIPTION:  THIS PROGRAM PROCESSES CHANGES OF THE IMUCAGE INBIT, CHANNEL 30 BIT 11.  IF THE BIT
R0731    CHANGES TO 0 (CAGE BUTTON PRESSED), THE ISS IS CAGED (ICDU ZERO + COARSE ALIGN + NO ATT LAMP) UNTIL THE
R0733    ASTRONAUT SELECTS ANOTHER PROGRAM TO ALIGN THE ISS.  ANY PULSE TRAINS TO THE ICDU'S AND GYRO'S ARE TERMINATED,
R0735    THE ASSOCIATED OUTCOUNTERS ARE ZEROED AND THE GYRO'S ARE DE-SELECTED.  NO ACTION OCCURS WHEN THE BUTTON IS
R0737    RELEASED (INBIT CHANGES TO 1).

R0738    CALLING SEQUENCE:  BY IMUMON WHEN IMU CAGE BIT CHANGES.

R0739    JOBS OR TASKS INITIATED:  NONE.

R0740    SUBROUTINES CALLED:  CAGESUB.

R0741    ERASABLE INITIALIZATION:  FRESH START AND RESTART SET BIT 11 OF IMODES30 TO 1.

R0743    ALARMS:  NONE.

R0744    EXIT:  NXTIFAIL.

R0745    OUTPUT:  ISS CAGED, COUNTERS ZEROED, PULSE TRAINS TERMINATED AND NO ATT LAMP LIT.

 0747    REF  15  LAST  162    06,2565  10 000 0  IMUCAGE   CCS     A                    NO ACTION IF GOING OFF.
 0748    REF   1               06,2566  1 2361 0            TCF     ISSZERO
 0749    REF   1               06,2567  4 3002 1            CS      OCT77000             TERMINATE ICDU,RCDU, GYRO PULSE TRAINS
 0750                          06,2570  0 0006 1            EXTEND
 0751    REF   1               06,2571  03 014 1            WAND    CHAN14

 0752    REF   1               06,2572  4 2776 1            CS      OCT272               KNOCK DOWN DISPLAY INERTIAL DATA, IMU
 07521                         06,2573  0 0006 1            EXTEND                       ERROR COUNTER ENABLE, ZERO ICDU, COARSE
 07522   REF   3  LAST  182    06,2574  03 012 1            WAND    CHAN12               ALIGN ENABLE, RR ERROR COUNTER ENABLE.

 075221 REF    1               06,2575  4 4736 0            CS      ENGONBIT             INSURE ENGONFLG IS CLEAR.
 075222 REF    2  LAST  167    06,2576  7 0101 0            MASK    FLAGWRD5
 075223 REF    3  LAST  184    06,2577  54 101 0            TS      FLAGWRD5
 07523   REF   1               06,2600  4 4346 0            CS      PRIO30               TURN ENGINE OFF.
 07524                         06,2601  0 0006 1            EXTEND
 07525   REF   3  LAST  181    06,2602  02 011 0            RAND    DSALMOUT
 075251 REF   23  LAST  182    06,2603  6 4727 1            AD      BIT14
 075252                        06,2604  0 0006 1            EXTEND
 075253 REF    4  LAST  184    06,2605  01 011 0            WRITE   DSALMOUT             FORCE BIT14=1, BIT13=0.

 07526   REF   1               06,2606  0 2743 0            TC      CAGESUB1

 07527   REF   4  LAST  179    06,2607  0 4665 0            TC      IBNKCALL             KNOCK DOWN TRACK, REFSMMAT, DRIFT FLAGS
 07528   REF   1               06,2610   17162 1            CADR    RNDREFDR

 0753    REF   5  LAST  180    06,2611  4 4746 1            CS      ZERO
 0754    REF   1               06,2612  54 050 0            TS      CDUXCMD
 0755    REF   1               06,2613  54 051 1            TS      CDUYCMD
 0756    REF    1                  06,2614   54 052 1           TS      CDUZCMD
 0757    REF    1                  06,2615   54 047 0           TS      GYROCMD

 0758    REF    1                  06,2616   4 3001 1           CS      OCT740          HAVING WAITED AT LEAST 27 MCT FROM
 0759                              06,2617   0 0006 1           EXTEND                  GYRO PULSE TRAIN TERMINATION, WE CAN
 0760    REF    2  LAST   184      06,2620   03 014 1           WAND    CHAN14          DE-SELECT THE GYROS
 0761    REF    3  LAST   183      06,2621   1 2225 1           TCF     NXTIFAIL
```

```
P0762    PROGRAM NAME:  IMUOP.

R0763    FUNCTIONAL DESCRIPTION:  THIS PROGRAM PROCESSES CHANGES IN THE ISS OPERATE DISCRETE, BIT 9 OF CHANNEL 30.
R0765    IF THE INBIT CHANGES TO 0, INDICATING ISS ON, IMUOP GENERALLY SETS BIT 7 OF IMODES30 TO 1 TO REQUEST ISS
R0767    INITIALIZATION VIA TNONTEST.  AN EXCEPTION IS DURING A FAILED ISS DELAY DURING WHICH BIT 2 OF IMODES30 IS SET
R0769    TO 1 AND NO FURTHER INITIALIZATION IS REQUIRED.  WHEN THE INBIT CHANGES TO 1, INDICATING ISS OFF, IMUSEFLG IS
R0771    TESTED TO SEE IF ANY PROGRAM WAS USING THE ISS.  IF SO, PROGRAM ALARM 00214 IS ISSUED.

R0773    CALLING SEQUENCE:  BY IMUMON WHEN BIT 9 OF CHANNEL 30 CHANGES.

R0774    JOBS OR TASKS INITIATED:  NONE.

R0775    SUBROUTINES CALLED:  ALARM, IF ISS IS TURNED OFF WHILE IN USE.

R0776    ERASABLE INITIALIZATION:  ON FRESH START AND RESTART, BIT 9 OF IMODES30 IS SET TO 1 EXCEPT WHEN THE GIMBAL LOCK
R0778    LAMP IS ON, IN WHICH CASE IT IS SET TO 0.  THIS PREVENTS ICDU ZERO BY TNONTEST WITH THE ISS IN GIMBAL LOCK.

R0780    ALARMS:  PROGRAM ALARM 00214 IF THE ISS IS TURNED OFF WHILE IN USE.

R0781    EXIT:  NXTIFAIL.

R0782    OUTPUT:  ISS INITIALIZATION REQUEST (IMODES30 BIT 7) OR PROGRAM ALARM 00214.

 0784                              06,2622  0 0006 1  IMUOP     EXTEND
 0785    REF    1                  06,2623  1 2643 0            BZF      IMUOP2

 0786    REF   10  LAST  178       06,2624  4 1300 1            CS       IMODES33         DISABLE DAP
 0787    REF   19  LAST  180       06,2625  7 4737 1            MASK     BIT6
 0788    REF   11  LAST  186       06,2626  27'300 1            ADS      IMODES33

 07885   REF    5  LAST  184       06,2627  0 4665 0            TC       IBNKCALL         KNOCK DOWN TRACK, REFSMMAT, DRIFT FLAGS
 07886   REF    2  LAST  184       06,2630   17162 1            CADR     RNDREFDR

 07887   REF    2  LAST  174       06,2631  4 2777 0            CS       BITS7&8          KNOCK DOWN RENDEZVOUS, IMUUSE FLAGS
 07888   REF    3  LAST  176       06,2632  7 0074 0            MASK     FLAGWRD0
 0789    REF    4  LAST  186       06,2633  56 074 1            XCH      FLAGWRD0         IF GOING OFF, ALARM IF PROG USING IMU.
 0789I                             06,2634  4 0000 0            COM
 0790    REF    1                  06,2635  7 4735 0            MASK     IMUSEFLG
 0791    REF   16  LAST  184       06,2636  10 000 0            CCS      A
 0792    REF    9  LAST  135       06,2637  1 2225 1            TCF      NXTIFAIL

 0793    REF    3  LAST  182       06,2640  0 5571 1            TC       ALARM
 0794                              06,2641   00214 0            OCT      214
 0795    REF   10  LAST  186       06,2642  1 2225 1            TCF      NXTIFAIL

 0796    REF   18  LAST  182       06,2643  3 4743 0  IMUOP2    CAF      BIT2             SEE IF FAILED ISS TURN-ON SEQ IN PROG.
 0797    REF   24  LAST  183       06,2644  7 1277 0            MASK     IMODES30
 0798    REF   17  LAST  186       06,2645  10 000 0            CCS      A
 0799    REF   11  LAST  186       06,2646  1 2225 1            TCF      NXTIFAIL         IF SO, DONT PROCESS UNTIL PRESENT 90
 0800    REF    2  LAST  132       06,2647  1 2556 1            TCF      ITURNON2         SECONDS EXPIRES.
```

```
L        T4RUPT PROGRAM                                                                USER'S PAGE NO.  23       F6 S4

P0801    PROGRAM NAME:  PIPFAIL

R0802    FUNCTIONAL DESCRIPTION:  THIS PROGRAM PROCESSES CHANGES OF BIT 13 OF CHANNEL 33, PIPA FAIL.  IT SETS BIT 10 OF
R0804    IMODES30 TO AGREE.  IT CALLS SETISSW IN CASE A PIPA FAIL NECESSITATES AN ISS WARNING.  IF NOT,I.E., IMODES30
R0806    BIT 1 = 1, AND A PIPA FAIL IS PRESENT AND THE ISS IS NOT BEING INITIALIZED, PROGRAM ALARM 00212 IS ISSUED.

R0808    CALLING SEQUENCE:  BY C33TEST ON CHANGES OF CHANNEL 33 BIT 13.

R0809    JOBS OR TASKS INITIATED:  NONE.

R0810    SUBROUTINES CALLED:  1) SETISSW, AND 2) ALARM (SEE FUNCTIONAL DESCRIPTION).

R0812    ERASABLE INITIALIZATION:  SEE IMUMON FOR INITIALIZATION OF IMODES30.  THE RELAVANT BITS ARE 5, 7, 8, 9, AND 10.

R0814    ALARMS:  PROGRAM ALARM 00212 IF PIPA FAIL IS PRESENT BUT NEITHER ISS WARNING IS TO BE ISSUED NOR THE ISS IS
R0816    BEING INITIALIZED.

R0817    EXIT:  NXTFL33.

R0818    OUTPUT:  PROGRAM ALARM 00212 AND ISS WARNING MAINTENANCE.

 0819    REF  18  LAST  186    06,2650  10 000 0  PIPFAIL   CCS     A                 SET BIT10 IN IMODES30 SO ALL ISS WARNING
 0820    REF  14  LAST  186    06,2651  3 4733 1            CAF     BIT10             INFO IS IN ONE REGISTER.
 0821    REF  25  LAST  186    06,2652  57'277 1            XCH     IMODES30
 0822    REF   1               06,2653  7 3004 1            MASK    -BIT10
 0823    REF  26  LAST  187    06,2654  27'277 0            ADS     IMODES30

 0824    REF   2  LAST  175    06,2655  0 2703 1            TC      SETISSW

 0825    REF  27  LAST  187    06,2656  4 1277 0            CS      IMODES30          IF PIP FAIL DOESNT LIGHT ISS WARNING, DO
 0826    REF  14  LAST   90    06,2657  7 4744 0            MASK    BIT1              A PROGRAM ALARM IF IMU OPERATING BUT NOT
 0827    REF  19  LAST  187    06,2660  10 000 0            CCS     A                 CAGED OR BEING TURNED ON.
 0828    REF   1               06,2661  1 2432 1            TCF     NXTFL33

 0829    REF  28  LAST  187    06,2662  3 1277 1            CA      IMODES30
 0830    REF   1               06,2663  7 3000 0            MASK    OCT1720
 0831    REF  20  LAST  187    06,2664  10 000 0            CCS     A
 0832    REF   2  LAST  187    06,2665  1 2432 1            TCF     NXTFL33           ABOVE CONDITION NOT MET.

 0833    REF   4  LAST  186    06,2666  0 5571 1            TC      ALARM
 0834                          06,2667   00212 0            OCT     212
 0835    REF   3  LAST  187    06,2670  1 2432 1            TCF     NXTFL33
```

```
P0836    PROGRAM NAMES:  DNTMFAST, UPTMFAST

R0837    FUNCTIONAL DESCRIPTION:  THESE PROGRAMS PROCESS CHANGES OF BITS 12 AND 11 OF CHANNEL 33.  IF A BIT CHANGES TO A
R0839    0, A PROGRAM ALARM IS ISSUED.  THE ALARMS ARE:

R0840                BIT     ALARM            CAUSE
R0841                ---     -----            -----
R0842                 12     01105            DOWNLINK TOO FAST
R0843                 11     01106            UPLINK TOO FAST

R0844    CALLING SEQUENCE:  BY C33TEST ON A BIT CHANGE.

R0845    SUBROUTINES CALLED:  ALARM, IF A BIT CHANGES TO A 0.

R0846    ERASABLE INITIALIZATION:  FRESH START OR RESTART, BITS 12 AND 11 OF IMODES33 ARE SET TO 1.

R0848    ALARMS:  SEE FUNCTIONAL DESCRIPTION.

R0849    EXIT:  NXTFL33.

R0850    OUTPUT:  PROGRAM ALARM ON A BIT CHANGE TO 0.

 0851    REF  21  LAST  187   06,2671  10 000 0  DNTMFAST CCS     A                  DO PROG ALARM IF TM TOO FAST.
 0852    REF   4  LAST  187   06,2672  1 2432 1           TCF     NXTFL33

 0853    REF   5  LAST  187   06,2673  0 5571 1           TC      ALARM
 0854                         06,2674   01105 1           OCT     1105
 0855    REF   5  LAST  188   06,2675  1 2432 1           TCF     NXTFL33

 0856    REF  22  LAST  188   06,2676  10 000 0  UPTMFAST CCS     A                  SAME AS DNLINK TOO FAST WITH DIFFERENT
 0857    REF   6  LAST  188   06,2677  1 2432 1           TCF     NXTFL33            ALARM CODE.

 0858    REF   6  LAST  188   06,2700  0 5571 1           TC      ALARM
 0859                         06,2701   01106 1           OCT     1106
 0860    REF   7  LAST  188   06,2702  1 2432 1           TCF     NXTFL33
```

```
P0861    PROGRAM NAME:  SETISSW

R0862    FUNCTIONAL DESCRIPTION:  THIS PROGRAM TURNS THE ISS WARNING LAMP ON AND OFF (CHANNEL 11 BIT 1 = 1 FOR ON,
R0864    0 FOR OFF) DEPENDING ON THE STATUS OF IMODES30 BITS 13 (IMU FAIL) AND 4 (INHIBIT IMU FAIL), 12 (ICDU FAIL) AND
R0866    3 (INHIBIT ICDU FAIL), AND 10 (PIPA FAIL) AND 1 (INHIBIT PIPA FAIL).  THE LAMP IS LEFT ON IF A LAMP TEST IS IN
R0868    PROGRESS.

R0869    CALLING SEQUENCE:  CALLED BY IMUMON ON CHANGES TO IMU FAIL AND ICDU FAIL.  CALLED BY IFAILOK AND PFAILOK UPON
R0871    REMOVAL OF THE FAIL INHIBITS.  CALLED BY PIPFAIL WHEN THE PIPA FAIL DISCRETE CHANGES.  IT IS CALLED BY PIPUSE
R0873    SINCE THE PIPA FAIL PROGRAM ALARM MAY NECESSITATE AN ISS WARNING, AND LIKEWISE BY PIPFREE WHEN THE ALARM DEPARTS
R0875    AND IT IS CALLED BY IMUZERO3 AND ISSUP AFTER THE FAIL INHIBITS HAVE BEEN REMOVED.

R0877    JOBS OR TASKS INITIATED:  NONE.

R0878    SUBROUTINES CALLED:  NONE.

R0879    ERASABLE INITIALIZATION:

R0880              1) IMODES30 - SEE IMUMON.
R0881              2) IMODES33 BIT 1 = 0 (LAMP TEST NOT IN PROGRESS).

R0882    ALARMS:  ISS WARNING.

R08821   THE FOLLOWING PROGRAM ALARMS WILL SHOW WHICH FAILURE CAUSED THE ISS WARN
R08822   PROGRAM ALARM 00777  PIPA FAIL
R08823   PROGRAM ALARM 03777  ICDU FAIL
R08824   PROGRAM ALARM 04777  ICDU , PIPA FAILS
R08825   PROGRAM ALARM 07777  IMU FAIL
R08826   PROGRAM ALARM 10777  IMU , PIPA FAILS
R08827   PROGRAM ALARM 13777  IMU , ICDU FAILS
R08828   PROGRAM ALARM 14777  IMU , ICDU , PIPA FAILS

R0883    EXIT:  VIA Q.

R0884    OUTPUT:  ISS WARNING LAMP SET PROPERLY.

 0885    REF   1                06,2703   3 4752 0  SETISSW  CAF      OCT15          SET ISS WARNING USING THE FAIL BITS IN
 0886    REF  29  LAST   187    06,2704   7 1277 0           MASK     IMODES30       BITS 13, 12, AND 10 OF IMODES30 AND THE
 0887                           06,2705   0 0006 1           EXTEND                  FAILURE INHIBIT BITS IN POSITIONS
 0888    REF  15  LAST   187    06,2706   7 4733 0           MP       BIT10          4, 3, AND 1.
 0889    REF  30  LAST   189    06,2707   3 1277 1           CA       IMODES30
 0890                           06,2710   0 0006 1           EXTEND
 0891    REF   5  LAST   177    06,2711   04 001 1           ROR      LCHAN          0 INDICATES FAILURE
 0892                           06,2712   4 0000 0           COM
 0893    REF   1                06,2713   7 5016 1           MASK     OCT15000
 0894    REF  23  LAST   188    06,2714   10 000 0           CCS      A
 0895    REF   1                06,2715   1 2726 1           TCF      ISSWON         FAILURE.

 0896    REF  15  LAST   187    06,2716   3 4744 1  ISSWOFF  CAF      BIT1           DONT TURN OFF ISS WARNING IF LAMP TEST
 0897    REF  12  LAST   186    06,2717   7 1300 1           MASK     IMODES33       IN PROGRESS.
 0898     REF  24  LAST  185   06,2720  10 000 0              CCS    A
 0899     REF   3  LAST  167   06,2721  0 0002 0              TC     Q

 0900     REF  16  LAST  189   06,2722  4 4744 0              CS     BIT1
 0901                          06,2723  0 0006 1              EXTEND
 0902     REF   5  LAST  184   06,2724  03 011 1              WAND   DSALMOUT
 0903     REF   4  LAST  190   06,2725  0 0002 0              TC     Q

 0904                          06,2726  0 0006 1   ISSWON     EXTEND
 090402   REF   1              06,2727  22 066 1              QXCH   ITEMP6
 090404   REF   1              06,2730  0 5740 1              TC     VARALARM          TELL EVERYONE WHAT CAUSED THE ISSWARNING
 09041    REF  17  LAST  190   06,2731  3 4744 1              CAF    BIT1
 0905                          06,2732  0 0006 1              EXTEND
 0906     REF   6  LAST  190   06,2733  05 011 1              WOR    DSALMOUT
 0907     REF   2  LAST  190   06,2734  0 0066 1              TC     ITEMP6

 0908     REF   1              06,2735  4 3003 0   CAGESUB    CS     BITS6&15          SET OUTBITS AND INTERNAL FLAGS FOR
 0909                          06,2736  0 0006 1              EXTEND                   SYSTEM TURN-ON OR CAGE. DISABLE THE
 0910     REF   9  LAST  184   06,2737  03 012 1              WAND   CHAN12            ERROR COUNTER AND REMOVE IMU DELAY COMP.
 0911     REF   2  LAST  175   06,2740  3 4754 0              CAF    BITS4&5           SEND ZERO AND COARSE.
 0912                          06,2741  0 0006 1              EXTEND
 0913     REF  10  LAST  190   06,2742  05 012 1              WOR    CHAN12

 0914     REF  11  LAST  180   06,2743  4 1035 1   CAGESUB1   CS     DSPTAB +11D       TURN ON NO ATT LAMP
 0915     REF   1              06,2744  7 2773 1              MASK   OC40010
 0916     REF  12  LAST  190   06,2745  27'035 1              ADS    DSPTAB +11D

 0918     REF  31  LAST  189   06,2746  4 1277 0   CAGESUB2   CS     IMODES30          SET FLAGS TO INDICATE CAGING OR TURN-ON
 0919     REF   1              06,2747  7 2775 1              MASK   OCT75                 AND INHIBIT ALL ISS WARNING INFO
 0920     REF  32  LAST  190   06,2750  27'277 0              ADS    IMODES30

 0922     REF  13  LAST  189   06,2751  4 1300 1              CS     IMODES33          DISABLE DAP AUTO AND HOLD MODES
 0923     REF  20  LAST  186   06,2752  7 4737 1              MASK   BIT6
 0924     REF  14  LAST  190   06,2753  27'300 1              ADS    IMODES33

 0925     REF   5  LAST  190   06,2754  0 0002 0              TC     Q

 0926     REF   3  LAST  187   06,2703             IMUFAIL    EQUALS SETISSW
 0927     REF   4  LAST  190   06,2703             ICDUFAIL   EQUALS SETISSW
```

```
P0928                JUMP TABLES AND CONSTANTS.

 0929   REF   1                  06,2755  1 2533 1  IFAILJMP TCF     ITURNON          CHANNEL 30 DISPATCH.
 0930   REF   1                  06,2756  1 2703 0           TCF     IMUFAIL
 0931   REF   1                  06,2757  1 2703 0           TCF     ICDUFAIL
 0932   REF   1                  06,2760  1 2565 1           TCF     IMUCAGE
 0933                            06,2761   76400 1  30RDMSK  OCT     76400            (BIT 10 NOT SAMPLED HERE).
 0934   REF   1                  06,2762  1 2622 1           TCF     IMUOP

 0935   REF   1                  06,2763  1 2650 1  C33JMP   TCF     PIPFAIL          CHANNEL 33 DISPATCH.
 0936   REF   1                  06,2764  1 2671 1           TCF     DNTMFAST
 0937   REF   1                  06,2765  1 2676 0           TCF     UPTMFAST

R0938                SUBROUTINE TO SKIP IF LAMP TEST NOT IN PROGRESS.
 0939   REF  15  LAST  190       06,2766  4 1300 1  LAMPTEST CS      IMODES33         BIT 1 OF IMODES33 = 1 IF LAMP TEST IN
 0940   REF  18  LAST  190       06,2767  7 4744 0           MASK    BIT1             PROGRESS.
 0941   REF  25  LAST  190       06,2770  10 000 0           CCS     A
 0942   REF   6  LAST  190       06,2771  24 002 0           INCR    Q
 0943   REF   7  LAST  191       06,2772  0 0002 0           TC      Q

 0944   REF   1                     5017            33RDMSK  EQUALS  PRIO16
 0945                            06,2773   40010 1  OC40010  OCT     40010
 0947                            06,2774   00054 0  OCT54    OCT     54
 0948                            06,2775   00075 0  OCT75    OCT     75
 09485                           06,2776   00272 0  OCT272   OCT     00272
 0949                            06,2777   00300 1  BITS7&8  OCT     300
 0950                            06,3000   01720 0  OCT1720  OCT     1720
 0951                            06,3001   00740 1  OCT740   OCT     00740
 0952   REF   1                     5016            OCT15000 EQUALS  PRIO15
 0953                            06,3002   77000 1  OCT77000 OCT     77000
 0954                            06,3003   40040 1  BITS6&15 OCT     40040
 0955                            06,3004   76777 1  -BIT10   OCT     -1000

 0956                            06,3005   21450 0  90SECS   DEC     9000
 0957   REF   1                     5745            120MS    =       OCT14            (DEC12)
 0958   REF   2  LAST   84       06,3006  4 0106 1  GLOCKOK  CS      FLGWRD10
 0959   REF   1                  06,3007  7 4743 1           MASK    CONTRLBT
 0960   REF  13  LAST  190       06,3010  6 1035 0           AD      DSPTAB +11D
 0961   REF   2  LAST  191       06,3011  7 4743 1           MASK    CONTRLBT
 0962                            06,3012  0 0006 1           EXTEND
 0963   REF   1                  06,3013  1 3025 1           BZF     LITEOK           NO CHANGE

 0964   REF  14  LAST  191       06,3014  7 1035 1           MASK    DSPTAB +11D
 0965   REF  26  LAST  191       06,3015  10 000 0           CCS     A
 0966   REF   1                  06,3016  1 3032 1           TCF     LAMPBTST         WAS ON

 0967   REF  15  LAST  191       06,3017  4 1035 1  LITESWCH CS      DSPTAB +11D      WAS OFF
 0968   REF   3  LAST  191       06,3020  7 4743 1           MASK    CONTRLBT
 0969   REF  17  LAST  182       06,3021  6 4726 0           AD      BIT15
 0970   REF  16  LAST  191       06,3022  57'C35 0           XCH     DSPTAB +11D
 0971    REF    1                  06,3023   7 3031 1             MASK    OCT37775
 0972    REF   17   LAST   191     06,3024  27'035 1             ADS     DSPTAB +11D

 0973    REF    3   LAST   191     06,3025   4 0106 1  LITEOK     CS      FLGWRD10
 0974    REF    4   LAST   191     06,3026   7 4743 1             MASK    CONTRLBT
 0975    REF    4   LAST   192     06,3027  26 106 1              ADS     FLGWRD10
 0976    REF    4   LAST   170     06,3030   1 5272 1             TCF     RESUME

 0977                              06,3031    37775 0  OCT37775 OCT     37775

 0978    REF    3   LAST   181     06,3032   0 2766 1  LAMPBTST TC      LAMPTEST
 0979    REF    2   LAST   191     06,3033   1 3025 1             TCF     LITEOK
 0980    REF    1                  06,3034   1 3017 0             TCF     LITESWCH
```

```
P0981    PRCGRAM NAME_  RRAUTCHK

R0982    FUNCTIONAL DESCRIPTICN_
R0983    RRAUTCHK IS THE RENDEZVOUS RADAR INBIT MONITOR. INITIALLY THE RR
R0984    POWER ON AUTO (CHAN 33 BIT 2) INBIT IS CHECKED. IF NO CHANGE, THE
R0985    PROGRAM EXITS TO RRCDUCHK. IF A CHANGE, RADMODES IS UPDATED
R0986    AND A CHECK MADE IF RR POWER HAS JUST COME ON. IF JUST OFF, A CHECK
R0987    IS MADE TO SEE IF A PROGRAM WAS USING THE RR (STATE BIT 7). IF NO,
R0988    THE PROGRAM EXITS TO RRCDUCHK. IF YES, PROGRAM ALARM 00514
R0989    IS REQUESTED BEFORE EXITING TO RRCDUCHK. IF RR POWER HAS JUST COME
R0990    ON, A CHECK IS MADE TO SEE IF A PROGRAM WAS USING THE RR (STATE BIT 7).
R0991    IF YES, THE PROGRAM EXITS TO RRCDUCHK WITHOUT REQUESTING THE TURN-ON
R0992    SEQUENCE. IF NO, RADMODES IS UPDATED TO INDICATE RR CDU ZERO AND
R0993    RR TURN-ON SEQUENCE (BITS 13, 1). A 10 MILLISECOND WAITLIST CALL
R0994    IS THEN SET FOR RRTURNON BEFORE THE PROGRAM EXITS TO NORRGMON.

R0995    CALLING SEQUENCE_
R0996    T4RUPT EVERY 480 MILLISECONDS

R0997    ERASABLE INITIALIZATION REQUIRED_
R0998    RADMODES, STATE

R0999    SUBROUTINES CALLED_
R1000    WAITLIST

R1001    JOBS CR TASKS INITIATED_
R1002    RRTURNON

R1003    ALARMS_  PROGRAM ALARM 00514 - RADAR GOES OUT OF AUTO MODE WHILE BEING
R1004    USED

R1005    EXIT_ RRCDUCHK, NORRGMON

 1006    REF    4  LAST  183    06,3035  3 0110 I  RRAUTCHK CA      RADMODES        SEE IF CHANGE IN RR AUTO MODE BIT.
 1007                           06,3036  0 0006 1           EXTEND
 1008    REF    2  LAST  177    C6,3037  06 C33 I           RXOR    CHAN33
 1009    REF    1               06,3040  7 4743 1           MASK    AUTOMBIT
 1010                           06,3041  0 0006 I           EXTEND
 1011    RFF    I               06,3042  1 3066 0           BZF     RRCDUCHK

 1012    REF    5  LAST  193    06,3043  22 110 I           LXCH    RADMODES        UPDATE RADMODES.
 1013                           06,3044  0 C006 I           EXTEND
 1014    REF    6  LAST  139    06,3045  06 001 0           RXOR    LCHAN
 1015    REF    1               06,3046  7 3062 I           MASK    OCT05776        CLR CONT. DES., REMODE, REPOS, CDUZERO,
 1016    REE    6  LAST  193    06,3047  54 110 0           TS      RADMODES          AND TURNON BITS.
 1017    REF   19  LAST  186    06,3050  7 4743 1           MASK    BIT2            SEE IF JUST ON.
 1018    REF   27  LAST  191    06,3051  10 C00 0           CCS     A
 1019    RFF    2  LAST  193    06,3052  I 3063 0           TCF     RRCDUCHK -3     OFF.  GO DISABLE RR CDU ERROR COUNTERS.
 1020    REF    I               06,3053  3 7704 0           CA      OCT10001        SET RRCDUZRO AND TURNON BITS.
 1021    REF    7  LAST  193    06,3054  26 110 0           ADS     RADMODES
 1022    REF    5  LAST   178    06,3055   3 4744 1              CAF      ONE
 1023    REF    5  LAST   179    06,3056   0 5205 0              TC       WAITLIST
 1024    REF    2  LAST   157    E7,1456                         EBANK=   LOSCOUNT
 1025    REF    1                06,3057    02053 0              2CADR    RRTURNON
 1025    REF    1                06,3060    52107 0

 1026    REF    1                06,3061   1 3155 1              TCF      NORRGMON

 1027                            06,3062    05776 1  OCT05776    OCT      5776
```

```
P1028    PROGRAM NAME_ RRCDUCHK

R1029    FUNCTIONAL DESCRIPTION_
R1030    RRCDUCHK CHECKS FOR RR CDU FAIL (CHAN 30 BIT 7). INITIALLY THE
R1031    RR CDU FAIL BIT IS SAMPLED (CHAN 30 BIT 7). IF NO CHANGE, THE
R1032    PROGRAM EXITS TO RRGIMON. IF A CHANGE, THE RR AUTO MODE
R1033    (RADMODES BIT 2) BIT IS CHECKED. IF NOT IN RR AUTO MODE, THE
R1034    PROGRAM EXITS TO NORRGMON. IF IN AUTO MODE, RADMODES BIT 7
R1035    (RR CDU OK) IS UPDATED AND IF P-20 IS OPERATING PROGRAM ALARM 00515 IS
R1036    REQUESTED. CONTROL IS TRANSFERRED TO SETTRKF TO UPDATE
R1037    THE TRACKER FAIL LAMP (DSPTAB+11D BIT 8). CONTROL RETURNS TO
R1038    RRGIMON.

R1039    CALLING SEQUENCE_
R1040    EVERY 480 MILLISECONDS FROM RRAUTCHK (VIA T4RUPT) UNLESS A
R1041    TURN-ON SEQUENCE HAS JUST BEEN INITIATED.

R1042    ERASABLE INITIALIZATION REQUIRED_
R1043    RADMODES

R1044    SUBROUTINES CALLED_
R1045    SETTRKF

R1046    JOBS OR TASKS INITIATED_
R1047    NONE

R1048    ALARMS_
R1049    TRACKER FAIL
R1050    PROGRAM ALARM 00515 - RRCDU FAIL DURING P-20

R1051    EXIT_
R1052    RRGIMON, NORRGMON

 1053    REF  20  LAST  193   06,3063  4 4743 1        -3  CS       BIT2
 1054                         06,3064  0 0006 1            EXTEND
 1055    REF  11  LAST  190   06,3065  03 012 1            WAND     CHAN12           AT TURNON, DISABLE CDU ERROR COUNTERS.

 1056    REF   8  LAST  193   06,3066  3 0110 1  RRCDUCHK  CA       RADMODES         LAST SAMPLED BIT IN RADMODES.
 1057                         06,3067  0 0006 1            EXTEND
 1058    REF   2  LAST  171   06,3070  06 030 1            RXOR     CHAN30
 1059    REF   1              06,3071  7 4736 0            MASK     RCDUFBIT
 1060                         06,3072  0 0006 1            EXTEND
 1061    REF   1              06,3073  1 3120 0            BZF      RRGIMON

 1062    REF   2  LAST  193   06,3074  3 4743 0            CAF      AUTOMBIT         IF RR NOT IN AUTO MODE, DON'T CHANGE BIT
 1063    REF   9  LAST  195   06,3075  7 0110 0            MASK     RADMODES         7 OF RADMODES. IF THIS WERE NOT DONE,
 1064    REF  28  LAST  193   06,3076  10 000 0            CCS      A                THE TRACKER FAIL MIGHT COME ON WHEN
 1065    REF   2  LAST  194   06,3077  1 3155 1            TCF      NORRGMON         JUST READING LR DATA.

 1066    REF   2  LAST  195   06,3100  3 4736 1            CAF      RCDUFBIT         SET BIT 7 OF RADMODES FOR SETTRKF.
 1067   REF  10  LAST  195   06,3101  22 110 1              LXCH   RADMODES         UPDATE RADMODES.
 1068                        06,3102  0 0006 1              EXTEND
 1069   REF   3  LAST  177   06,3103  06 001 0              RXOR   L
 1070   REF  11  LAST  196   06,3104  54 110 0              TS     RADMODES

 1071   REF  12  LAST  196   06,3105  3 0110 1              CA     RADMODES         DID RR CDU FAIL
 1072   REF   1              06,3106  7 4606 1              MASK   13,7,2           CDU ZERO+ CDUFAIL+ RR AUTO
 1073   REF  29  LAST  195   06,3107  10 000 0              CCS    A
 1074   REF   1              06,3110  1 3117 1              TCF    TRKFLCDU         NO
 1075   REF   5  LAST  186   06,3111  4 0074 0              CS     FLAGWRD0         RNDVFLG  P20 OR P22 OPERATING
 1076   REF   1              06,3112  7 4736 0              MASK   RNDVZBIT
 1077   REF  30  LAST  196   06,3113  10 000 0              CCS    A
 1078   REF   2  LAST  196   06,3114  1 3117 1              TCF    TRKFLCDU         NO
 1079   REF   7  LAST  188   06,3115  0 5571 1              TC     ALARM            YES
 1080                        06,3116   00515 0              OCT    00515
 1081   REF   1              06,3117  0 4555 0   TRKFLCDU   TC     SETTRKF          UPDATE TRACKER FAIL LAMP ON DSKY.
```

```
P1082    PROGRAM NAME_  RRGIMON                                              E AUTO MODE EXCEPT WHEN THE RR CDUS ARE

R1084    FUNCTIONAL DESCRIPTION_                                             TTER IS INITIATED BY THIS MONITOR WHEN
R1086    RRGIMON IS THE RR GIMBAL LIMIT MONITOR. INITIALLY THE FOLLOWING IS  ED TO DRIVE THE GIMBALS TO T = 0 AND
R1088    CHECKED_ REMODE, RR CDU:S BEING ZEROED, REPOSITION, AND RR
R1089    NOT IN AUTO MODE (RADMODES BITS 14, 13, 11 2). IF ANY OF THESE
R1090    EXIST THE PROGRAM EXITS TO GRMATRIX. IF NONE ARE PRESENT RRLIMCHK
R1091    IS CALLED TO SEE IF THE PRESENT RR CDU ANGLES (OPTY, OPTX) ARE WITHIN
R1092    THE LIMITS OF THE CURRENT MODE. IF WITHIN LIMITS, THE PROGRAM EXITS
R1093    TO NORRGMON. IF NOT WITHIN LIMITS, THE REPOSITION FLAG (RADMODES
R1094    BIT 11) IS SET, THE RR AUTO TRACKER AND RR ERROR COUNTER
R1095    (CHAN 12 BITS 14, 2) ARE DISABLED, AND A 20 MILLISECOND WAITLIST
R1096    CALL IS SET FOR DORREPOS AFTER WHICH THE PROGRAM EXITS TO NORRGMON.

R1097    CALLING SEQUENCE_
R1098    EVERY 480 MILLISECONDS FROM RRCDUCHK (VIA T4RUPT) UNLESS TURN-ON
R1099    HAS JUST BEEN INITIATED VIA RRAUTCHK OR IF THERE HAS BEEN A CHANGE IN
R1100    THE RR CDU FAIL BIT (CHAN 30 BIT 7) AND THE RR IS NOT IN THE AUTO MODE
R1101    (RADMODES BIT 2).

R1102    ERASABLE INITIALIZATION_  RADMODES

R1103    SUBROUTINES CALLED_
R1104    RRLIMCHK, WAITLIST

R1105    JOBS OR TASKS INITIATED_
R1106    DORREPOS

R1107    ALARMS_
R1108    NONE

R1109    EXIT_
R1110    NORRGMON

 1111    REF   4  LAST  184    06,3120  30 101 1  RRGIMON  CAE     FLAGWRD5       IS NO ANGLE MONITOR FLAG SET
 1112    REF   1               06,3121  7 4741 0           MASK    NORRMBIT
 1113    REF  31  LAST  196    06,3122  10 000 0           CCS     A
 1114    REF   3  LAST  195    06,3123  1 3155 1           TCF     NORRGMON       YES - SKIP LIMIT CHECK
 1115    REF   1               06,3124  4 0103 1           CS      FLAGWRD7       IS SERVICER RUNNING?
 1116    REF   1               06,3125  7 4740 1           MASK    AVEGFBIT
 1117    REF  32  LAST  197    06,3126  10 000 0           CCS     A
 1118                          06,3127  1 3134 0           TCF     +5             NO.  DO R25
 1119    REF   1               06,3130  3 0102 1           CA      FLAGWRD6       YES.  IS MUNFLAG SET?
 1120    REF   1               06,3131  7 4735 0           MASK    MUNFLBIT
 1121    REF  33  LAST  197    06,3132  10 000 0           CCS     A
 1122    REF   4  LAST  197    06,3133  1 3155 1           TCF     NORRGMON       YES.  DON'T DO R25
 1123    REF   1               06,3134  3 3164 1       +5  CAF     OCT32002       INHIBIT BY REMODE,ZEROING,MONITOR.
 1124    REF  13  LAST  196    06,3135  7 0110 0           MASK    RADMODES       OR RR NOT IN AUTO.
 1125    REF  34  LAST  197    06,3136  10 000 0           CCS     A
 1126    REF   5  LAST  197    06,3137  1 3155 1           TCF     NORRGMON
 1127   REF    1                06,3140  0 4514 0             TC       RRLIMCHK        SEE IF ANGLES IN LIMITS.
 1128   REF    1                06,3141   00035 1             ADRES    CDUT

 1129   REF    1                06,3142  1 3144 1             TCF      MONREPOS

 1130   REF    6  LAST   197    06,3143  1 3155 1             TCF      NORRGMON        (ADDITIONAL CODING MAY GO HERE).

 1131   REF    1                06,3144  3 4732 0  MONREPOS   CAF      REPOSBIT        SET FLAG TO SHOW REPOSITION IN PROGRESS.
 1132   REF   14  LAST   197    06,3145  26 110 0             ADS      RADMODES

 1133   REF    1                06,3146  4 3165 1             CS       OCT20002        DISABLE TRACKER AND ERROR COUNTER.
 1134                           06,3147  0 0006 1             EXTEND
 1135   REF   12  LAST   195    06,3150  03 012 1             WAND     CHAN12

 1136   REF    2  LAST    38    06,3151  3 4743 0             CAF      TWO
 1137   REF    6  LAST   194    06,3152  0 5205 0             TC       WAITLIST
 1138   REF    3  LAST   194    F7,1456                       FBANK=   LOSCOUNT
 1139   REF    1                06,3153   02120 0             2CADR    OORREPOS
 1139   REF    1                06,3154   52107 0

 1140   REF   15  LAST   198    06,3155  3 0110 1  NORRGMON   CA       RADMODES        IF SELECT SWITCH IS NOT IN LGC, SEND RR
 1141   REF    3  LAST   195    06,3156  7 4743 1             MASK     AUTOMBIT          CDU ZERO BIT TO PREVENT MEMORY CYCLE
 1142   REF   35  LAST   197    06,3157  10 000 0             CCS      A                 SNATCHING BY MANIC RR CDUS.  BIT2 OF
 1143                           06,3160  13 161 0             NOOP                       RADMODES AGREES WITH BIT2 OF CHANNEL
 1144                           06,3161  0 0006 1             EXTEND                     33.  FOR THIS CODING, WHICH ASSUMES
 1145   REF   13  LAST   198    06,3162  05 012 1             WOR      CHAN12            AUTOMBIT = BIT2, THANKS TO HUGH B-S.
 1146   REF    1                06,3163  1 3167 0             TCF      ENDRRMON

 1147   REF    3  LAST   169    06,3167            ENDRRMON   EQUALS   OAPT4S

 1148                           06,3164   32002 1  OCT32002   OCT      32002
 1149                           06,3165   20002 1  OCT20002   OCT      20002
 1150                           06,3166   02100 1  OCT02100   OCT      02100           P20,P22 MASK BITS
```

```
P1151    PROGRAM NAME: GPMATRIX (DAPT4S) MOD. NO. 2  DATE: OCTOBER 27, 1966

R1152    AUTHOR: JONATHAN D. ADDELSTON (ADAMS ASSOCIATES)

R1153    MODIFIED:  7FEB. 1968 BY P. S. WEISSMAN TO DELETE COMPUTATION OF MR12 AND MR13, WHICH ARE NO LONGER REQIURED.

R1155    THIS PROGRAM CALCULATES ALL THE SINGLE-PRECISION MATRIX ELEMENTS WHICH ARE USED BY LEM DAP TO TRANSFORM VECTORS
R1157    FROM GIMBAL TO PILOT (BODY) AXES AND BACK AGAIN.  THESE ELEMENTS ARE USED EXCLUSIVELY BY BASIC LANGUAGE ROUTINES
R1159    AND THEREFORE ARE NOT ARRAYED FOR USE BY INTERPRETIVE PROGRAMS.

R1160    CALLING SEQUENCE: GPMATRIX IS TRANSFERRED TO FROM DAPT4S AND IS THUS EXECUTED 4 TIMES A SECOND BY T4RUPT.
R1162    DAPT4S IS LISTED IN T4JUMP TABLE TWICE EXPLICITLY AND ALSO OCCURS AFTER RRAUTCHK (WHICH IS ALSO LISTED TWICE).

R1164    SUBROUTINES CALLED: SPSIN, SPCOS.

R1165    NORMAL EXIT MODE:  TCF   RESUME

R1166    ALARM AND ABORT MODES:  NONE.

R1167    INPUT:  CDUX, CDUY, CDUZ.

R1168    OUTPUT:  M11, M21, M31, M22, M32.

R1169    AOG = CDUX, AIG = CDUY, AMG = CDUZ: MNEMONIC IS: OIM = XYZ

R1170       *       *     SIN(MG)          0          1  *
R1171       M   =   *     COS(MG)COS(OG) SIN(OG)      0  *
R1172        GP     *    -COS(MG)SIN(OG) COS(OG)      0  *

R1173       *       *  0     COS(OG)/COS(MG)          -SIN(OG)/COS(MG)          *
R1174       M   =   *  0     SIN(OG)                   COS(OG)                  *
R1175        PG     *  1   -SIN(MG)COS(OG)/COS(MG)   SIN(MG)SIN(OG)/COS(MG)    *

  1176   REF   5  LAST  176   E6,1414                          EBANK= M11
  1177   REF   1              06,3167               DAPT4S     EQUALS GPMATRIX
R1178    T4RUPT DAP LOGIC:

  1179   REF   3  LAST  179   06,3167  30 034 0  GPMATRIX CAE      CDUZ              SINGLE ENTRY POINT
  1180   REF   1              06,3170  0 5024 1           TC       SPSIN             SIN(CDUZ) = SIN(MG)
  1181   REF   6  LAST  199   06,3171  55'414 0           TS       M11               SCALED AT 1

  1182   REF   4  LAST  199   06,3172  30 034 0           CAE      CDUZ
  1183   REF   1              06,3173  0 5023 0           TC       SPCOS             COS(CDUZ) = COS(MG)
  1184   REF   1              06,3174  54 061 1           TS       COSMG             SCALED AT 1 (ONLY A FACTOR)

  1185   REF   2  LAST  161   06,3175  30 032 0           CAE      CDUX
  1186   REF   2  LAST  199   06,3176  0 5024 1           TC       SPSIN             SIN(CDUX) = SIN(OG)
  1187   REF   1              06,3177  55'417 0           TS       M22               SCALED AT 1 (ALSO IS MR22)

  1188   REF   2  LAST  199   06,3200  4 1417 0           CS       M22
```

```
 1189                             06,3201  0 0006 1          EXTEND
 1190   REF   2  LAST  199       06,3202  7 0061 1          MP      COSMG          -SIN(OG)COS(MG)
 1191   REF   1                   06,3203  55'416 1          TS      M31            SCALED AT 1

 1192   REF   3  LAST  199       06,3204  30 032 0          CAE     CDUX
 1193   REF   2  LAST  199       06,3205  0 5023 0          TC      SPCOS          COS(CDUX) = COS(OG)
 1194   REF   1                   06,3206  55'420 1          TS      M32            SCALED AT 1 (ALSO IS MR23)

 1195                             06,3207  0 0006 1          EXTEND
 1196   REF   3  LAST  200       06,3210  7 0061 1          MP      COSMG          COS(OG)COS(MG)
 1197   REF   1                   06,3211  55'415 1          TS      M21            SCALED AT 1

 1198   REF   5  LAST  192       06,3212  0 5272 0          TC      RESUME

 1199   REF   6  LAST  200           5272           ENDDAPT4 EQUALS RESUME
```

```
L        RCS FAILURE MONITOR                                                           USER'S PAGE NO.   1      EO S4

R0001    PROGRAM DESCRIPTION

R0002    AUTHOR:  J S MILLER

R00025   MODIFIED 6 MARCH 1968 BY P S WEISSMAN TO SET UP JOB FOR 1/ACCS WHEN THE MASKS ARE CHANGED.

R0003         THIS ROUTINE IS ATTACHED TC T4RUPT, AND IS ENTERED EVERY 480 MS.  ITS FUNCTION IS TO EXAMINE THE LOW 8 BITS
R0005    OF CHANNEL 32 TO SEE IF ANY ISOLATION-VALVE CLOSURE BITS HAVE APPEARED OR DISAPPEARED (THE CREW IS WARNED OF JET
R0007    FAILURES BY LAMPS LIT BY THE GRUMMAN FAILURE-DETECTION CIRCUITRY; THEY MAY RESPOND BY OPERATING SWITCHES WHICH
R0009    ISOLATE PAIRS OF JETS FROM THE PROPELLANT TANKS AND SET BITS IN CHANNEL 32).  IN THE EVENT THAT CHANNEL 32 BITS
R0011    DIFFER FROM 'PVALVEST', THE RECORD OF ACTIONS TAKEN BY THIS ROUTINE, THE APPROPRIATE BITS IN 'CH5MASK' &
R0013    'CH6MASK', USED BY THE DAP JET-SELECTION LOGIC, ARE UPDATED, AS IS 'PVALVEST'.  TO SPEED UP & SHORTEN THE
R0015    ROUTINE, NO MORE THAN ONE CHANGE IS ACCEPTED PER ENTRY.  THE HIGHEST-NUMBERED BIT IN CHANNEL 32 WHICH REQUIRES
R0017    ACTION IS THE ONE PROCESSED.

R0018         THE CODING IN THE FAILURE MONITOR HAS BEEN WRITTEN SO AS TO HAVE ALMOST COMPLETE RESTART PROTECTION.  FOR
R0020    EXAMPLE, NO ASSUMPTION IS MADE WHEN SETTING A 'CH5MASK' BIT TO 1 THAT THE PREVIOUS STATE IS 0, ALTHOUGH IT OF
R0022    COURSE SHOULD BE.  ONE CASE WHICH MAY BE SEEN TO EVADE PROTECTION IS THE OCCURRENCE OF A RESTART AFTER UPDATING
R0024    ONE OR BOTH DAP MASK-WORDS BUT BEFORE UPDATING 'PVALVEST', COUPLED WITH A CHANGE IN THE VALVE-BIT BACK TO ITS
R0026    FORMER STATE.  THE CONSEQUENCE OF THIS IS THAT THE NEXT ENTRY WOULD NOT SEE THE CHANGE INCOMPLETELY INCORP-
R0028    ORATED BY THE LAST PASS (BECAUSE IT WENT AWAY AT JUST THE RIGHT TIME), BUT THE DAP MASK-WORDS WILL BE INCORRECT.
R0030    THIS COMBINATION OF EVENTS SEEMS QUITE REMOTE, BUT NOT IMPOSSIBLE UNLESS THE CREW OPERATES THE SWITCHES AT HALF-
R0032    SECOND INTERVALS OR LONGER.  IN ANY EVENT, A DISAGREEMENT BETWEEN REALITY AND THE DAP MASKS WILL BE CURED IF
R0034    THE MISINTERPRETED SWITCH IS REVERSED AND THEN RESTORED TO ITS CORRECT POSITION (SLOWLY).

R0036    CALLING SEQUENCE:

R0037              TCF    RCSMONIT         (IN INTERRUPT MODE, EVERY 480 MS.)

R0038    EXIT:  TCF  RCSMONEX  (ALL PATHS EXIT VIA SUCH AN INSTRUCTION)
 0039    REF    7  LAST  200      5272             RCSMONEX EQUALS RESUME

R0040    ERASABLE INITIALIZATION REQUIRED:

R0041              VIA FRESH START:  PVALVEST           = +0  (ALL JETS ENABLED)
R0042                                CH5MASK, CH6MASK   = +0  (ALL JETS OK)

R0043    OUTPUT:  CH5MASK & CH6MASK UPDATED  (1'S WHERE JETS NOT TO BE USED, IN CHANNEL 5 & 6 FORMAT)
R0045             PVALTEST UPDATED  (1,S WHEN VALVE CLOSURES HAVE BEEN TRANSLATED INTO CH5MASK & CH6MASK; CHAN 32 FORMAT)
R00465            JOB TO DO 1/ACCS.

R0047    DEBRIS:  A, L, Q AND DEBRIS OF NOVAC.

R0048    SUBROUTINE CALLED:  NOVAC.

 0052    REF    2  LAST  162      1257                      EBANK= CH5MASK

 0059                          23,2000                      BANK    23
 0060    REF    1              06,2000                      SETLOC  RCSMONT
 0061                          06,3213                      BANK
 0062   REF   1                                               COUNT* $$/T4RCS

 00625  REF   1                 06,3213              RCSMONIT EQUALS RCSMON

 0063   REF   6  LAST  184      06,3213  4 4746 1    RCSMON   CS     ZERO
 0064                           06,3214  0 0006 1             EXTEND
 0065   REF   2  LAST  168      06,3215  06 032 0             RXOR   CHAN32         PICK UP + INVERT INVERTED CHANNEL 32.
 0066   REF   1                 06,3216  7 4350 1             MASK   LOW8           KEEP JET-FAIL BITS ONLY.
 0067   REF   8  LAST  191      06,3217  54 002 1             TS     Q

 0068   REF   1                 06,3220  4 1273 1             CS     PVALVEST           -    -
 0069   REF   9  LAST  202      06,3221  7 0002 1             MASK   Q              FORM PC + PC.
 0070   REF   4  LAST  196      06,3222  54 001 1             TS     L                (P = PREVIOUS ISOLATION VALVE STATE,
 0071   REF  10  LAST  202      06,3223  4 0002 1             CS     Q                 C = CURRENT VALVE STATE (CH 32)).
 0072   REF   2  LAST  202      06,3224  7 1273 1             MASK   PVALVEST
 0073   REF   5  LAST  202      06,3225  26 001 1             ADS    L              RESULT NZ INDICATES ACTION REQUIRED.

 0074                           06,3226  0 0006 1             EXTEND
 0075   REF   1                 06,3227  1 5272 1             BZF    RCSMONEX       QUIT IF NO ACTION REQUIRED.

 0076                           06,3230  0 0006 1             EXTEND
 0077   REF  17  LAST  183      06,3231  7 4736 0             MP     BIT7           MOVE BITS 8 - 1 OF A TO 14 - 7 OF L.
 0078   REF   6  LAST  202      06,3232  56 001 0             XCH    L              ZERO TO L IN THE PROCESS.

 0079   REF   7  LAST  202      06,3233  24 001 0    -3       INCR   L
 0080                           06,3234  6 0000 1             DOUBLE                BOUND TO GET OVERFLOW IN THIS LOOP,
 0081                           06,3235  54 000 0             OVSK                  SINCE WE ASSURED INITIAL NZ IN A.
 0082                           06,3236  1 3233 1             TCF    -3

 0083   REF   8  LAST  202      06,3237  50 001 0             INDEX  L
 0084   REF  16  LAST  174      06,3240  3 4734 0             CA     BIT8 -1        SAVE THE RELEVANT BIT (8 - 1).
 0085   REF  11  LAST  202      06,3241  54 002 1             TS     Q
 0086   REF   3  LAST  202      06,3242  7 1273 1             MASK   PVALVEST       LOOK AT PREVIOUS VALVE STATE BIT.
 0087   REF  36  LAST  198      06,3243  10 000 0             CCS    A
 0088   REF   1                 06,3244  1 3260 1             TCF    VOPENED        THE VALVE HAS JUST BEEN OPENED.

 0089   REF   3  LAST  201      06,3245  4 1257 1             CS     CH5MASK        THE VALVE HAS JUST BEEN CLOSED.
 0090   REF   9  LAST  202      06,3246  50 001 0             INDEX  L
 0091   REF   1                 06,3247  7 3277 1             MASK   5FAILTAB
 0092   REF   4  LAST  202      06,3250  27'257 1             ADS    CH5MASK        SET INHIBIT BIT FOR CHANNEL 5 JET.

 0093   REF   1                 06,3251  4 1260 0             CS     CH6MASK
 0094   REF  10  LAST  202      06,3252  50 001 0             INDEX  L
 0095   REF   1                 06,3253  7 3307 1             MASK   6FAILTAB
 0096   REF   2  LAST  202      06,3254  27'260 0             ADS    CH6MASK        SET INGIBIT BIT FOR CHANNEL 6 JET.

 0097   REF  12  LAST  202      06,3255  3 0002 0             CA     Q
 0098   REF   4  LAST  202      06,3256  27'273 1             ADS    PVALVEST       RECORD ACTION TAKEN.

 0099   REF   1                 06,3257  1 3273 0             TCF    1/ACCFIX       SET UP 1/ACCJOB AND EXIT.
 0100    REF  11  LAST  202    06,3260  50 001 0  VOPENED  INDEX  L           A VALVE HAS JUST BEEN OPENED.
 0101    REF   2  LAST  202    06,3261  4 3277 1           CS     5FAILTAB
 0102    REF   5  LAST  202    06,3262  7 1257 1           MASK   CH5MASK
 0103    REF   6  LAST  203    06,3263  55'257 1           TS     CH5MASK     REMOVE INHIBIT BIT FOR CHANNEL 5 JET.

 0104    REF  12  LAST  203    06,3264  50 001 0           INDEX  L
 0105    REF   2  LAST  202    06,3265  4 3307 1           CS     6FAILTAB
 0106    REF   3  LAST  202    06,3266  7 1260 0           MASK   CH6MASK
 0107    REF   4  LAST  203    06,3267  55'260 0           TS     CH6MASK     REMOVE INHIBIT BIT FOR CHANNEL 6 JET.

 0108    REF  13  LAST  202    06,3270  4 0002 1           CS     Q
 0109    REF   5  LAST  202    06,3271  7 1273 1           MASK   PVALVEST
 0110    REF   6  LAST  203    06,3272  55'273 1           TS     PVALVEST    RECORD ACTION TAKEN.

 0111    REF   1               06,3273  3 7736 1  1/ACCFIX CAF    PRIO27      SET UP 1/ACCS SO THAT THE SWITCH CURVES
 0112    REF   2  LAST  168    06,3274  0 5063 1           TC     NOVAC         FOR TJETLAW CAN BE MODIFIED IF CH5MASK
 0113    REF   4  LAST  138    E6,1536                     EBANK= AOSQ          HAS BEEN ALTERED.
 0114    REF   1               06,3275   03603 1           2CADR  1/ACCJOB
 0114    REF   1               06,3276   42106 0
 0115    REF   2  LAST  202    06,3277  1 5272 1           TCF    RCSMONEX    EXIT.


 0117                          06,3276            5FAILTAB EQUALS -1          CH 5 JET BIT CORRESPONDING TO CH 32 BIT:
 0118                          06,3300   00040 0           OCT    00040       8
 0119                          06,3301   00020 0           OCT    00020       7
 0120                          06,3302   00100 0           OCT    00100       6
 0121                          06,3303   00200 0           OCT    00200       5
 0122                          06,3304   00010 0           OCT    00010       4
 0123                          06,3305   00001 0           OCT    00001       3
 0124                          06,3306   00004 0           OCT    00004       2
 0125                          06,3307   00002 0           OCT    00002       1

 0126                          06,3306            6FAILTAB EQUALS -1          CH 6 JET BIT CORRESPONDING TO CH 32 BIT:
 0127                          06,3310   00010 0           OCT    00010       8
 0128                          06,3311   00020 0           OCT    00020       7
 0129                          06,3312   00004 0           OCT    00004       6
 0130                          06,3313   00200 0           OCT    00200       5
 0131                          06,3314   00001 0           OCT    00001       4
 0132                          06,3315   00002 0           OCT    00002       3
 0133                          06,3316   00040 0           OCT    00040       2
 0134                          06,3317   00100 0           OCT    00100       1
 0001                    22,2004                   BANK    22
 0002  REF   1           05,2000                   SETLOC DOWNTELM
 0003                    05,2045                   BANK

 0004  REF   2  LAST  164      0340                EBANK= DNTMBUFF

R0005  SPECIAL DOWNLINK OP CODES
A0006                                              OP CODE ADDRESS(EXAMPLE) SENDS..     BIT 15  BITS 14-12 BITS 11
A0007                                                                                                         -0
A0008                                              ------ ----------       ----------   ------  ---------- -------
A0009                                                                                                         --
A0010                                              1DNADR TIME2            (2 AGC WDS)    0         0      ECADR
A0011                                              2DNADR TEPHEM           (4 AGC WDS)    0         1      ECADR
A0012                                              3DNADR VGBODY           (6 AGC WDS)    0         2      ECADR
A0013                                              4DNADR STATE            (8 AGC WDS)    0         3      ECADR
A0014                                              5DNADR UPBUFF           (10AGC WDS)    0         4      ECADR
A0015                                              6DNADR DSPTAB           (12AGC WDS)    0         5      ECADR
A0016                                              DNCHAN 30               CHANNELS       0         7      CHANNEL
A0017                                                                                                      ADDRESS
A0018                                              DNPTR  NEXTLIST         POINTS TO NEXT 0         6      ADRES
A0019                                                                       LIST.

R0020  DOWNLIST FORMAT DEFINITIONS AND RULES-
R0021  1. END OF A LIST = -XDNADR (X = 1 TO 6), -DNPTR, OR -DNCHAN.
R0022  2. SNAPSHOT SUBLIST = LIST WHICH STARTS WITH A -1DNADR.
R0023  3. SNAPSHOT SUBLIST CAN ONLY CONTAIN 1DNADRS.
R0024  4. TIME2 1DNADR MUST BE LOCATED IN THE CONTROL LIST OF A DOWNLIST.
R0025  5. ERASABLE DOWN TELEMETRY WORDS SHOULD BE GROUPED IN SEQUENTIAL
R0026     LOCATIONS AS MUCH AS POSSIBLE TO SAVE STORAGE USED BY DOWNLINK LISTS.


 0027  REF   1                                     COUNT* $$/DLIST
 0028                       0007            ERASZERO EQUALS 7
 0029  REF   1              0007            UNKNOWN  EQUALS ERASZERO
 0030  REF   2  LAST  204   0007            SPARE    EQUALS ERASZERO       USE SPARE TO INDICATE AVAILABLE SPACE
 0032                    05,2045   77340 0  LOWIDCOD OCT    77340          LOW ID CODE

 0033  REF   1           05,2153            NOMDNLST EQUALS COSTALIN       FRESH START AND POST P27 DOWNLIST
 0034  REF   1           05,2414            AGSLIST  EQUALS AGSI/UPD
 0035  REF   2  LAST  204   05,2414         UPDNLIST EQUALS AGSI/UPD       UPDATE PROGRAM (P27) DOWNLIST
```

```
P0036    LM ORBITAL MANEUVERS LIST

R0037        ----------------  CONTROL LIST  -------------------------

 0038                          05,2046               ORBMANUV EQUALS                SEND ID BY SPECIAL CODING
 0039    REF   1               05,2046   32107 0              DNPTR   LMORBM01      COLLECT SNAPSHOT
 0040    REF   3  LAST  204    05,2047   24340 0              6DNADR DNTMBUFF       SEND SNAPSHOT
 0041    REF   2  LAST  145    05,2050   03451 1              1DNADR DELLT4         DELLT4,+1
 0042    REF   1               05,2051   13443 0              3DNADR RTARG          RTARG,+1...+5
 0043    REF   1               05,2052   02247 1              1DNADR ELEV           ELEV,+1
 0044    REF   1               05,2053   01341 0              1DNADR TEVENT         TEVENT,+1
 0045    REF   2  LAST    1    05,2054   25731 0              6DNADR REFSMMAT       REFSMMAT+0...+11D
 0046    REF   1               05,2055   03633 1              1DNADR TCSI           TCSI,+1
 0047    REF   1               05,2056   12257 1              3DNADR DELVEET1       DELVEET1+0...+5
 0048    REF   3  LAST  162    05,2057   13700 1              3DNADR VGTIG          VGTIG+0...+5
 0049    REF   3  LAST  161    05,2060   01335 0              1DNADR DNLRVELZ       DNLRVELZ,DNLRALT
 0050    REF   1               05,2061   03630 1              1DNADR TPASS4         TPASS4,+1
 0051    REF   1               05,2062   32116 0              DNPTR   LMORBM02      COMMON DATA
 0052    REF   2  LAST  161    05,2063   00024 1              1DNADR TIME2          TIME2/1
 0053    REF   1               05,2064   32125 0              DNPTR   LMORBM03      COLLECT SNAPSHOT
 0054    REF   4  LAST  205    05,2065   24340 0              6DNADR DNTMBUFF       SEND SNAPSHOT
 0055    REF   1               05,2066   32134 0              DNPTR   LMORBM04      COMMON DATA
 0056    REF   2  LAST  162    05,2067   07115 0              2DNADR POSTORKU       POSTORKU,NEGTORKU,POSTORKV,NEGTORKV
 0058    REF   2  LAST  161    05,2070   01355 0              1DNADR SERVDURN       SERVDURN,DUMLOOPS
 0059    REF   1               05,2071   01774 1              1DNADR TCDH           TCDH,+1
 0060    REF   1               05,2072   12265 0              3DNADR DELVEET2       DELVEET2+0...+5
 0061    REF   1               05,2073   03635 1              1DNADR TTPI           TTPI,+1
 0062    REF   1               05,2074   12356 1              3DNADR DELVEET3       DELVEET3+0...+5
 0063    REF   3  LAST  161    05,2075   01330 0              1DNADR DNRRANGE       DNRRANGE,DNRRDOT
 0065    REF   3  LAST  161    05,2076   05333 1              2DNADR DNLRVELX       DNLRVELX,DNLRVELY,DNLRVELZ,DNLRALT
 0066    REF   1               05,2077   03577 1              1DNADR DIFFALT        DIFFALT,+1
 0067    REF   2  LAST  161    05,2100   01326 1              1DNADR LEMMASS        LEMMASS,CSMMASS
 0068    REF  33  LAST  190    05,2101   01277 1              1DNADR IMODES30       IMODES30,IMODES33
 0069    REF   1               05,2102   03441 0              1DNADR TIG            TIG,+1
 0070    REF   1               05,2103   32140 0              DNPTR   LMORBM05      COMMON DATA
 0071    REF   1               05,2104   32151 0              DNPTR   LMORBM06      COMMON DATA
 0072    REF   2  LAST  112    05,2105   01363 0              1DNADR ALMCADR        ALMCADR,+1
 0073    REF   2  LAST  154    05,2106   74261 1             -1DNADR TGO            TGO,+1

R0074        ----------------  SUB-LISTS  --------------------------

 0075    REF   3  LAST  162    05,2107   76060 0  LMORBM01-1DNADR R-OTHER +2        R-OTHER+2,+3          SNAPSHOT
 0076    REF   4  LAST  205    05,2110   01721 1              1DNADR R-OTHER +4     R-OTHER+4,+5
 0077    REF   3  LAST  162    05,2111   01723 0              1DNADR V-OTHER        V-OTHER,+1
 0078    REF   4  LAST  205    05,2112   01725 0              1DNADR V-OTHER +2     V-OTHER+2,+3
 0079    REF   5  LAST  205    05,2113   01727 1              1DNADR V-OTHER +4     V-OTHER+4,+5
 0080    REF   3  LAST  162    05,2114   01570 1              1DNADR T-OTHER        T-OTHER,+1
 0081    REF   5  LAST  205    05,2115   76062 1             -1DNADR R-OTHER        R-OTHER+0,+1

 0082    REF   2  LAST  161    05,2116   04320 1  LMORBM02 2DNADR REDOCTR           REDOCTR,THETAD,+1,+2  COMMON DATA
 0083    REF    1                05,2117    01432 0             1DNADR RSBBQ         RSBBQ,+1
 0084    REF    6   LAST  161    05,2120    07021 0             2DNADR OMEGAP        OMEGAP,OMEGAQ,OMEGAR,GARBAGE
 0085    REF    6   LAST  162    05,2121    07234 0             2DNADR CDUXD         CDUXD,CDUYD,CDUZD,GARBAGE
 0086    REF    4   LAST  200    05,2122    04032 1             2DNADR CDUX          CDUX,CDUY,CDUZ,CDUT
 0087    REF   17   LAST  162    05,2123    24074 1             6DNADR STATE         STATE+0...+11D (FLAGWORDS)
 0088    REF   18   LAST  192    05,2124    52755 1            -6DNADR DSPTAB        DSPTAB TABLES

 0089    REF    1                05,2125    76556 0  LMORBM03-1DNADR RN +2          RN +2,+3                    SNAPSHOT
 0090    REF    2   LAST  206    05,2126    01223 0             1DNADR RN +4          RN +4,+5
 0091    REF    1                05,2127    01225 0             1DNADR VN             VN,+1
 0092    REF    2   LAST  206    05,2130    01227 1             1DNADR VN +2          VN +2,+3
 0093    REF    3   LAST  206    05,2131    01231 0             1DNADR VN +4          VN +4,+5
 0094    REF    1                05,2132    01233 1             1DNADR PIPTIME        PIPTIME,+1
 0095    REF    3   LAST  206    05,2133    76560 0            -1DNADR RN             RN,+1

 0096    REF    4   LAST  162    05,2134    07242 1  LMORBM04 2DNADR OMEGAPD        OMEGAPD,OMEGAQD,OMEGARD,GARBAGE
 0097                            05,2135    34076 1           DNCHAN 76             GARBAGE,CHANNEL77
 00971   REF    2   LAST  161    05,2136    04374 0           2DNADR CHANBKUP
 0098    REF   16   LAST  198    05,2137    77667 0          -1DNADR RADMODES       RADMODES,DAPBOOLS           COMMON DATA

 0099    REF    7   LAST  206    05,2140    07021 0  LMORBM05 2DNADR OMEGAP         OMEGAP,OMEGAQ,OMEGAR,GARBAGE
 0100    REF    7   LAST  206    05,2141    07234 0           2DNADR CDUXD          CDUXD,CDUXD,CDUZD,GARBAGE
 0101    REF    5   LAST  206    05,2142    04032 1           2DNADR CDUX           CDUX,CDUY,CDUZ,CDUT
 0102    REF    2   LAST  161    05,2143    03024 1           1DNADR ALPHAQ         ALPHAQ,ALPHAR               COMMON DATA
 0103    REF    3   LAST  162    05,2144    03113 1  LMORB10  1DNADR POSTORKP       POSTORKP,NEGTORKP
 0104                            05,2145    34011 0  LMORBM09 DNCHAN 11             CHANNEL11,12
 0105                            05,2146    34013 1           DNCHAN 13             CHANNELS13,14
 0106                            05,2147    34030 0           DNCHAN 30             CHANNELS30,31
 0107                            05,2150    43745 0          -DNCHAN 32             CHANNELS32,33

 0108    REF    2   LAST  154    05,2151    03560 1  LMORBM06 1DNADR PIPTIME1       PIPTIME,+1                  COMMON DATA
 0109    REF    7   LAST  162    05,2152    67453 1          -3DNADR DELV           DELV+0...+5

R0110           ----------------------------------------------------------
R0111    *** THE FOLLOWING IS A LIST OF LOCATIONS IN DOWNLINK LISTS
R0112    *** BUT NOT REFERENCED IN THE DIRECTORY BECAUSE THEY ARE NOT
R0113    *** THE FIRST LOCATION REFERENCED IN AN INSTRUCTION
R0114    *** THIS LIST SHOULD BE UPDATED WHEN ANY CHANGES ARE MADE TO LISTS.

A0115                                                          LOCATION         LIST NAME

 0116    REF    1                    1336          DL101    =    DNLRALT          ORBMANUV
 0117    REF    2   LAST  175        0025          DL102    =    TIME1
 0118    REF    2   LAST  162     E6,1516          DL103    =    NEGTORKU
 0119    REF    2   LAST  162     E6,1517          DL104    =    POSTORKV
 0120    REF    1                 E6,1520          DL105    =    NEGTORKV
 0121    REF    1                    1356          DL106    =    DUMLOOPS
 0122    REF    2   LAST  111        1331          DL107    =    DNRRDOT
 0123    REF    3   LAST  161        1334          DL108    =    DNLRVELY
 0124   REF   4  LAST  205      1335         DL109    =     DNLRVELZ
 0125   REF   2  LAST  206      1336         DL110    =     DNLRALT
 0126   REF   1                 1327         DL111    =     CSMMASS
 0127   REF  16  LAST  191      1300         DL112    =     IMODES33
 0128   REF   7  LAST  162      0321         DL113    =     THETAD            LMORBM02
 0129   REF   2  LAST  161   E6,1422         DL114    =     OMEGAQ
 0130   REF   1              F6,1423         DL115    =     OMEGAR
 0131   REF   2  LAST  162   E6,1635         DL116    =     CDUYD
 0132   REF   1              F6,1636         DL117    =     CDUZD
 0133   REF   2  LAST  161      0033         DL118    =     CDUY
 0134   REF   5  LAST  199      0034         DL119    =     CDUZ
 0135   REF   2  LAST  198      0035         DL120    =     CDUT
 0136   REF   2  LAST  162   F6,1643         DL121    =     OMEGAQD           LMORBM04
 0137   REF   1              E6,1644         DL122    =     OMEGARD
 0138   REF   1                 0375         DL123    =     FAILREG
 0139   REF   2  LAST  162      0111         DL124    =     DAPBOOLS
 0140   REF   3  LAST  207   E6,1422         DL125    =     OMEGAQ            LMORBM05
 0141   REF   2  LAST  207   E6,1423         DL126    =     OMEGAR
 0142   REF   3  LAST  207   E6,1635         DL127    =     CDUYD
 0143   REF   2  LAST  207   E6,1636         DL128    =     CDUZD
 0144   REF   3  LAST  207      0033         DL129    =     CDUY
 0145   REF   6  LAST  207      0034         DL130    =     CDUZ
 0146   REF   3  LAST  207      0035         DL131    =     CDUT
 0147   REF   1              E6,1425         DL132    =     ALPHAR
 0148   REF   1              E6,1514         DL133    =     NEGTORKP
```

```
P0149    LM COAST AND ALIGNMENT DOWNLIST

R0150        -----------------  CONTROL LIST  --------------------------

 0151                          05,2153              COSTALIN EQUALS                 SEND ID BY SPECIAL CODING
 0152    REF   1               05,2153   32107 0             DNPTR   LMCSTA01       COLLECT SNAPSHOT
 0153    REF   5  LAST  205    05,2154   24340 0             6DNADR DNTMBUFF        SEND SNAPSHOT
 0154    REF   1               05,2155   03371 1             1DNADR AGSK            AGSK,+1
 0155    REF   2  LAST  129    05,2156   02774 1             1DNADR TALIGN          TALIGN,+1
 0156    REF   3  LAST  205    05,2157   07115 0             2DNADR POSTORKU        POSTORKU,NEGTORKU,POSTORKV,NEGTORKV
 0157    REF   4  LAST  205    05,2160   01330 0             1DNADR DNRRANGE        DNRRANGE,DNRRDOT
 0158    REF   2  LAST  205    05,2161   01341 0             1DNADR TEVENT          TEVENT,+1
 0159    REF   3  LAST  205    05,2162   25731 0             6DNADR REFSMMAT        REFSMMAT+0...+11D
 0160    REF   6  LAST  162    05,2163   01235 1             1DNADR AOTCODE         AOTCODE,GARBAGE
 0161    REF   2  LAST    1    05,2164   12020 0             3DNADR RLS             RLS+0...+5
 0162    REF   4  LAST  205    05,2165   05333 1             2DNADR DNLRVELX        DNLRVELX,DNLRVELY,DNLRVELZ,DNLRALT
 0163    REF   4  LAST  205    05,2166   13700 1             3DNADR VGTIG           VGTIGX,Y,Z
 0164    REF   1               05,2167   32116 0             DNPTR   LMCSTA02       COMMON DATA
 0165    REF   3  LAST  205    05,2170   00024 1             1DNADR TIME2           TIME2/1
 0166    REF   1               05,2171   32125 0             DNPTR   LMCSTA03       COLLECT SNAPSHOT
 0167    REF   6  LAST  208    05,2172   24340 0             6DNADR DNTMBUFF        SEND SNAPSHOT
 0168    REF   1               05,2173   32134 0             DNPTR   LMCSTA04       COMMON DATA
 0169    REF   1               05,2174   32215 0             DNPTR   LMCSTA07       COMMON DATA
 0170    REF   3  LAST  205    05,2175   01355 0             1DNADR SERVDURN        SERVDURN,DUMLOOPS
 0171    REF   2  LAST  115    05,2176   01516 1             1DNADR TET             TET,+1
 0172    REF   2  LAST  161    05,2177   04036 0             2DNADR CDUS            CDUS,PIPAX,PIPAY,PIPAZ
 0173    REF   3  LAST  161    05,2200   00112 0             1DNADR LASTYCMD        LASTYCMD,LASTXCMD
 0174    REF   3  LAST  205    05,2201   01326 1             1DNADR LEMMASS         LEMMASS,CSMMASS
 0175    REF  34  LAST  205    05,2202   01277 1             1DNADR IMODES30        IMODES30,IMODES33
 0176    REF   2  LAST  205    05,2203   03441 0             1DNADR TIG             TIG,+1
 0177    REF   1               05,2204   32207 0             DNPTR   LMCSTA05       COMMON DATA
 01771   REF   1               05,2205   32144 1             DNPTR   LMCSTA10       COMMON DATA
 0178    REF  19  LAST  206    05,2206   52755 1            -6DNADR DSPTAB          DSPTAB+0...+11D TABLE

R0179        ----------------  SUB-LISTS  ----------------------------

 0180    REF   2  LAST  205    05,2107              LMCSTA01 EQUALS LMORBM01        COMMON DOWNLIST DATA

 0181    REF   2  LAST  205    05,2116              LMCSTA02 EQUALS LMORBM02        COMMON DOWNLIST DATA

 0182    REF   2  LAST  205    05,2125              LMCSTA03 EQUALS LMORBM03        COMMON DOWNLIST DATA

 0183    REF   2  LAST  205    05,2134              LMCSTA04 EQUALS LMORBM04        COMMON DOWNLIST DATA

 0184    REF   8  LAST  206    05,2207   07021 0  LMCSTA05 2DNADR OMEGAP          OMEGAP,OMEGAQ,OMEGAR,GARBAGE
 01841   REF   8  LAST  206    05,2210   07234 0           2DNADR CDUXD           CDUXD,CDUYD,CDUZD,GARBAGE
 01842   REF   6  LAST  206    05,2211   04032 1           2DNADR CDUX            CDUX,CDUY,CDUZ,CDUT
 01843   REF   7  LAST  203    05,2212   76520 1          -1DNADR CH5MASK         CH5MASK,CH6MASK        COMMON DATA

 0185    REF   1               05,2213   05700 0  LMCSTA06 2DNADR X789            X789+0...+3             COMMON DATA
 0186   REF    4  LAST  208   05,2214   77665 1            -1DNADR LASTYCMD      LASTYCMD,LASTXCMD
A0187
 0188   REF    3  LAST  161   05,2215   12737 1  LMCSTA07 3DNADR OGC           OGC,+1,IGC,+1,MGC,+1      COMMON DATA
 0189   REF    3  LAST  161   05,2216   02755 1            1DNADR 8ESTI         8ESTI,8ESTJ
 0190   REF    2  LAST  128   05,2217   12760 0            3DNADR STARSAV1      STARSAV1+0...+5
 0191   REF    2  LAST  128   05,2220   65011 1           -3DNADR STARSAV2      STARSAV2+0...+5

 01911  REF    1              05,2144            LMCSTA10 EQUALS LMORB10       COMMON DOWNLIST DATA

R0192         ----------------------------------------------------------
R0193   *** UNREFERENCED LOCATIONS USED IN LIST 2
R0194   *** UPDATE THIS LIST WHEN ANY CHANGES ARE MADE TO DOWNLINK LISTS.


A0195                                                          LOCATION         LIST NAME

 0196   REF    3  LAST  206   E6,1516            DL201      =     NEGTORKU         COSTALIN
 0197   REF    3  LAST  206   E6,1517            DL202      =     POSTORKV
 0198   REF    2  LAST  206   E6,1520            DL203      =     NEGTORKV
 0199   REF    3  LAST  206      1331            DL204      =     DNRRDOT
 0200   REF    4  LAST  206      1334            DL205      =     DNLRVELY
 0201   REF    5  LAST  207      1335            DL206      =     DNLRVELZ
 0202   REF    3  LAST  207      1336            DL207      =     DNLRALT
 0203   REF    3  LAST  206      0025            DL208      =     TIME1
 0204   REF    2  LAST  206      1356            DL209      =     DUMLOOPS
 0205   REF    2  LAST  161      0037            DL210      =     PIPAX
 0206   REF    2  LAST  161      0040            DL211      =     PIPAY
 0207   REF    1                 0041            DL212      =     PIPAZ
 0208   REF    1                 0113            DL213      =     LASTXCMD
 0209   REF    2  LAST  207      1327            DL214      =     CSMMASS
 0210   REF   17  LAST  207      1300            DL215      =     IMUDES33
 0211   REF    2  LAST  209      0113            DL216      =     LASTXCMD         LMCSTA06
 0212   REF    3  LAST  161   E5,1741            DL217      =     IGC              LMCSTA07
 0213   REF    2  LAST  128   E5,1743            DL218      =     MGC
 0214   REF    2  LAST  128   E5,1756            DL219      =     8ESTJ
 02141  REF    5  LAST  203      1260            DL220      =     CH6MASK
```

```
P0215    LM RENDEZVOUS AND PRE-THRUST DOWNLIST

R0216        -----------------  CONTROL LIST  --------------------------

 0217                         05,2221                RENDEZVU EQUALS                    SEND ID BY SPECIAL CODING
 0218    REF   1              05,2221   32107 0               DNPTR   LMREND01          COLLECT SNAPSHOT
 0219    REF   7  LAST  208   05,2222   24340 0               6DNADR  DNTMBUFF          SEND SNAPSHOT
 0220    REF   1              05,2223   32265 1               DNPTR   LMREND07          COLLECT SNAPSHOT
 0221    REF   1              05,2224   32275 0               DNPTR   LMREND08          SEND    SNAPSHOT
 0222    REF   3  LAST  205   05,2225   03451 1               1DNADR  DELLT4            DELLT4,+1
 0223    REF   3  LAST  162   05,2226   13433 1               3DNADR  DELVSLV           DELVSLV+0...+5
 0224    REF   2  LAST  205   05,2227   03633 1               1DNADR  TCSI              TCSI,+1
 0225    REF   2  LAST  205   05,2230   12257 1               3DNADR  DELVEET1          DELVEET+0...+5
 0226    REF   4  LAST  208   05,2231   01355 0               1DNADR  SERVDURN          SERVDURN,DUMLOOPS
 0227    REF   2  LAST  205   05,2232   03630 1               1DNADR  TPASS4            TPASS4,+1
 0228    REF   1              05,2233   32213 0               DNPTR   LMREND06          COMMON DATA
 0229    REF   1              05,2234   32116 0               DNPTR   LMREND02          COMMON DATA
 0230    REF   4  LAST  208   05,2235   00024 1               1DNADR  TIME2             TIME2/1
 0231    REF   1              05,2236   32125 0               DNPTR   LMREND03          COLLECT SNAPSHOT
 0232    REF   8  LAST  210   05,2237   24340 0               6DNADR  DNTMBUFF          SEND SNAPSHOT
 0233    REF   1              05,2240   32134 0               DNPTR   LMREND04          COMMON DATA
 0234    REF   4  LAST  208   05,2241   07115 0               2DNADR  POSTORKU          POSTORKU,NEGTORKU,POSTORKV,NEGTORKV
 0235    REF   3  LAST  205   05,2242   01363 0               1DNADR  ALMCADR           ALMCADR,+1
 0236    REF   2  LAST  205   05,2243   01774 1               1DNADR  TCDH              TCDH,+1
 0237    REF   2  LAST  205   05,2244   12265 0               3DNADR  DELVEET2          DELVEET2+0...+5
 0238    REF   2  LAST  205   05,2245   03635 1               1DNADR  TTPI              TTPI,+1
 0239    REF   2  LAST  205   05,2246   12356 1               3DNADR  DELVEET3          DELVEET3+0...+5
 0240    REF   2  LAST  205   05,2247   02247 1               1DNADR  ELEV              ELEV,+1
 0241    REF   3  LAST  208   05,2250   04036 0               2DNADR  CDUS              CDUS,PIPAX,PIPAY,PIPAZ
 0242    REF   5  LAST  209   05,2251   00112 0               1DNADR  LASTYCMD          LASTYCMD,LASTXCMD
 0243    REF   4  LAST  208   05,2252   01326 1               1DNADR  LEMMASS           LEMMASS,CSMMASS
 0244    REF  35  LAST  208   05,2253   01277 1               1DNADR  IMODES30          IMODES30,IMODES33
 0245    REF   3  LAST  208   05,2254   03441 0               1DNADR  TIG               TIG,+1
 0246    REF   1              05,2255   32207 0               DNPTR   LMREND05          COMMON DATA
 02461   REF   1              05,2256   32144 1               DNPTR   LMREND10          COMMON DATA
 0247    REF   3  LAST  208   05,2257   01516 1               1DNADR  TET               TET,+1
 0248    REF   1              05,2260   03620 0               1DNADR  CENTANG           CENTANG,+1
 0249    REF   1              05,2261   03466 0               1DNADR  NN                NN,+1
 0250    REF   2  LAST  205   05,2262   03577 1               1DNADR  DIFFALT           DIFFALT,+1
 0251    REF   1              05,2263   02340 1               1DNADR  DELVTPF           DELVTPF,+1
 0252    REF   1              05,2264   77770 1              -1DNADR  SPARE

R0253        -----------------  SUB-LISTS  ---------------------------

 0254    REF   3  LAST  208   05,2107                LMREND01 EQUALS LMORBM01           COMMON DOWNLIST DATA

 0255    REF   3  LAST  208   05,2116                LMREND02 EQUALS LMORBM02           COMMON DOWNLIST DATA

 0256    REF   3  LAST  208   05,2125                LMREND03 EQUALS LMORBM03           COMMON DOWNLIST DATA
 0257   REF   3  LAST  208   05,2134                LMREND04 EQUALS LMORBM04          COMMON DOWNLIST DATA

 0258   REF   2  LAST  208   05,2207                LMREND05 EQUALS LMCSTA05          COMMON DOWNLIST DATA

 0259   REF   1              05,2213                LMREND06 EQUALS LMCSTA06          COMMON DOWNLIST DATA

 0260   REF   2  LAST  162   05,2265   74320 0  LMREND07-1DNADR AIG                   AIG,AMG         SNAPSHOT
 0261   REF   3  LAST  162   05,2266   03461 1           1DNADR AOG                   AOG,TRKMKCNT
 0262   REF   3  LAST  152   05,2267   03752 1           1DNADR TANGNB                TANGNB,+1
 0263   REF   4  LAST  211   05,2270   03753 0           1DNADR TANGNB +1             TANGNB+1,GARBAGE
 0264   REF   2  LAST  153   05,2271   03760 0           1DNADR RANGRDOT              RANGRDOT, +1
 0265   REF   3  LAST  211   05,2272   03761 1           1DNADR RANGRDOT +1           RANGERDOT +1, GARBAGE
 0266   REF   1              05,2273   01073 1           1DNADR AGSCODE               AGSCODE,GARBAGE
 0267   REF   2  LAST  152   05,2274   74023 0          -1DNADR MKTIME                MKTIME,+1
 0268   REF   9  LAST  210   05,2275   24340 0  LMREND08 6DNADR DNTMBUFF              SEND SNAPSHOT
 0269   REF  10  LAST  211   05,2276   77423 1          -1DNADR DNTMBUFF +12D         SEND SNAPSHOT
 02691  REF   2  LAST  209   05,2144                LMREND10 EQUALS LMORB10           COMMON DATA

R0270        -----------------------------------------------------
R0271   *** UNREFERENCED LOCATIONS USED IN LIST 3
A0272                                                   LOCATION          LIST NAME

R0273   *** UPDATE THIS LIST WHEN ANY CHANGES ARE MADE TO DOWNLINK LISTS.


 0274   REF   3  LAST  209      1356                DL301     =         DUMLOOPS          RENDEZVU
 0275   REF   4  LAST  209      0025                DL302     =         TIME1
 0276   REF   4  LAST  209   E6,1516                DL303     =         NEGTORKU
 0277   REF   4  LAST  209   E6,1517                DL304     =         POSTORKV
 0278   REF   3  LAST  209   E6,1520                DL305     =         NEGTORKV
 0279   REF   3  LAST  209      0037                DL306     =         PIPAX
 0280   REF   3  LAST  209      0040                DL307     =         PIPAY
 0281   REF   2  LAST  209      0041                DL308     =         PIPAZ
 0282   REF   3  LAST  209      0113                DL309     =         LASTXCMD
 0283   REF   3  LAST  209      1327                DL310     =         CSMMASS
 0284   REF  18  LAST  209      1300                DL311     =         IMODES33
 0285   REF   1              E7,1460                DL312     =         AMG               LMREND07
 0286   REF   4  LAST  162   E7,1462                DL313     =         TRKMKCNT
 0287   REF   4  LAST  209      1331                DL314     =         DNRRDOT
```

```
P0288   LM DESCENT AND ASCENT DOWNLIST

R0289        ----------------  CONTROL LIST  --------------------------

 0290                              05,2277              DESC/ASC EQUALS               SEND ID BY SPECIAL CODING
 0291   REF   4  LAST  210         05,2277  01363 0           1DNADR ALMCADR           ALMCADR,+1
 0294   REF   1                    05,2300  32347 0           DNPTR  LMDSAS08          COLLECT SNAPSHOT
 0295   REF  11  LAST  211         05,2301  10340 1           3DNADR DNTMBUFF          SNED SNAPSHOT
 0296   REF   1                    05,2302  32340 1           DNPTR  LMDSAS07          COLLECT SNAPSHOT
 0297   REF  12  LAST  212         05,2303  24340 0           6DNADR DNTMBUFF          SEND SNAPSHOT
 0298   REF   3  LAST  208         05,2304  01341 0           1DNADR TEVENT            TEVENT,+1
 0299   REF   2  LAST  141         05,2305  13251 0           3DNADR UNFC/2            UNFC/2+0...+5
 0300   REF   2  LAST  160         05,2306  13645 1           3DNADR VGVECT            VGVECT+0...+5
 0301   REF   2  LAST  156         05,2307  03642 1           1DNADR TTF/8             TTF/8,+1
 0302   REF   2  LAST  210         05,2310  00007 0           1DNADR SPARE
 0303   REF   3  LAST  208         05,2311  12020 0           3DNADR RLS               RLS+0...+5
 0304   REF   2  LAST  124         05,2312  02267 0           1DNADR ZDOTD             ZDOTD,+1
 0305   REF   1                    05,2313  32213 0           DNPTR  LMDSAS09          COMMON DATA
 0306   REF   1                    05,2314  32116 0           DNPTR  LMDSAS02          COMMON DATA
 0307   REF   5  LAST  210         05,2315  00024 1           1DNADR TIME2             TIME2/1
 0308   REF   1                    05,2316  32125 0           DNPTR  LMDSAS03          COLLECT SNAPSHOT
 0309   REF  13  LAST  212         05,2317  24340 0           6DNADR DNTMBUFF          SEND SNAPSHOT
 0310   REF   1                    05,2320  32134 0           DNPTR  LMDSAS04          COMMON DATA
 0311   REF   5  LAST  210         05,2321  07115 0           2DNADR POSTORKU          POSTORKU,NEGTORKU,POSTORKV,NEGTORKV
 0312   REF   2  LAST  127         05,2322  12623 0           3DNADR RGU               RGU+0...+5
 0313   REF   2  LAST  156         05,2323  13626 1           3DNADR VGU               VGU+0...+5
 0314   REF   2  LAST  156         05,2324  13634 1           3DNADR LAND              LAND+0...+5
 0315   REF   2  LAST  123         05,2325  02253 1           1DNADR AT                AT,+1
 0316   REF   1                    05,2326  02026 1           1DNADR TLAND             TLAND,+1
 0317   REF   2  LAST  154         05,2327  03507 0           1DNADR DVTOTAL           DVTOTAL,+1
 0318   REF   6  LAST  210         05,2330  00112 0           1DNADR LASTYCMD          LASTYCMD,LASTXCMD
 0319   REF   5  LAST  210         05,2331  01326 1           1DNADR LEMMASS           LEMMASS,CSMMASS
 0320   REF  36  LAST  210         05,2332  01277 1           1DNADR IMODES30          IMODES30,IMODES33
 0321   REF   4  LAST  210         05,2333  03441 0           1DNADR TIG               TIG,+1
 0322   REF   1                    05,2334  32140 0           DNPTR  LMDSAS05          COMMON DATA
 0323   REF   1                    05,2335  32151 0           DNPTR  LMDSAS06          COMMON DATA
 0324   REF   2  LAST  156         05,2336  03614 1           1DNADR PSEUDO55          PSEUDO55,GARBAGE
 0325   REF   2  LAST  164         05,2337  74324 1          -1DNADR TTOGO             TTOGO,+1
R0326        ----------------  SUB-LISTS  --------------------------

 0327   REF   4  LAST  210         05,2116              LMDSAS02 EQUALS LMORBM02      COMMON DOWNLIST DATA

 0328   REF   4  LAST  210         05,2125              LMDSAS03 EQUALS LMORBM03      COMMON DOWNLIST DATA

 0329   REF   4  LAST  211         05,2134              LMDSAS04 EQUALS LMORBM04      COMMON DOWNLIST DATA

 0330   REF   2  LAST  205         05,2140              LMDSAS05 EQUALS LMORBM05      COMMON DOWNLIST DATA

 0331   REF   2  LAST  205         05,2151              LMDSAS06 EQUALS LMORBM06      COMMON DOWNLIST DATA
 0332   REF   1                05,2340   74001 0  LMDSAS07-1DNADR HMEASDL          HMEASDL,+1
 0333   REF   2  LAST   157    05,2341   03652 0           1DNADR VMEAS            VMEAS,+1
 0334   REF   3  LAST   211    05,2342   03457 1           1DNADR AIG              AIG,AMG
 0335   REF   4  LAST   211    05,2343   03461 1           1DNADR AOG              AOG,VSELECT
 0336   REF   3  LAST   162    05,2344   03732 1           1DNADR LATVMETR         LATVMETR,FORVMETR
 0337   REF   5  LAST   210    05,2345   01355 0           1DNADR SERVDURN         SERVDURN,DUMLOOPS
 0338   REF   3  LAST   211    05,2346   74023 0          -1DNADR MKTIME           MKTIME,+1

 0339   REF   2  LAST   157    05,2347   74113 1  LMDSAS08-1DNADR DELTAH           DELTAH,+1
 03391  REF   2  LAST   156    05,2350   03615 0           1DNADR FC               FC,+1
 03392  REF   1                05,2351   03752 1           1DNADR GTCTIME          GTCTIME,+1
 0340   REF   1                05,2352   74041 1          -1DNADR TRUDELH          TRUDELH,+1

 0341   REF   2  LAST   211    05,2213            LMDSAS09 EQUALS LMCSTA06         COMMON DOWNLIST DATA

R0342        ------------------------------------------------------------
R0343       *** UNREFERENCED LOCATIONS USED IN LIST 4
R0344       *** UPDATE THIS LIST WHEN ANY CHANGES ARE MADE TO DOWNLINK LISTS.


A0345                                                       LOCATION         LIST NAME

 0346   REF   5  LAST   211       0025            DL401    =    TIME1            DESC/ASC
 0347   REF   5  LAST   211    E6,1516            DL402    =    NEGTORKU
 0348   REF   5  LAST   211    E6,1517            DL403    =    POSTORKV
 0349   REF   4  LAST   211    E6,1520            DL404    =    NEGTORKV
 0350   REF   4  LAST   211       0113            DL405    =    LASTXCMD
 0351   REF   4  LAST   211       1327            DL406    =    CSMMASS
 0352   REF  19  LAST   211       1300            DL407    =    IMODES33
 0353   REF   2  LAST   211    E7,1460            DL408    =    AMG              LMDSAS07
 0354   REF   1                E7,1462            DL409    =    VSELECT
 0355   REF   2  LAST   158    E7,1733            DL410    =    FORVMETR
 0356   REF   4  LAST   211       1356            DL411    =    DUMLOOPS
```

```
P0357   LM LUNAR SURFACE ALIGN DOWNLIST

R0358        -----------------  CONTROL LIST  -------------------------

 0359                          05,2353                 SURFALIN EQUALS                 SEND ID BY SPECIAL CODING
 0360    REF   1               05,2353   32107 0                DNPTR   LMLSAL01       COLLECT SNAPSHOT
 0361    REF  14   LAST  212   05,2354   24340 0                6DNADR  DNTMBUFF       SEND SNAPSHOT
 0362    REF   1               05,2355   32407 0                DNPTR   LMLSAL07       COLLECT SNAPSHOT
 0363    REF  15   LAST  214   05,2356   14340 0                4DNADR  DNTMBUFF       SEND SNAPSHOT
 0364    REF   3   LAST  208   05,2357   02774 1                1DNADR  TALIGN         TALIGN,+1
 0365    REF   4   LAST  208   05,2360   25731 0                6DNADR  REFSMMAT       REFSMMAT+0...+11D
 0366    REF   3   LAST  161   05,2361   26227 1                6DNADR  YNBSAV         YNBSAV+0...+5,ZNBSAV+0...+5
 0367    REF   2   LAST  208   05,2362   01700 1                1DNADR  X789           X789,+1
 0368    REF   4   LAST  210   05,2363   01516 1                1DNADR  TET            TET,+1
 0369    REF   7   LAST  212   05,2364   00112 0                1DNADR  LASTYCMD       LASTYCMD,LASTXCMD
 0370    REF   1               05,2365   32116 0                DNPTR   LMLSAL02       COMMON DATA
 0371    REF   6   LAST  212   05,2366   00024 1                1DNADR  TIME2          TIME/1
 0372    REF   1               05,2367   32125 0                DNPTR   LMLSAL03       COLLECT SNAPSHOT
 0373    REF  16   LAST  214   05,2370   24340 0                6DNADR  DNTMBUFF       SEND SNAPSHOT
 0374    REF   1               05,2371   32134 0                DNPTR   LMLSAL04       COMMON DATA
 0375    REF   1               05,2372   32215 0                DNPTR   LMLSAL08       COMMON DATA
 0376    REF   4   LAST  123   05,2373   12221 0                3DNADR  GSAV           GSAV+0...+5
 0377    REF   2   LAST  208   05,2374   03371 1                1DNADR  AGSK           AGSK,+1
 0378    REF   8   LAST  214   05,2375   00112 0                1DNADR  LASTYCMD       LASTYCMD,LASTXCMD
 0379    REF   6   LAST  212   05,2376   01326 1                1DNADR  LEMMASS        LEMMASS,CSMMASS
 0380    REF  37   LAST  212   05,2377   01277 1                1DNADR  IMODES30       IMODES30,IMODES33
 0381    REF   5   LAST  212   05,2400   03441 0                1DNADR  TIG            TIG,+1
 0385    REF   1               05,2401   32207 0                DNPTR   LMSAL05        COMMON DATA
 0386    REF   7   LAST  208   05,2402   01235 1                1DNADR  AOTCODE        AOTCODE,GARBAGE
 0387    REF   1               05,2403   32145 0                DNPTR   LMLSAL09       COMMON DATA
 0388    REF   1               05,2404   32151 0                DNPTR   LMLSAL06       COMMON DATA
 0389    REF   2   LAST  151   05,2405   03561 0                1DNADR  TSIGHT         TSIGHT,TSIGHT +1
 0390    REF   3   LAST  161   05,2406   76537 1               -1DNADR  CURSOR         AOT CURSOR,SPIRAL
R0391        -----------------  SUB-LISTS  -------------------------

 0392    REF   4   LAST  210   05,2107                 LMLSAL01 EQUALS LMORBM01        COMMON DOWNLIST DATA

 0393    REF   5   LAST  212   05,2116                 LMLSAL02 EQUALS LMORBM02        COMMON DOWNLIST DATA

 0394    REF   5   LAST  212   05,2125                 LMLSAL03 EQUALS LMORBM03        COMMON DOWNLIST DATA

 0395    REF   5   LAST  212   05,2134                 LMLSAL04 EQUALS LMORBM04        COMMON DOWNLIST DATA

 0396    REF   3   LAST  211   05,2207                 LMSAL05  EQUALS LMCSTA05        COMMON DOWNLIST DATA

 0397    REF   3   LAST  212   05,2151                 LMLSAL06 EQUALS LMORBM06        COMMON DOWNLIST DATA

 0398    REF   4   LAST  213   05,2407   74320 0       LMLSAL07-1DNADR  AIG            AIG,AMG                 SNAPSHOT
 03981   REF   5   LAST  213   05,2410   03461 1                1DNADR  AOG            AOG,TRKMKCNT
 03982   REF   5   LAST  211   05,2411   03752 1                1DNADR  TANGNB         TANGNB,+1
 03983  REF   4  LAST  213    05,2412   03754 1         1DNADR MKTIME       MKTIME,+1
 03984  REF   4  LAST  211    05,2413   74017 1        -1DNADR RANGRDOT     DNRRANGE,DNRRDOT

 0399   REF   2  LAST  208    05,2215            LMLSAL08 EQUALS LMCSTA07   COMMON DOWNLIST DATA
 0400   REF   1               05,2145            LMLSAL09 EQUALS LMORBM09   COMMON DOWNLIST DATA
R0401       ----------------------------------------------------------------------
R0402   *** UNREFERENCED LOCATIONS USED IN LIST 5
R0403   *** UPDATE THIS LIST WHEN ANY CHANGES ARE MADE TO DOWNLINK LISTS.


A0404                                                       LOCATION        LIST NAME

 0405   REF   1               E4,1635            DL501    =    ZNBSAV          SURFALIN
 0406   REF   5  LAST  213       0113            DL502    =    LASTXCMD
 0407   REF   6  LAST  213       0025            DL503    =    TIME1
 0408   REF   6  LAST  215       0113            DL504    =    LASTXCMD
 0409   REF   5  LAST  213       1327            DL505    =    CSMMASS
 0410   REF  20  LAST  213       1300            DL506    =    IMODES33
 0411   REF   4  LAST  207    E6,1422            DL507    =    OMEGAQ
 0412   REF   3  LAST  207    E6,1423            DL508    =    OMEGAR
 0413   REF   4  LAST  207    E6,1635            DL509    =    CDUYD
 0414   REF   3  LAST  207    E6,1636            DL510    =    CDUZD
 0415   REF   4  LAST  207       0033            DL511    =    CDUY
 0416   REF   7  LAST  207       0034            DL512    =    CDUZ
 0417   REF   4  LAST  207       0035            DL513    =    CDUT ←
 0418   REF   2  LAST  207    E6,1425            DL514    =    ALPHAR
 0419   REF   2  LAST  108       1241            DL515    =    SPIRAL
 04191 *REF   3  LAST  213    E7,1460            DL516    =    AMG             LMSAL07
 04192 *REF   5  LAST  211    E7,1462            DL517    =    TRKMKCNT
 04193 *REF   5  LAST  211       1331            DL518    =    DNRRDOT
```

```
P0420  LM AGS INITIALIZATION AND UPDATE DOWNLIST

R0421       ----------------  CONTROL LIST  -------------------------

 0422                          05,2414             AGSI/UPD EQUALS                 SEND ID BY SPECIAL CODING
 0423  REF   2  LAST  122      05,2414   12171 0           3DNADR AGSBUFF +0       AGSBUFF+0...+5
 0424  REF   3  LAST  216      05,2415   02205 1           1DNADR AGSBUFF +12D     AGSBUFF+12D,GARBAGE
 0425  REF   4  LAST  216      05,2416   12172 0           3DNADR AGSBUFF +1       AGSBUFF+1...+6
 0426  REF   5  LAST  216      05,2417   02206 1           1DNADR AGSBUFF +13D     AGSBUFF+13D,GARBAGE
 0427  REF   6  LAST  216      05,2420   12177 0           3DNADR AGSBUFF +6       AGSBUFF+6...+11
 0428  REF   7  LAST  216      05,2421   02205 1           1DNADR AGSBUFF +12D     AGSBUFF+12,GARBAGE
 0429  REF   8  LAST  216      05,2422   12200 0           3DNADR AGSBUFF +7       AGSBUFF+7...+12D
 0430  REF   9  LAST  216      05,2423   02206 1           1DNADR AGSBUFF +13D     AGSBUFF+13D,GARBAGE
 0431  REF   3  LAST  161      05,2424   25167 0           6DNADR COMPNUMB         COMPNUMB,UPOLDMOD,UPVERB,UPCOUNT,
A0432                                                                              UPBUFF+0...+7
 0433  REF   2  LAST  1 7      05,2425   25203 1           6DNADR UPBUFF +8D       UPBUFF +8D...+19D
 0434  REF   1                 05,2426   32116 0           DNPTR  LMAGSI02         COMMON DATA
 0435  REF   7  LAST  214      05,2427   00024 1           1DNADR TIME2            TIME2/1
 0436  REF   1                 05,2430.  32125 0           DNPTR  LMAGSI03         COLLECT SNAPSHOT
 0437  REF  17  LAST  214      05,2431   24340 0           6DNADR DNTMBUFF         SEND SNAPSHOT
 0438  REF   1                 05,2432   32134 0           DNPTR  LMAGSI04         COMMON DATA
 0439  REF   6  LAST  212      05,2433   07115 0           2DNADR POSTORKU         POSTORKU,NEGTORKU,POSTORKV,NEGTORKV
 0440  REF   6  LAST  213      05,2434   01355 0           1DNADR SERVDURN         SERVDURN,DUMLOOPS
 0441  REF   5  LAST  212      05,2435   01363 0           1DNADR ALMCADR          ALMCADR,+1
 0442  REF   3  LAST  214      05,2436   03371 1           1DNADR AGSK             AGSK,+1
 0443  REF   3  LAST  216      05,2437   25173 0           6DNADR UPBUFF           UPBUFF+0...+11D
 0444  REF   4  LAST  216      05,2440   15207 0           4DNADR UPBUFF +12D      UPBUFF+12D...+19D
 0445  REF   7  LAST  214      05,2441   01326 1           1DNADR LEMMASS          LEMMASS,CSMMASS
 0446  REF  38  LAST  214      05,2442   01277 1           1DNADR IMODES30         IMODES30,IMODES33
 0447  REF   3  LAST  212      05,2443   00007 0           1DNADR SPARE
 0448  REF   1                 05,2444   32140 0           DNPTR  LMAGSI05         COMMON DATA
 0449  REF  20  LAST  208      05,2445   52755 1          -6DNADR DSPTAB           DSPTAB+0...+11D

R0450       ----------------  SUB-LISTS  ---------------------------

 0451  REF   6  LAST  214      05,2116             LMAGSI02 EQUALS LMORBM02        COMMON DOWNLIST DATA

 0452  REF   6  LAST  214      05,2125             LMAGSI03 EQUALS LMORBM03        COMMON DOWNLIST DATA

 0453  REF   6  LAST  214      05,2134             LMAGSI04 EQUALS LMORBM04        COMMON DOWNLIST DATA

 0454  REF   3  LAST  212      05,2140             LMAGSI05 EQUALS LMORBM05        COMMON DOWNLIST DATA

R0455       ------------------------------------------------------

R0456  *** UNREFERENCED LOCATIONS USED IN LIST 6
R0457  *** UPDATE THIS LIST WHEN ANY CHANGES ARE MADE TO DOWNLINK LISTS.

A0458                                                   LOCATION        LIST NAME
```

```
 0459    REF    3  LAST  161        1170             DL601      =       UPOLDMOD         AGSI/UPD
 0460    REF    3  LAST  161        1171             DL602      =       UPVERB
 0461    REF    3  LAST  161        1172             DL603      =       UPCOUNT
 0462    REF    5  LAST  216        1173             DL604      =       UPBUFF
 0463    REF    7  LAST  215        0025             DL605      =       TIME1
 0464    REF    6  LAST  213     E6,1516             DL606      =       NEGTORKU
 0465    REF    6  LAST  213     E6,1517             DL607      =       POSTORKV
 0466    REF    5  LAST  213     E6,1520             DL608      =       NEGTORKV
 0467    REF    5  LAST  213        1356             DL609      =       DUMLOOPS
 0468    REF    6  LAST  215        1327             DL610      =       CSMMASS
 0469    REF   21  LAST  215        1300             DL611      =       1MODES33
R0470    ---------------------------------------------------------------------------------------------------------------
 0471    REF    2  LAST  204     05,2446    02153 1  DNTABLE    GENADR COSTALIN         LM COAST AND ALIGN DOWNLIST
 0472    REF    3  LAST  204     05,2447    02414 1             GENADR AGSI/UPD         LM AGS INITIALIZATION/UPDATE DOWNLIST
 0473    REF    1                05,2450    02221 1             GENADR RENDEZVU         LM RENDEZVOUS AND PRETHRUST DOWNLIST
 0474    REF    1                05,2451    02046 1             GENADR ORBMANUV         LM ORBITAL MANEUVERS DOWNLIST
 0475    REF    1                05,2452    02277 1             GENADR DESC/ASC         LM DESCENT AND ASCENT DOWNLIST
 0476    REF    1                05,2453    02353 0             GENADR SURFALIN         LM LUNAR SURFACE ALIGN DOWNLIST
R0477     ------------------------------------------------------------------------------------------
```

```
R0001  PROGRAM NAME:    AGS INITIALIZATION (R47)

R0002  WRITTEN BY  :    RHODE / KILROY / FOLLETT

R0003  MOD NO. :        0
R0004  DATE    :        23 MARCH 1967
R0005  MOD BY  :        KILROY

R0006  MOD NO. :        1
R0007  DATE    :        28 OCTOBER 1967
R0008  MOD BY  :        FOLLETT

R0009  FUNCT. DESC.:    (1) TO PROVIDE THE AGS ABORT ELECTRONICS ASSEMBLY(AEA) WITH THE LEM AND CSM STATE VECTORS
R0011                   (POSITION,VELOCITY,TIME) IN LEM IMU COORDINATES BY MEANS OF THE LGC DIGITAL DOWNLINK.

R0013                   (2) TO ZERO THE ICDU, LGC AND AEA GIMBAL ANGLE COUNTERS SIMULTANEOUSLY IN ORDER TO ESTABLISH A
R0015                   COMMON ZERO REFERENCE FOR THE MEASUREMENT OF GIMBAL(EULER) ANGLES WHICH DEFINE LEM ATTITUDE
R0019                   (3) TO ESTABLISH THE GROUND ELAPSED TIME OF AEA CLOCK ZERO.(IF AN AEA CLOCK ZERO IS
R0021                   REQUESTED DURING THIS PROGRAM

R0022  LOG SECTION :    AGS INITIALIZATION

R0023  CALLING SEQ :    PROGRAM IS ENTERED WHEN ASTRONAUT KEYS V47E ON DSKY.
R0024                   R47 MAY BE CALLED AT ANY TIME EXCEPT WHEN ANOTHER EXTENDED VERB IS IN PROGRESS

R0026  SUBROUTINES
R0027  CALLED      :

R0028  NORMAL EXIT :    ENDEXT

R0029  ALARM/ABORT :    ALARM - BAD REFSMMAT - CODE:220
R0030                   OPERATOR ERROR IF V47 SELECTED DURING ANOTHER EXTENDED VERB.

R0032  ERASABLES
R0033  USED        :    SAMPTIME    (2) TIME OF :ENTER: KEYSTROKE
R0034                   AGSK        (2) GROUND ELAPSED TIME OF THE AEA CLOCK :ZERO:
R0036                   AGSBUFF   (14D) CONTAINS AGS INITIALIZATION DATA (SEE :OUTPUT: BELOW)
R0038                   AGSWORD     (1) PREVIOUS DOWNLIST SAVED HERE

 0039  REF   4  LAST  216   E6,1771                          EBANK= AGSK
 0040                       40,2000                          BANK    40
 0041  REF   1              32,2000                          SETLOC R47
 0042                       32,2005                          BANK

 0043  REF   1                                               COUNT* $$/R47

 0044  REF   1              32,2005  3 4730 1  AGSINIT       CAF     REFSMBIT
 0045  REF   1              32,2006  7 0077 0                MASK    FLAGWRD3        CHECK REFSMFLG.
 0046  REF  37  LAST  202   32,2007 10 000 0                 CCS     A
 0047  REF   1              32,2010  0 2017 0                TC      REDSPTEM        REFSMMAT IS OK
 0048    REF    8  LAST  196   32,2011  0 5571 1             TC       ALARM             REFSMMAT IS BAD
 0049                          32,2012   00220 1             OCT      220
 0050    REF    1              32,2013  0 5474 0             TC       ENDEXT

 0061                          32,2014  0 0006 1  NEWAGS     EXTEND
 0062    REF    1              32,2015  3 0014 1             DCA      SAMPTIME          TIME OF THE :ENTER: KEYSTROKE
 0063    REF    5  LAST  218   32,2016  53'772 0             DXCH     AGSK              BECOMES NEW AEA CLOCK :ZERO:

 0064                          32,2017  0 0006 1  REDSPTEM   EXTEND
 0065    REF    6  LAST  219   32,2020  3 1772 1             DCA      AGSK
 0066    REF    2  LAST  105   32,2021  53'051 0             DXCH     DSPTEMX
 0067    REF    1              32,2022  3 2166 1  AGSDISPK   CAF      V06N16
 0068    REF    1              32,2023  0 4607 1             TC       BANKCALL          R1 = 00XXX. HRS., R2 = 000XX MIN.,
 0069    REF    1              32,2024   20323 1             CADR     GOMARKE           R3 = 0XX.XX SEC.
 0070    REF    2  LAST  219   32,2025  0 5474 0             TC       ENDEXT            TERMINATE RETURN
 0071    REF    1              32,2026  0 2036 0             TC       AGSVCALC          PROCEED   RETURN
 00711   REF   21  LAST  190   32,2027  4 4737 1             CS       BIT6              IS ENTER VIA A V32
 00712   REF   12  LAST  100   32,2030  6 0154 1             AD       MPAC
 00713                         32,2031  0 0006 1             EXTEND
 00714   REF    1              32,2032  1 2014 1             BZF      NEWAGS            YES, USE KEYSTROKE TIME FOR NEW AGSK

 0072                          32,2033  0 0006 1             EXTEND                     NO, NEW AGSK LOADED VIA V25
 0073    REF    3  LAST  219   32,2034  3 1051 1             DCA      DSPTEMX           LOADED INTO DSPTEMX BY KEYING
 0074    REF    2  LAST  218   32,2035  0 2016 1             TC       REDSPTEM -1       V25E FOLLOWED BY HRS.,MINS.,SECS.
A0075                                                                                   DISPLAY THE NEW K

 0076    REF    1              32,2036  0 6060 1  AGSVCALC   TC       INTPRET
 0077                          32,2037   77414 0             SET      EXIT
 0078    REF    1              32,2040   02076 1                      XDSPFLAG

 0079    REF    2  LAST  219   32,2041  3 2166 1             CAF      V06N16
 00795   REF    2  LAST  219   32,2042  0 4607 1             TC       BANKCALL
 00796   REF    1              32,2043   20632 1             CADR     EXDSPRET

 0082    REF    2  LAST  219   32,2044  0 6060 1             TC       INTPRET           EXTRAPOLATE LEM AND CSM STATE VECTORS
 0083                          32,2045   77634 0             RTB                        TO THE PRESENT TIME
 0084    REF    1              32,2046   21603 1                      LOADTIME          LOAD MPAC WITH TIME2,TIME1
 0085    REF    1              32,2047   34041 0             STCALL   TDEC1             CALCULATE LEM STATE VECTOR
 0086    REF    2  LAST   38   32,2050   27115 1                      LEMPREC
 0087                          32,2051   77624 1             CALL                       CALL ROUTINE TO CONVERT TO SM COORDS AND
 0088    REF    1              32,2052   64126 0                      SCALEVEC          PROVIDE PROPER SCALING
 0089    REF   10  LAST  216   32,2053   16172 1             STODL    AGSBUFF           (LEMPREC AND CSMPREC LEAVE TDEC1 IN TAT)
 0090    REF    1              32,2054   00015 0                      TAT               TAT = TIME TO WHICH RATT1 AND VATT1 ARE
 0091    REF    2  LAST  219   32,2055   34041 0             STCALL   TDEC1             COMPUTED(CSEC SINCE CLOCK START B-28).
 0092    REF    2  LAST   38   32,2056   27101 1                      CSMPREC           CALCULATE CSM STATE VECTOR FOR SAME TIME
 0093                          32,2057   77624 1             CALL
 0094    REF    2  LAST  219   32,2060   64126 0                      SCALEVEC
 0095    REF   11  LAST  219   32,2061   16200 1             STODL    AGSBUFF +6
 0096    REF    2  LAST  219   32,2062   00015 0                      TAT
 0097                          32,2063   56225 1             DSU      DDV               CALCULATE AND STORE THE TIME
```

```
L          AGS INITIALIZATION                                                                      USER'S PAGE NO.   3      E6 S3

 0098   REF    7  LAST   219    32,2064   03372 1                      AGSK
 0099   REF    1                32,2065   24171 0                      TSCALE
 0100   REF   12  LAST   219    32,2066   02206 1             STORE    AGSBUFF +12D
 0101                           32,2067   77776 1             EXIT

 0102   REF    1                32,2070  3 4744 1             CAF      LAGSLIST
 0103   REF    3  LAST   162    32,2071  54 333 0             TS       DNLSTCOD

 0104   REF    1                32,2072  3 2172 1             CAF      20SEC                 DELAY FOR 20 SEC WHILE THE AGS
 0105   REF    3  LAST   219    32,2073  0 4607 1             TC       BANKCALL              DOWNLIST IS TRANSMITTED
 0106   REF    1                32,2074   01736 1             CADR     DELAYJOB

 0107   REF    1                32,2075  3 1321 0             CA       AGSWORD
 0108   REF    4  LAST   220    32,2076  54 333 0             TS       DNLSTCOD              RETURN TO THE OLD DOWNLIST
 0109   REF    3  LAST   176    32,2077  3 4735 1             CAF      IMUSEBIT
 0110   REF    6  LAST   196    32,2100  7 0074 0             MASK     FLAGWRD0              CHECK IMUSE FLAG.
 0111   REF   38  LAST   218    32,2101  10 000 0             CCS      A
 0112   REF    1                32,2102  0 2120 0             TC       AGSEND                IMU IS BEING USED - DO NOT ZERO
 01121  REF    1                32,2103  11 301 0  CKSTALL    CCS      IMUCADR               CHECK FOR IMU USAGE WHICH AVOIDS THE
 01122                          32,2104  1 2107 1             TCF      +3                    IMUSE BIT:  I.E., IMU COMPENSATION.
 01123                          32,2105  1 2113 1             TCF      +6                    FREE.  GO AHEAD WITH THE IMU ZERO.
 01124                          32,2106  1 2107 1             TCF      +1
 01125  REF    1                32,2107  3 4354 1     +3      CAF      TEN                   WAIT .1 SEC AND TRY AGAIN.
 01126  REF    4  LAST   220    32,2110  0 4607 1             TC       BANKCALL
 01127  REF    2  LAST   220    32,2111   01736 1             CADR     DELAYJOB
 01128  REF    1                32,2112  1 2103 0             TCF      CKSTALL

 0113   REF    5  LAST   220    32,2113  0 4607 1     +6      TC       BANKCALL              IMU IS NOT IN USE
 0114   REF    1                32,2114   16701 0             CADR     IMUZERO               SET IMU ZERO DISCRETE FOR 320MSECS
 0115   REF    6  LAST   220    32,2115  0 4607 1             TC       BANKCALL              WAIT 3SEC FOR COUNTERS TO INCREMENT
 0116   REF    1                32,2116   17735 0             CADR     IMUSTALL
 0117   REF    2  LAST   220    32,2117  0 2120 0             TC       AGSEND
 0120   REF    1                32,2120  3 2167 0  AGSEND     CAF      V50N16
 0121   REF    7  LAST   220    32,2121  0 4607 1             TC       BANKCALL
 01211  REF    1                32,2122   20334 1             CADR     GOMARK3
 01212  REF    3  LAST   219    32,2123  1 5474 1             TCF      ENDEXT
 01213  REF    4  LAST   220    32,2124  1 5474 1             TCF      ENDEXT
 0122   REF    5  LAST   220    32,2125  0 5474 0             TC       ENDEXT

 0127                           32,2126   64375 1  SCALEVEC   VLOAD    MXV
 0128   REF    1                32,2127   00025 0                      VATT1
 0129   REF    5  LAST   214    32,2130   01732 0                      REFSMMAT
 0130                           32,2131   72561 0             VXSC     VSL2
 0131   REF    1                32,2132   24176 1                      VSCALE
 01311                          32,2133   53255 0             VAD      VAD                   THIS SECTION ROUNDS THE VECTOR, AND
 01312  REF    1                32,2134   24200 0                      AGSRND1               CORRECTS FOR THE FACT THAT THE AGS
 01313  REF    1                32,2135   24206 0                      AGSRND2               IS A 2 S COMPLIMENT MACHINE WHILE THE
 01314                          32,2136   77634 0             RTB                            LGC IS A 1 S COMPLIMENT MACHINE.
 01315  REF    1                32,2137   21770 1                      VECSGNAG
 0132   REF    2  LAST   220    32,2140   24025 0             STOVL    VATT1
 0133   REF    1              32,2141   00017 1                   RATT1
 0134                         32,2142   74321 1           MXV     VXSC
 0135   REF    6  LAST   220  32,2143   01732 0                   REFSMMAT
 0136   REF    1              32,2144   24174 0                   RSCALE
 0137                         32,2145   53212 0           VSL8    VAD                    AGAIN THIS SECTION ROUNDS. TWO VECTORS
 01371  REF    2  LAST   220  32,2146   24200 0                   AGSRND1                ARE ADDED TO DEFEAT ALSIGNAG IN THE
 01372                        32,2147   47055 1           VAD     RTB                    CASE OF A HIGH-ORDER ZERO COUPLED WITH
 01373  REF    2  LAST   220  32,2150   24206 0                   AGSRND2                A LOW ORDER NEGATIVE PART.
 01374  REF    2  LAST   220  32,2151   21770 1                   VECSGNAG
 01375                        32,2152   77750 0           LXA,1
 0138   REF    3  LAST   220  32,2153   00024 1                   VATT1
 0139                         32,2154   72130 0           SXA,1   LXA,1
 0140   REF   13  LAST   219  32,2155   00155 0                   MPAC +1
 0141   REF    4  LAST   221  32,2156   00026 0                   VATT1 +2
 0142                         32,2157   72130 0           SXA,1   LXA,1
 0143   REF   14  LAST   221  32,2160   00160 0                   MPAC +4
 0144   REF    5  LAST   221  32,2161   00030 1                   VATT1 +4
 0145                         32,2162   43530 0           SXA,1   RVQ
 0146   REF   15  LAST   221  32,2163   00162 1                   MPAC +6

 0147   REF    6  LAST   194      4744            LAGSLIST =      ONE
 0148                         32,2164   00216 1   VC1N14   VN     0114
 01485                        32,2165   14400 0   V50N00A  VN     5000
 0149   REF    1                  6010            V00N25   EQUALS OCT31
 01495                        32,2166   01420 0   V06N16   VN     0616
 01496  REF    1                  4233            V00N34   EQUALS 34DEC
 01497                        32,2167   14420 1   V50N16   VN     5016
 0150                         32,2170   03100 0   TSCALE   2DEC   100B-10            CSEC TO SEC SCALE FACTOR
 0150                         32,2171   00000 1
 0151                         32,2172   03720 1   20SEC    DEC    2000
 0152                         32,2173   15077 0   RSCALE   2DEC   3.280839 B-3       METERS TO FEET SCALE FACTOR
 0152                         32,2174   05041 1
 0153                         32,2175   24402 1   VSCALE   2DEC   3.280839 E2 B-9 METERS/CS TO FEET/SEC SCALE FACTOR
 0153                         32,2176   25724 1
 01531                        32,2177   00000 1   AGSRND1  2OCT   0000060000
 01531                        32,2200   60000 1
 01532                        32,2201   00000 1            2OCT   0000060000
 01532                        32,2202   60000 1
 01533                        32,2203   00000 1            2OCT   0000060000
 01533                        32,2204   60000 1
 01534                        32,2205   00000 1   AGSRND2  2OCT   0000037777
 01534                        32,2206   37777 1
 01535                        32,2207   00000 1            2OCT   0000037777
 01535                        32,2210   37777 1
 01536                        32,2211   00000 1            2OCT   0000037777
 01536                        32,2212   37777 1
 0154   REF    1              30,2000                      SBANK= LOWSUPER           FOR SUBSEQUENT LOW 2CADRS.
```

```
P00743
 0075                          10,2000                          BANK    10
 0076    REF    2  LAST    45  05,2000                          SETLOC  FRANDRES
 0077                          05,2454                          BANK

 0078    REF    3  LAST   164  E3,1400                          EBANK=  LST1

 0079    REF    2 LAST    45 TO  45:      1       1*            COUNT*  $$/START             FRESH AND RESTART
 0080                          05,2454  0 0004 0  SLAP1         INHINT                       FRESH START. COMES HERE FROM PINBALL.
 0081    REF    1              05,2455  0 3107 1                TC      STARTSUB             SUBROUTINE DOES MOST OF THE WORK.

 0082    REF    1              05,2456  1 2463 0  STARTSW       TCF     SKIPSIM              PATCH....TCF STARTSIM...FOR SIMULATION
 0083    REF   24  LAST   184  05,2457  3 4727 1  STARTSIM      CAF     BIT14
 0084    REF    1              05,2460  0 5C76 0                TC      FINDVAC
 0085                          05,2461   77777 0  SIM2CADR      OCT     77777                PATCH 2CADR (AND EBANK DESIGNATION) OF
 0086                          05,2462   77777 0                OCT     77777                SIMULATION START ADDRESS.

 0087    REF   21  LAST   216  05,2463  3 1035 0  SKIPSIM       CA      DSPTAB +11D
 00871   REF    1              05,2464  7 4762 1                MASK    BITS4&6              TURN OFF ALL DSPTAB +11D LAMPS
 00872   REF   18  LAST   191  05,2465  6 4726 0                AD      BIT15                EXCEPT THE GIMBAL LOCK & NO ATT ONLY ON
 0088    REF   22  LAST   222  C5,2466  55'035 1                TS      DSPTAB +11D          REQUESTED FRESH START.

 0093    REF    7  LAST   202  05,2467  3 4746 0                CA      ZERO
 00931   REF    2  LAST   112  05,2470  55'365 1                TS      ERCOUNT
 009315  REF    2  LAST   207  05,2471  54 375 1                TS      FAILREG
 00932   REF    3  LAST   222  05,2472  54 376 1                TS      FAILREG +1
 009325  REF    4  LAST   222  05,2473  54 377 0                TS      FAILREG +2
 00933   REF    3  LAST   205  05,2474  54 320 1                TS      REDOCTR

 009333                        05,2475  0 0C06 1                EXTEND
 009334  REF    1              05,2476  01 077 0                WRITE   CHAN77               ZERO CHANNEL 77

 009335  REF    1              05,2477  4 4635 1                CS      PRIO12
 00934   REF    9  LAST   170  05,2500  55'310 0                TS      DSRUPTSW

 0094    REF   25  LAST   222  C5,2501  3 4727 1  DOESTART      CAF     BIT14                INSURE ENGINE IS OFF.
 0095                          05,2502  0 0006 1                EXTEND
 0096    REF    7  LAST   190  C5,2503  01 011 0                WRITE   DSALMOUT
 0097    REF    8  LAST   222  05,2504  4 4746 1                CS      ZERO
 0098    REF    1              05,2505  54 055 0                TS      THRUST

 0101    REF    2  LAST   184  C5,2506  3 4346 1  DOFSTRT1      CA      PRIO30
 0102    REF    1              05,2507  55'264 1                TS      RESTREG              SUPER BANK PRIORITY FOR DISPLAYS.

 0103    REF    9  LAST   222  05,2510  3 4746 0                CA      ZERO
 0104    REF    3  LAST   108  C5,2511  55'245 1                TS      ABDELV               DAP INITIALIZATION
 0105    REF    1              05,2512  54 370 1                TS      NVSAVE
 0106    REF    1              C5,2513  55'071 1                TS      EBANKTEM
 0107    REF    8  LAST   208  05,2514  55'257 1                TS      CH5MASK
 0108    REF    6  LAST   209  C5,2515  55'260 0                TS      CH6MASK
 0109   REF   7  LAST  203   05,2516  55'273 1          TS      PVALVEST    FOR RCS FAILURE MONITOR
 0110   REF   2  LAST  112   05,2517  55'360 1          TS      ERESTORE    ***** MUST NOT BE REMOVED FROM DOFSTART
 0111   REF   2  LAST  112   05,2520  55'362 0          TS      SMODE       ***** MUST NOT BE REMOVED FROM DOFSTART
 0112   REF   5  LAST  220   05,2521  54 333 0          TS      DNLSTCOD    SELECT P00 DOWNLIST
 0113   REF   2  LAST  220   05,2522  55'321 1          TS      AGSWORD     ALLOW AGS INITIALIZATION
 0114   REF   3  LAST  115   05,2523  55'501 0          TS      UPSVFLAG    ZERO UPDATE STATE VECTOR REQUEST FLAGWRD
 0115                        05,2524  0 0006 1          EXTEND
 0116   REF   1              05,2525  01 005 0          WRITE   CHAN5       TURN OFF RCS JETS.
 0117                        05,2526  0 0006 1          EXTEND
 0118   REF   1              05,2527  01 006 0          WRITE   CHAN6       TURN OFF RCS JETS.
 0119                        05,2530  0 0006 1          EXTEND
 0120   REF  14  LAST  198   05,2531  01 012 0          WRITE   CHAN12
 0121                        05,2532  0 0006 1          EXTEND
 0122   REF   1              05,2533  01 013 1          WRITE   CHAN13
 0123                        05,2534  0 0006 1          EXTEND
 0124   REF   3  LAST  185   05,2535  01 014 0          WRITE   CHAN14
 0125   REF  23  LAST  222   05,2536  4 1035 1          CS      DSPTAB +11D
 0126   REF   2  LAST  222   05,2537  7 4762 1          MASK    BITS4&6
 0127   REF  39  LAST  220   05,2540  10 000 0          CCS     A
 0128                        05,2541  0 2545 1          TC      +4
 0129   REF   3  LAST  223   05,2542  3 4762 0          CA      BITS4&6
 0130                        05,2543  0 0006 1          EXTEND              THE IMU WAS IN COARSE ALIGN IN GIMBAL
 0131   REF  15  LAST  223   05,2544  05 012 1          WOR     CHAN12      LOCK, SO PUT IT BACK INTO COARSE ALIGN.
 0132   REF   1              05,2545  0 2645 1    +4    TC      MR.KLEAN

 0133   REF  10  LAST  222   05,2546  4 4746 1          CS      ZERO
 0134   REF   1              05,2547  55'010 0          TS      MODREG

 0135   REF   1              05,2550  3 3377 1          CAF     IM30INIF    FRESH START IMU INITIALIZATION.
 0136   REF  39  LAST  216   05,2551  55'277 0          TS      IMODES30

 0137   REF   1              05,2552  3 3067 0          CAF     MAXDB
 0138   REF   2  LAST  111   05,2553  55'343 0          TS      DB
 0139   REF   1              05,2554  3 4742 1          CAF     FOUR
 0140   REF   1              05,2555  55'322 1          TS      RATEINDX    INITIALIZE KALCMANU RATE
 0141   REF   1              05,2556  3 3064 0          CA      BOOLSTRT
 0142   REF   3  LAST  207   05,2557  54 111 1          TS      DAPBOOLS
 0143   REF   1              05,2560  3 5006 1          CAF     EBANK6
 0144   REF   1              05,2561  54 003 0          TS      EBANK
 0145   REF   1              E6,1400                    EBANK=  HIASCENT

 01451  REF   1              05,2562  3 3062 0          CA      STIKSTRT
 01452  REF   1              05,2563  55'444 0          TS      STIKSENS
 01453  REF   1              05,2564  3 3063 1          CA      RATESTRT
 01454  REF   2  LAST  135   05,2565  55'476 1          TS      -RATEDB
 0146   REF   1              05,2566  3 2000 0          CAF     FULLAPS     INITIALIZE MAXIMUM ASCENT MASS FOR USE
 0147   REF   2  LAST  223   05,2567  55'400 0          TS      HIASCENT      BY 1/ACCS UNTIL THE PAD LOAD IS DONE.
 0148   REF   1              05,2570  4 4775 1          CS      LOW9        LOAD DAP FILTER GAINS (PAD LOAD)
 0149   REF   1              05,2571  55'403 0          TS      DKTRAP         TO BEST PRESENT ESTIMATE OF GOODIES
 0150   REF   1              05,2572  55'406 0          TS      LMTRAP      .14 DEG
```

```
0151  REF   1             05,2573  3 3065 1              CA     60DEC
0152  REF   1             05,2574  55'405 0              TS     DKKAOSN
0153  REF   1             05,2575  55'410 1              TS     LMKAOSN           6 SEC GAIN FOR ALPHA
0154  REF  11  LAST  223  05,2576  3 4746 0              CA     ZERO
0155  REF   1             05,2577  55'407 1              TS     LMOMEGAN          UNITY GAIN
0156  REF   2  LAST  220  05,2600  3 4354 1              CA     TEN
0157  REF   1             05,2601  55'404 1              TS     DKOMEGAN          1 SEC GAIN FOR OMEGA
0158  REF  17  LAST  202  05,2602  3 4735 1              CAF    BIT8              SET DOCKED DB TO 1.4 DEG.  MAY OVERWRITE
0159  REF   1             05,2603  55'411 0              TS     DKD8                WITH PAD LOAD.
0160  REF   1             05,2604  3 5017 1              CAF    IM33INIT
0161  REF  22  LAST  215  05,2605  6 4737 0              AD     BIT6              KEEP BOTH DAP AND ERROR-NEEDLES DISPLAY
0162  REF  22  LAST  217  05,2606  55'300 1              TS     IMODES33            OFF UNTIL ICDU ZERO IS FINISHED.

0163                      05,2607  0 0006 1              EXTEND                   INITIALIZE SWITCHES ONLY ON FRESH START.
0164  REF   1             05,2610  3 3404 1              DCA    SWINIT
0165  REF  18  LAST  206  05,2611  52 075 1              DXCH   STATE
0166  REF   2  LAST  224  05,2612  3 3405 0              CA     SWINIT +2
0167  REF  19  LAST  224  05,2613  54 076 1              TS     STATE +2
0168  REF   2  LAST  218  05,2614  3 4730 1              CA     REFSMBIT          DO NOT ALTER REFSMFLG ON FRESH START.
01685 REF   1             05,2615  6 4732 0              AD     NOPO7BIT                   NODOP07
0169  REF  20  LAST  224  05,2616  7 0077 0              MASK   STATE +3
0170  REF   3  LAST  224  05,2617  6 3406 0              AD     SWINIT +3
0171  REF  21  LAST  224  05,2620  54 077 0              TS     STATE +3
0172                      05,2621  0 0006 1              EXTEND
0173  REF   4  LAST  224  05,2622  3 3410 1              DCA    SWINIT +4
0174  REF  22  LAST  224  05,2623  52 101 0              DXCH   STATE +4
0175                      05,2624  0 0006 1              EXTEND
0176  REF   5  LAST  224  05,2625  3 3412 0              DCA    SWINIT +6
0177  REF  23  LAST  224  05,2626  52 103 1              DXCH   STATE +6
0178  REF   1             05,2627  3 3061 0              CA     OCT6200           CMOONFLG, LMOONFLG, SURFFLAG
0181  REF  24  LAST  224  05,2630  7 0104 0              MASK   STATE +8D
0182  REF   6  LAST  224  05,2631  6 3413 1              AD     SWINIT +8D
0183  REF  25  LAST  224  05,2632  54 104 0              TS     STATE +8D
0184  REF   7  LAST  224  05,2633  3 3414 0              CA     SWINIT +9D
0185  REF  26  LAST  224  05,2634  54 105 1              TS     STATE +9D
0186  REF   1             05,2635  3 4730 1              CA     APSFLBIT          DO NOT ALTER APSFLAG ON FRESH START.
0187  REF  27  LAST  224  05,2636  7 0106 1              MASK   STATE +10D
0188  REF   8  LAST  224  05,2637  6 3415 1              AD     SWINIT +10D
0189  REF  28  LAST  224  05,2640  54 106 1              TS     STATE +10D
0190  REF   9  LAST  224  05,2641  3 3416 1              CAE    SWINIT +11D
0191  REF  29  LAST  224  05,2642  54 107 0              TS     STATE +11D

0192  REF   2  LAST  175  05,2643  0 4626 1   ENDRSTRT   TC     POSTJUMP          NOW IN ANOTHER BANK.
0193  REF   1             05,2644   03212 0              CADR   DUMMYJOB + 2      PICKS UP AT RELINT.   (DONT ZERO NEWJOB)


0194                      05,2645  0 0004 0   MR.KLEAN   INHINT
0195                      05,2646  0 0006 1              EXTEND
0196  REF   2  LAST  167  05,2647  3 4746 0              DCA    NEGO
0197  REF   1             05,2650  52 754 0              DXCH   -PHASE2
```

```
0198                            05,2651  0 0006 1  POOKLEAN EXTEND
0199    REF    3  LAST   224    05,2652  3 4746 0           DCA     NEGO
0200    REF    1                05,2653  52 760 1           DXCH    -PHASE4
0201                            05,2654  0 0006 1  V37KLEAN EXTEND
0202    REF    4  LAST   225    05,2655  3 4746 0           DCA     NEGO
0203    REF    1                05,2656  52 762 0           DXCH    -PHASE5
0204                            05,2657  0 0006 1  ABTKLEAN EXTEND
0205    REF    5  LAST   225    05,2660  3 4746 0           DCA     NEGO
0206    REF    1                05,2661  52 756 1           DXCH    -PHASE3
0207                            05,2662  0 0006 1           EXTEND
0208    REF    6  LAST   225    05,2663  3 4746 0           DCA     NEGO
0209    REF    1                05,2664  52 752 0           DXCH    -PHASE1
0210                            05,2665  0 0006 1           EXTEND
0211    REF    7  LAST   225    05,2666  3 4746 0           DCA     NEGO
0212    REF    1                05,2667  52 764 0           DXCH    -PHASE6
0213    REF   14  LAST   203    05,2670  0 0002 0           TC      Q
```

```
P0214              COMES HERE FROM LOCATION 4000, GOJAM. RESTART ANY PROGRAMS WHICH MAY HAVE BEEN RUNNING AT THE TIME

 0215   REF   4  LAST  222   E3,1400                          EBANK= LST1
 0217   REF   4  LAST  222   05,2671  24 320 0  GOPROG      INCR    REDOCTR          ADVANCE RESTART COUNTER.

 0218   REF  15  LAST  225   05,2672  22 002 0              LXCH    Q
 0219                        05,2673  0 0006 1              EXTEND
 0220   REF   1              05,2674  04 007 1              ROR     SUPERBNK
 0221   REF   2  LAST  206   05,2675  53'433 0              DXCH    RSBBQ
 0222   REF  24  LAST  223   05,2676  3 1035 0              CA      DSPTAB +11D
 0223   REF  17  LAST  181   05,2677  7 4741 0              MASK    BIT4
 0224                        05,2700  0 0006 1              EXTEND
 0225                        05,2701  1 2705 0              BZF     +4
 0226   REF  23  LAST  224   05,2702  6 4737 0              AD      BIT6             SET ERROR COUNTER ENABLE
 0227                        05,2703  0 0006 1              EXTEND
 0228   REF  16  LAST  223   05,2704  05 012 1              WOR     CHAN12           ISS WAS IN COARS ALIGN SO GO BACK TO
 0229   REF   1              05,2705  0 3070 0  BUTTONS     TC      LIGHTSET

R0230                                                  ERASCHK TEMPORARILY STORES THE CONTENTS OF TWO ERASABLE LOCATIONS, X
R0232                                                  AND X+1 INTO SKEEP5 AND SKEEP6. IT ALSO STORES X INTO SKEEP7 AND
R0234                                                  ERESTORE. IF ERASCHK IS INTERRUPTED BY A RESTART, C(ERESTORE) SHOULD
R0236                                                  EQUAL C(SKEEP7),AND BE A + NUMBER LESS THAN 2000 OCT. OTHERWISE
R0238                                                  C(ERESTORE) SHOULD EQUAL +0.

 0239   REF   2  LAST  167   05,2706  3 4341 0              CAF     HI5
 0240   REF   3  LAST  223   05,2707  7 1360 1              MASK    ERESTORE
 0241                        05,2710  0 0006 1              EXTEND
 0242                        05,2711  1 2713 1              BZF     +2               IF ERESTORE NOT = +0 OR +N LESS THAN 2K,
 0243   REF   1              05,2712  1 3105 1              TCF     NONAVKEY +3      DO FRESH START - E MEMORY MIGHT BE BAD
 0244   REF   4  LAST  226   05,2713  4 1360 1              CS      ERESTORE
 0245                        05,2714  0 0006 1              EXTEND
 0246   REF   1              05,2715  1 2732 1              BZF     DORSTART         = +0 CONTINUE WITH RESTART.
 0247   REF   1              05,2716  6 1377 0              AD      SKEEP7
 0248                        05,2717  0 0006 1              EXTEND
 0249                        05,2720  1 2722 0              BZF     +2               = SKEEP7, RESTORE E MEMORY.
 0250   REF   2  LAST  226   05,2721  1 3105 1              TCF     NONAVKEY +3      DO FRESH START - E MEMORY MIGHT BE BAD
 0251   REF   2  LAST  113   05,2722  3 1374 0              CA      SKEEP4
 0252   REF   2  LAST  223   05,2723  54 003 0              TS      EBANK            EBANK OF E MEMORY THAT WAS UNDER TEST.
 0253                        05,2724  0 0006 1              EXTEND                   (NOT DXCH SINCE THIS MIGHT HAPPEN AGAIN)
 0254   REF   2  LAST  113   05,2725  3 1376 1              DCA     SKEEP5
 0255   REF   2  LAST  226   05,2726  51'377 0              INDEX   SKEEP7
 0256                        05,2727  52 001 1              DXCH    0000             E MEMORY RESTORED.
 0257   REF  12  LAST  224   05,2730  3 4746 0              CA      ZERO
 0258   REF   5  LAST  226   05,2731  55'360 1              TS      ERESTORE
 0259   REF   2  LAST  222   05,2732  0 3107 1  DORSTART    TC      STARTSUB         DO INITIALIZATION AFTER ERASE RESTORE.

 0271   REF   1              05,2733  4 4727 0  SETINFL     CS      INTFLBIT
 0272   REF   5  LAST  192   05,2734  7 0106 1              MASK    FLGWRD10
 0273   REF   6  LAST  226   05,2735  54 106 1              TS      FLGWRD10
 0274   REF   1              05,2736  3 3401 1            CA      9,6,4              LEAVE PROG ALARM,GIMBAL LOCK, NO ATT
 0275   REF  25  LAST  226   05,2737  7 1035 1            MASK    DSPTAB +11D        LAMPS INTACT ON HARDWARE RESTART
 0276   REF  19  LAST  222   05,2740  6 4726 0            AD      BIT15
 0277   REF  26  LAST  227   05,2741  57'035 0            XCH     DSPTAB +11D
 0278   REF   1              05,2742  3 3365 1            CAF     IFAILINH           LEAVE IMU FAILURE INHIBITS INTACT ON
 0279   REF  40  LAST  223   05,2743  7 1277 0            MASK    IMODES30           HARDWARE RESTART. RESET ALL FAILURE
 0280   REF   1              05,2744  6 3400 0            AD      IM30INIR           CODES.
 0281   REF  41  LAST  227   05,2745  55'277 0            TS      IMODES30

 0282   REF   3  LAST  223   05,2746  3 1321 0            CA      AGSWORD            BE SURE OF CORRECT DOWNLIST
 0283   REF   6  LAST  223   05,2747  54 333 0            TS      DNLSTCOD

 0284   REF  18  LAST  226   05,2750  3 4741 1            CA      BIT4               TURN ON THROTTLE COUNTER
 0285                        05,2751  0 0006 1            EXTEND
 0286   REF   4  LAST  223   05,2752  05 014 1            WOR     CHAN14             TURN ON THRUST DRIVE
 0287   REF   5  LAST  197   05,2753  4 0101 0            CS      FLAGWRD5
 0288   REF   2  LAST  184   05,2754  7 4736 0            MASK    ENGONBIT
 0289   REF  40  LAST  223   05,2755  10 000 0            CCS     A
 0290                        05,2756  1 2763 0            TCF     +5
 0291   REF  17  LAST  178   05,2757  3 4730 1            CAF     BIT13
 0292                        05,2760  0 0006 1            EXTEND
 0293   REF   8  LAST  222   05,2761  05 011 1            WOR     DSALMOUT           TURN ENGINE ON
 0294   REF   1              05,2762  1 2777 0            TCF     GOPROG3
 0295   REF  26  LAST  222   05,2763  3 4727 1     +5     CAF     BIT14
 0296                        05,2764  0 0006 1            EXTEND
 0297   REF   9  LAST  227   05,2765  05 011 1            WOR     DSALMOUT           TURN ENGINE OFF.
 0298   REF   2  LAST  227   05,2766  1 2777 0            TCF     GOPROG3

 0299                        05,2767  0 0004 0  ENEMA     INHINT
 0300   REF   1              05,2770  0 3116 1            TC      STARTSB1
 0301   REF   1              05,2771  1 2773 1            TCF     GOPROG2A
 0302   REF   1              05,2772  0 3156 0  GOPROG2   TC      STARTSB2
 0303   REF   2  LAST  226   05,2773  0 3070 0  GOPROG2A  TC      LIGHTSET
 0304   REF   2  LAST  226   05,2774  4 4727 0            CS      INTFLBIT           CLEAR INTEGR IN PROGRESS BIT
 0305   REF   7  LAST  226   05,2775  7 0106 1            MASK    FLGWRD10
 0306   REF   8  LAST  227   05,2776  54 106 1            TS      FLGWRD10

 0307   REF   1              05,2777  3 4747 1  GOPROG3   CAF     NUMGRPS            VERIFY PHASE TABLE AGREEMENTS
 0308   REF  16  LAST  221   05,3000  54 161 0  PCLOOP    TS      MPAC +5
 0309                        05,3001  6 0000 1            DOUBLE
 0310                        05,3002  0 0006 1            EXTEND
 0311   REF  41  LAST  227   05,3003  5 0000 1            INDEX   A
 0312   REF   2  LAST  225   05,3004  3 0752 1            DCA     -PHASE1            COMPLEMENT INTO A, DIRECT INTO L.
 0313                        05,3005  0 0006 1            EXTEND
 0314   REF   7  LAST  193   05,3006  06 001 0            RXOR    LCHAN              RESULT MUST BE -0 FOR AGREEMENT.
 0315   REF  42  LAST  227   05,3007  10 000 0            CCS     A
 0316   REF   1              05,3010  1 3056 0            TCF     PTBAD              RESTART FAILURE.
 0317   REF   2  LAST  227   05,3011  1 3056 0            TCF     PTBAD
 0318   REF   3  LAST  227   05,3012  1 3056 0            TCF     PTBAD
 0319    REF  17  LAST  227   05,3013  10 161 0             CCS     MPAC +5       PROCESS ALL RESTART GROUPS.
 0320    REF   1              05,3014   1 3000 0            TCF     PCLOOP

 0321    REF  18  LAST  228   05,3015  54 162 0             TS      MPAC +6       SET TO +0.
 0322    REF   1              05,3016   0 5317 1            TC      MMDSPLAY      DISPLAY MAJOR MODE

 0323                         05,3017   0 0004 0            INHINT                RELINT DONE IN MMDSPLAY

 0324    REF   1              05,3020   4 4727 0            CS      DIDFLBIT      CLEAR DIDFLAG IN ORDER TO FORCE R10 TO
 0325    REF   1              05,3021   7 0075 1            MASK    FLAGWRD1      RE-INITIALIZE ITSELF IF IT HAD BEEN
 0326    REF   2  LAST  228   05,3022  54 075 1             TS      FLAGWRD1      OPERATING AT THE TIME OF THE RESTART.

 03262   REF   1              05,3023   4 4731 1            CS      RODFLBIT      CLEAR RODFLAG.  IF P66 IS IN OPERATION
 03264   REF   3  LAST  228   05,3024   7 0075 1            MASK    FLAGWRD1            IT WILL RE-INITIALIZE ITSELF AND
 03266   REF   4  LAST  228   05,3025  54 075 1             TS      FLAGWRD1            CONTINUE.

 03267   REF   1              05,3026   4 4732 1            CS      P21FLBIT      CLEAR P21FLAG SO THAT P21 WILL COMPUTE
 03268   REF   7  LAST  220   05,3027   7 0074 0            MASK    FLAGWRD0      NEW BASE STATE VECTORS.
 03269   REF   8  LAST  228   05,3030  54 074 0             TS      FLAGWRD0

 0327    REF   2  LAST  227   05,3031   3 4747 1            CAF     NUMGRPS       SEE IF ANY GROUPS RUNNING.
 0328    REF  19  LAST  228   05,3032  54 161 0   NXTRST    TS      MPAC +5
 0329                         05,3033   6 0000 1            DOUBLE
 0330    REF  43  LAST  227   05,3034  50 000 1             INDEX   A
 0331    REF   1              05,3035  10 752 0             CCS     PHASE1
 0332    REF   1              05,3036   1 3040 1            TCF     PACTIVE       PNZ - GROUP ACTIVE.
 0333    REF   1              05,3037   1 3045 1            TCF     PINACT        +0 - GROUP NOT RUNNING.

 0334    REF  20  LAST  228   05,3040  54 154 0   PACTIVE   TS      MPAC
 0335    REF  21  LAST  228   05,3041  24 154 1             INCR    MPAC          ABS OF PHASE.
 0336    REF  22  LAST  228   05,3042  24 162 1             INCR    MPAC +6       INDICATE GROUP DEMANDS PRESENT.
 0337    REF   8  LAST  220   05,3043   0 4607 1            TC      BANKCALL
 0338    REF   1              05,3044    03530 1            CADR    RESTARTS
 0339    REF  23  LAST  228   05,3045  10 161 0   PINACT    CCS     MPAC +5       PROCESS ALL RESTART GROUPS.
 0340    REF   1              05,3046   1 3032 1            TCF     NXTRST

 0341    REF  24  LAST  228   05,3047  10 162 0             CCS     MPAC +6       NO, CHECK PHASE ACTIVITY FLAG
 0342    REF   1              05,3050   1 2643 0            TCF     ENDRSTRT      PHASE ACTIVE
 0343    REF  20  LAST  227   05,3051   3 4726 0            CAF     BIT15         IS MODE -0
 0344    REF   2  LAST  223   05,3052   7 1010 0            MASK    MODREG
 0345                         05,3053   0 0006 1            EXTEND
 0346    REF   1              05,3054   1 6011 0            BZF     CALGOP00      NO
 0347    REF   2  LAST  228   05,3055   1 2643 0            TCF     ENDRSTRT      YES
 0348    REF   9  LAST  219   05,3056   0 5571 1  PTBAD     TC      ALARM         SET ALARM TO SHOW PHASE TABLE FAILURE.
 0349                         05,3057    01107 0            OCT     1107

 0350    REF   1              05,3060   1 2506 1            TCF     DOFSTRT1

R0351    ******** ****** ******
R0352
```

```
R0353   DO NOT USE GOPROG2 OR ENEMA WITHCUT CONSULTING POOH PEOPLE
R0354
 0355   REF  18  LAST  227       4730                OCT10000 =       BIT13
 0356   REF   3  LAST  222       4346                OCT30000 =       PRIO30
 0357                       05,3061   06200 0  OCT6200  OCT     6200              SURFBIT, CMOONBIT, LMOONBIT FOR SWINITS
 03571                      05,3062   32321 0  STIKSTRT DEC     0.B25268          20 D/S MAXIMUM COMMANDED RATE
 03572                      05,3063   77445 1  RATESTRT DEC     -218
 0359                       05,3064   21322 1  BOOLSTRT OCT     21322
 0361                       05,3065   00074 1  60DEC    DEC     60
 0363                       05,3066   20100 1  RSFLGBTS OCT     20100
 03631                      05,3067   03434 1  MAXDB    OCTAL   03434             5 DEG ATTITUDE DEADBAND, SCALED AT 45.

 0364   REF  13  LAST  176  05,3070  3 4740 0  LIGHTSET CAF     BIT5              CHECK FOR MARK REJECT AND ERROR RESET
 0365                       05,3071  0 0006 1           EXTEND
 0366   REF   1             05,3072  02 016 1           RAND    NAVKEYIN
 0367                       05,3073  0 0006 1           EXTEND
 0368   REF   3  LAST  226  05,3074  1 3102 0           BZF     NONAVKEY          NO MARK REJECT
 0369                       05,3075  0 0006 1           EXTEND
 0370   REF   1             05,3076  00 015 0           READ    MNKEYIN           CHECK IF KEYS 2M AND 5M ON
 0371   REF   1             05,3077  6 3376 0           AD      -ELR              MAIN DSKY KEYCODE(BITS 1-5)
 0372                       05,3100  0 0006 1           EXTEND
 0373                       05,3101  1 3103 1           BZF     +2

 0374   REF  16  LAST  226  05,3102  0 0002 0  NONAVKEY TC      Q

 0375   REF   3  LAST  226  05,3103  0 3107 1           TC      STARTSUB
 0376   REF   1             05,3104  1 2501 0           TCF     DOFSTART
 03762  REF   4  LAST  229  05,3105  0 3107 1     +3    TC      STARTSUB
 03764  REF   2  LAST  228  05,3106  1 2506 1           TCF     DOFSTRT1          DO FRESH START BUT DON'T TOUCH ENGINE
```

```
P0377            INITIALIZATION COMMON TO BOTH FRESH START AND RESTART.

 0378   REF   5  LAST  203     E6,1536                          EBANK= AOSQ
 0379   REF   1                05,3107  3 3366 1  STARTSUB CAF    LDNPHAS1          SET POINTER SO NEXT 20MS DOWNRUPT WILL
 0380   REF   2  LAST  102     05,3110  54 335 0           TS     DNTMGOTO          CAUSE THE CURRENT DOWNLIST TO BE
A0381                                                                               INTERRUPTED AND START SENDING FROM THE
A0382                                                                               BEGINNING OF THE CURRENT DOWNLIST.
 0383   REF  24  LAST  226     05,3111  3 4737 0           CAF    BIT6
 0384                          05,3112  0 0006 1           EXTEND
 0385   REF   3  LAST  193     05,3113  02 033 0           RAND   CHAN33
 0386   REF   1                05,3114  6 3402 1           AD     RMODINIT
 0387   REF  17  LAST  206     05,3115  54 110 0           TS     RADMODES

 0388   REF   2  LAST  181     05,3116  3 4724 1  STARTSB1 CAF    POSMAX
 0389   REF   1                05,3117  54 026 1           TS     TIME3
 0390   REF   1                05,3120  6 7767 0           AD     MINUS2
 0391   REF   4  LAST  170     05,3121  54 027 0           TS     TIME4
 0392   REF   1                05,3122  6 7770 0           AD     NEGONE
 0393   REF   1                05,3123  54 030 0           TS     TIME5

 0394   REF   2  LAST  223     05,3124  3 5006 1           CAF    EBANK6
 0395   REF   3  LAST  226     05,3125  54 003 0           TS     EBANK

 03971  REF   3  LAST  230     05,3126  3 4724 1           CAF    POSMAX            DISABLE TIME6 CLOCK.  JUST IN CASE A T6
 03972  REF   1                05,3127  55'466 0           TS     T6NEXT              RUPT IS ALREADY IN THE PRIORITY CHAIN,
 03973                         05,3130  0 0006 1           EXTEND                     ENSURE THAT IT'S INPUTS WILL RENDER IT
 03974  REF   2  LAST  223     05,3131  03 013 0           WAND   CHAN13              INEFFECTUAL.
 0398   REF  13  LAST  226     05,3132  3 4746 0           CAF    ZERO
 0399   REF   1                05,3133  55'465 0           TS     NXT6ADR
 0400   REF   3  LAST  135     05,3134  55'472 0           TS     NEXTP

 0401   REF   1                05,3135  4 4742 0           CS     ACCSOKAY
 0402   REF   4  LAST  223     05,3136  7 0111 1           MASK   DAPBOOLS
 0403   REF   5  LAST  230     05,3137  54 111 1           TS     DAPBOOLS

 0404                          05,3140  0 0006 1           EXTEND                   SET T5RUPT FOR DAPIDLER PROGRAM.
 0405   REF   1                05,3141  3 3364 0           DCA    IDLEADR
 0406   REF   2  LAST  163     05,3142  53'263 0           DXCH   T5ADR

 04061  REF   1                05,3143  4 0107 0           CS     FLGWRD11          IF R12 IS PERMITTED, ENSURE THAT NEXT
 04062  REF   1                05,3144  7 4726 1           MASK   LRBYBIT            RADAR READS ARE NOT USED
 04063                         05,3145  0 0006 1           EXTEND
 040635 REF   2  LAST  227     05,3146  1 3156 1           BZF    STARTSB2          R12 OFF

 04064  REF  10  LAST  164     05,3147  24 006 1           INCR   BBANK             SET EBANK TO 7
 04065  REF   2  LAST  157     E7,1674                     EBANK= STILBADH
 04066  REF   3  LAST  230     05,3150  11'674 1           CCS    STILBADH          IF STILBADH>0,NEXT READ WILL BE IGNORED
 04067                         05,3151  1 3153 1           TCF    +2
 040675 REF   4  LAST  230     05,3152  25'674 0           INCR   STILBADH          SET STILBADH TO IGNORE NEXT READ
 04068  REF   2  LAST  157   05,3153  11'675 0    +2        CCS     STILBADV
 04069  REF   3  LAST  230   05,3154  1 3156 1              TCF     STARTSB2         IF STILBADV >0,NEXT READ WILL BE IGNORED
 040695 REF   3  LAST  231   05,3155  25'675 1              INCR    STILBADV         SET STILBADV TO IGNORE NEXT READ

 0407   REF   1              05,3156  3 3375 0  STARTSB2   CAF     OCT30001         DURING SOFTWARE RESTART, DO NOT DISTURB
 0408                        05,3157  0 0006 1              EXTEND                   ENGINE ON, OFF AND ISS WARNING.
 0409   REF  10  LAST  227   05,3160  03 011 1              WAND    DSALMOUT

 0415   REF   1              05,3161  4 3371 0              CS      OCT32001
 0416   REF  18  LAST  230   05,3162  7 0110 0              MASK    RADMODES
 0418   REF  19  LAST  231   05,3163  54 110 0              TS      RADMODES
 0419   REF   1              05,3164  3 3373 0              CAF     OCT27470         DURING SOFTWARE RESTART, DO NOT DISTURB
 0420                        05,3165  0 0006 1              EXTEND                   IMU FLAGS. (COURSE ALIGN ENABLE, ZERO
 0421   REF  17  LAST  226   05,3166  03 012 1              WAND    CHAN12           IMU CDUS, ENABLE IMU COUNTER) AND GIMBAL
A0422                                                                                TRIM DRIVES. LEAVE RR LOCKON ENABLE
A0423                                                                                ALONE.

 042305 REF   1              05,3167  4 4742 0              CS      R12RDBIT         R12RDFLG CLEARED TO ESCAPE FROM POSSIBLE
 04231  REF   2  LAST  230   05,3170  7 0107 0              MASK    FLGWRD11          "CCS NEWJOB" LOOP IN VUPDAT SEC. OF R12
 042315 REF   3  LAST  231   05,3171  54 107 0              TS      FLGWRD11

 04232  REF   2  LAST  197   05,3172  4 4741 0              CS      NORRMBIT         ENABLE R25.
 04234  REF   6  LAST  227   05,3173  7 0101 0              MASK    FLAGWRD5
 04236  REF   7  LAST  231   05,3174  54 101 0              TS      FLAGWRD5

 04237  REF   1              05,3175  4 4732 1              CS      R77FLBIT         CLEAR R77FLAG
 04238  REF   8  LAST  231   05,3176  7 0101 0              MASK    FLAGWRD5
 04239  REF   9  LAST  231   05,3177  54 101 0              TS      FLAGWRD5
 0424   RFF   1              05,3200  3 3374 1              CAF     OCT74160         DURING SOFTWARE RESTART, DO NOT DUSTURB
 0425                        05,3201  0 0006 1              EXTEND                   TELEMETRY FLAGS, RESET TRAP FLAGS, AND
 0426   REF   3  LAST  230   05,3202  03 013 0              WAND    CHAN13           ENABLE T6RUPT FLAG.

 0427   REF  13  LAST   89   05,3203  3 4731 0              CAF     BIT12            REENABLE RUPT10 (RUPT QUICKLY
 0428                        05,3204  0 0006 1              EXTEND                     RESUMES EXCEPT DURING P64)
 0429   REF   4  LAST  231   05,3205  05 013 0              WOR     CHAN13

 0430   REF   1              05,3206  3 4762 0              CAF     OCT50            DURING SOFTWARE RESTART, DO NOT DISTURB
 0431                        05,3207  0 0006 1              EXTEND                   GYRO ENABLE OR THRUST ENABLE
 0432   REF   5  LAST  227   05,3210  03 014 1              WAND    CHAN14

 04325  REF   1              05,3211  4 6130 1              CS      OCT40001         TO TURN OFF SUPER-KEYRELEASE LIGHT:
 04326  REF  27  LAST  227   05,3212  7 1035 1              MASK    DSPTAB +11D      TURN OFF BITS 15 AND 1 IF THEY WERE ON;
 04327  RFF  21  LAST  228   05,3213  6 4726 0              AD      BIT15            NOW SET BIT 15 TO TRIGGER DSKY UPDATE
 04328  REF  28  LAST  231   05,3214  55'035 1              TS      DSPTAB +11D

 0433   REF   5  LAST  226   E3,1400                        EBANK=  LST1
 0434   REF   1              05,3215  3 5000 1              CAF     STARTEB
 0435   REF   4  LAST  230   05,3216  54 003 0              TS      EBANK            SET FOR E3

 0436   REF   1              05,3217  3 4725 0              CAF     NEG1/2           INITIALIZE WAITLIST DELTA-TS.
 0437  REF   6  LAST  231   05,3220  55'407 1        TS       LST1 +7
 0438  REF   7  LAST  232   05,3221  55'406 0        TS       LST1 +6
 0439  REF   8  LAST  232   05,3222  55'405 0        TS       LST1 +5
 0440  REF   9  LAST  232   05,3223  55'404 1        TS       LST1  +4
 0441  REF  10  LAST  232   05,3224  55'403 0        TS       LST1  +3
 0442  REF  11  LAST  232   05,3225  55'402 1        TS       LST1  +2
 0443  REF  12  LAST  232   05,3226  55'401 1        TS       LST1  +1
 0444  REF  13  LAST  232   05,3227  55'400 0        TS       LST1

 0445  REF   1              05,3230  4 5240 0        CS       ENDTASK
 0446  REF   1              05,3231  55'410 1        TS       LST2
 0447  REF   2  LAST  232   05,3232  55'412 0        TS       LST2 +2
 0448  REF   3  LAST  232   05,3233  55'414 0        TS       LST2 +4
 0449  REF   4  LAST  232   05,3234  55'416 1        TS       LST2 +6
 0450  REF   5  LAST  232   05,3235  55'420 1        TS       LST2 +8D
 0451  REF   6  LAST  232   05,3236  55'422 0        TS       LST2 +10D
 0452  REF   7  LAST  232   05,3237  55'424 0        TS       LST2 +12D
 0453  REF   8  LAST  232   05,3240  55'426 1        TS       LST2 +14D
 0454  REF   9  LAST  232   05,3241  55'430 0        TS       LST2 +16D
 0455  REF   2  LAST  232   05,3242  4 5241 1        CS       ENDTASK +1
 0456  REF  10  LAST  232   05,3243  55'411 0        TS       LST2 +1
 0457  REF  11  LAST  232   05,3244  55'413 1        TS       LST2 +3
 0458  REF  12  LAST  232   05,3245  55'415 1        TS       LST2 +5
 0459  REF  13  LAST  232   05,3246  55'417 0        TS       LST2 +7
 0460  REF  14  LAST  232   05,3247  55'421 0        TS       LST2 +9D
 0461  REF  15  LAST  232   05,3250  55'423 1        TS       LST2 +11D
 0462  REF  16  LAST  232   05,3251  55'425 1        TS       LST2 +13D
 0463  REF  17  LAST  232   05,3252  55'427 0        TS       LST2 +15D
 0464  REF  18  LAST  232   05,3253  55'431 1        TS       LST2 +17D

 0465  REF  14  LAST  230   05,3254  4 4746 1        CS       ZERO            MAKE ALL EXECUTIVE REGISTER SETS
 0466  REF   1              05,3255  54 167 0        TS       PRIORITY        AVAILABLE.
 0467  REF   2  LAST  232   05,3256  54 203 1        TS       PRIORITY +12D
 0468  REF   3  LAST  232   05,3257  54 217 1        TS       PRIORITY +24D
 0469  REF   4  LAST  232   05,3260  54 233 1        TS       PRIORITY +36D
 0470  REF   5  LAST  232   05,3261  54 247 1        TS       PRIORITY +48D
 0471  REF   6  LAST  232   05,3262  54 263 1        TS       PRIORITY +60D
 0472  REF   7  LAST  232   05,3263  54 277 1        TS       PRIORITY +72D
 0473  REF   8  LAST  232   05,3264  54 313 1        TS       PRIORITY +84D

 0474  REF  10  LAST  222   05,3265  55'310 0        TS       DSRUPTSW
 0475  REF   1              05,3266  54 067 1        TS       NEWJOB          SHOWS NO ACTIVE JOBS.

 0476  REF   1              05,3267  3 3370 0        CAF      VAC1ADRC        MAKE ALL VAC AREAS AVAILABLE.
 0477  REF   1              05,3270  54 400 1        TS       VAC1USE
 0478  REF   1              05,3271  6 3372 1        AD       LTHVACA
 0479  REF   1              05,3272  54 454 0        TS       VAC2USE
 0480  REF   2  LAST  232   05,3273  6 3372 1        AD       LTHVACA
 0481  REF   1              05,3274  54 530 0        TS       VAC3USE
 0482  REF   3  LAST  232   05,3275  6 3372 1        AD       LTHVACA
```

```
0483   REF   1                05,3276  54 604 1           TS      VAC4USE
0484   REF   4  LAST  232     05,3277  6 3372 1           AD      LTHVACA
0485   REF   1                05,3300  54 660 0           TS      VAC5USE

0486   REF   3  LAST  224     05,3301  3 4354 1           CAF     TEN
0487   REF  25  LAST  228     05,3302  54 154 0  DSPOFF   TS      MPAC                  R1,R2,R3).
0489   REF  14  LAST  231     05,3303  4 4731 1           CS      BIT12
0490   REF  26  LAST  233     05,3304  50 154 1           INDEX   MPAC
0491   REF  29  LAST  231     05,3305  55'022 1           TS      DSPTAB
0492   REF  27  LAST  233     05,3306  10 154 0           CCS     MPAC
0493   REF   1                05,3307  1 3302 1           TCF     DSPOFF

0494   REF   1                05,3310  55'323 0           TS      DELAYLOC
0495   REF   2  LAST  233     05,3311  55'324 1           TS      DELAYLOC +1
0496   REF   3  LAST  233     05,3312  55'325 0           TS      DELAYLOC +2
0498   REF   1                05,3313  54 045 1           TS      INLINK
0499   REF   7  LAST  167     05,3314  54 775 0           TS      DSPCNT
0500   REF   1                05,3315  55'041 1           TS      CADRSTOR
0501   REF   1                05,3316  55'012 1           TS      REQRET
0502   REF   1                05,3317  55'C14 1           TS      CLPASS
0503   REF   1                05,3320  55'011 1           TS      DSPLOCK
0504   REF   1                05,3321  55'017 1           TS      MONSAVE               KILL MONITOR
0505   REF   1                05,3322  55'020 0           TS      MONSAVE1
0506   REF   1                05,3323  55'000 1           TS      VERBREG
0507   REF   1                05,3324  55'001 0           TS      NOUNREG
0508   REF   1                05,3325  55'042 1           TS      DSPLIST
0509   REF   1                05,3326  55'307 0           TS      MARKSTAT
0510   REF   1                05,3327  55'043 0           TS      EXTVBACT              MAKE EXTENDED VERBS AVAILABLE
0511   REF   2  LAST  220     05,3330  55'301 0           TS      IMUCADR
0512   REF   1                05,3331  55'302 0           TS      OPTCADR
0513   REF   1                05,3332  55'303 1           TS      RADCADR
0514   REF   2  LAST  110     05,3333  55'304 0           TS      ATTCADR
0515   REF   1                05,3334  55'311 1           TS      LGYRO
05151  REF   1                05,3335  55'776 1           TS      OLDAGS                ZERO  OUT LAST MARKTIME SENT TO AGS
05152  REF   2  LAST  233     05,3336  55'777 0           TS      OLDAGS +1             BY P20
0516   REF   1                05,3337  54 100 1           TS      FLAGWRD4              KILL INTERFACE DISPLAYS
0517   REF   1                05,3340  3 4751 0           CAF     NOUTCON
0518   REF   5  LAST  170     05,3341  55'015 0           TS      NOUT

0519   REF  27  LAST  227     05,3342  3 4727 1           CAF     BIT14
0520   REF   2  LAST  211     05,3343  55'073 0           TS      AGSCODE               AGSCODE DOWNLIST CODE = RESET CONFIG

0521   REF  25  LAST  230     05,3344  3 4737 0           CAF     BIT6
0522   REF  23  LAST  224     05,3345  7 1300 1           MASK    IMODES33              LEAVE BIT 6 UNCHANGED
0523   REF   2  LAST  224     05,3346  6 5017 1           AD      IM33INIT              NO PIP OR TM FAILS.BIT6=0 IN THIS WORD.
0524   REF  24  LAST  233     05,3347  55'300 1           TS      IMODES33

0525   REF   1                05,3350  3 3367 0           CAF     LESCHK                SELF CHECK GO-TO REGISTER.
0526   REF   2  LAST  112     05,3351  55'361 0           TS      SELFRET
```

```
 0527   REF    1                05,3352   4 4351 0              CS      V01
 0528   REF    2  LAST   168    05,3353  54 776  0              TS      DSPCOUNT

 05281                          05,3354   0 0006 1              EXTEND                   SET UP A JOB TO DO 1/ACCS AND TO ZERO
 05282  REF   14  LAST   178    05,3355  22 070  0              QXCH    RUPTREG1         THE OFFSET ACCELERATION ESTIMATE.

 05283  REF    2  LAST   203    05,3356   3 7736 1              CAF     PRIO27
 05284  REF    3  LAST   203    05,3357   0 5063 1              TC      NOVAC
 05285  REF    6  LAST   230    E6,1536                         EBANK=  AOSQ
 05286  REF    1                05,3360    03576 0              2CADR   1/ACCSET
 05286  REF    1                05,3361    42066 1

 0529   REF   15  LAST   234    05,3362   0 0070 0              TC      RUPTREG1         RETURN TO CALLER.


 0530   REF    7  LAST   234    E6,1536                         EBANK=  AOSQ
 0531   REF    1                05,3363    02037 1   IDLEADR    2CADR   DAPIDLER
 0531   REF    1                05,3364    34066 0

 0532                           05,3365    00435 0   IFAILINH   OCT     435
 0533   REF    1                05,3366    03524 1   LDNPHAS1   GENADR  DNPHASE1
 0534   REF    1                05,3367    03341 1   LESCHK     GENADR  SELFCHK
 0535   REF    2  LAST   232    05,3370    00400 0   VAC1ADRC   ADRES   VAC1USE
 0536                           05,3371    32001 1   OCT32001   OCT     32001
 0537                           05,3372    00054 0   LTHVACA    DEC     44

 0538                           05,3373    27470 1   OCT27470   OCT     27470
 0539                           05,3374    74160 0   OCT74160   OCT     74160
 0540                           05,3375    30001 0   OCT30001   OCT     30001
 0541   REF    1                    5000             STARTEB    EQUALS  EBANK3
 0542   REF    1                    4747             NUMGRPS    EQUALS  FIVE
 0543                           05,3376    77755 0   -ELR       OCT     -22              -ERROR LIGHT RESET KEY CODE.
 0544                           05,3377    37411 1   IM30INIF   OCT     37411            INHIBITS IMU FAIL FOR 5 SEC AND PIP ISSW
 0545                           05,3400    37000 0   IM30INIR   OCT     37000
 0546   REF    2  LAST   191        5017             IM33INIT   =       PRIO16           NO PIP OR TM FAIL SIGNALS.
 0547                           05,3401    00450 0   9,6,4      OCT     450
 0548                           05,3402    00102 1   RMODINIT   OCT     00102
 0549                           05,3403    00000 1   SWINIT     OCT     0
 0550                           05,3404    00000 1              OCT     0
 0551                           05,3405    00000 1              OCT     0
 0552                           05,3406    00000 1              OCT     0
 0553                           05,3407    00000 1              OCT     0
 0554                           05,3410    00000 1              OCT     0
 0555                           05,3411    00000 1              OCT     0
 0556                           05,3412    00100 0              OCT     00100

 0557                           05,3413    00000 1              OCT     0
 0558                           05,3414    00000 1              OCT     0
 0559                           05,3415    00000 1              OCT     0
 0560                           05,3416    40000 0              OCT     40000            BIT 15 = LRBYPASS.
```

```
P0561   PROGRAM NAME     GOTOPOOH                    ASSEMBLY      SUNDANCE
R0562   LOG SECTION      FRESH START AND RESTART

R0563   FUNCTIONAL DESCRIPTION

R0564          FLASH V 37 ON DSKY %MM CHANGE REQUEST "

R0565   INPUT/OUTPUT INFORMATION

R0566          A. CALLING SEQUENCE          TC GOTOPOOH

R0567          B. ERASABLE INITIALIZATION         NONE

R0568          C. OUTPUT FLASH V 37 ON DSKY

R0569          D. DEBRIS        L

R0570   PROGRAM ANALYSIS

R0571          A. SUBROUTINES CALLED PRIODSPR,  LINUS

R0572          B. NORMAL EXIT          TCF ENDOFJOB

R0573          C. ALARM AND ABORT EXITS         NONE

 0574                               6001                       BLOCK  03
 0575   REF   2  LAST   41          6000                       SETLOC FFTAG5
 0576                               6001                       BANK

 0577   REF   1                                                COUNT* $$/POO
 0578   REF   1                     6001  3 4755 1  GOTOPOOH CAF     OCT33          4.33SPOT FOR GOPOOFIX
 0579   REF  13  LAST  203          6002  54 001 1           TS      L
 0580                               6003  4 0C00 0           COM
 0581   REF   2  LAST  225          6004  52 760 1           DXCH    -PHASE4

 0582   REF   3  LAST  224          6005  0 4626 1           TC      POSTJUMP
 0583   REF   1                     6006   10040 1           CADR    GOPOOFIX
 0584                               6007   00024 1  OCT24    MM      20
 0585                               6010   00031 0  OCT31    MM      25

A05851


 05852  REF   4  LAST  229          6011  3 4346 1  CALGOPOO CAF     PRIO30
 05853  REF   4  LAST  234          6012  0 5063 1           TC      NOVAC
 05854  REF   1                  F7,1471                     FBANK=  WHOCARES
 05855  REF   1                     6013   06001 0           2CADR   GOTOPOOH
 05855  REF   1                     6014   06067 0
 05856  REF   4  LAST  235          6015  0 4626 1           TC      POSTJUMP
 05857  REF   2  LAST  224          6016   03212 0           CADR    DUMMYJOB +2
```

```
0586                        20,2004                     BANK   20
0587   REF   1              04,2000                     SETLOC VERB37
0588                        04,2040                     BANK

0589   REF   1                                          COUNT* $$/P00          VERB 37 AND P00 IN BANK 4.
0590   REF   1              04,2040  0 5520 0  GOPOOFIX TC     DOWNFLAG        ALLOW X-AXIS OVERRIDE
0591   REF   1              04,2041   00311 1           ADRES  XOVINFLG

0592   REF   2  LAST  236   04,2042  0 5520 0           TC     DOWNFLAG        INSURE THAT ULLAGE IS OFF
0593   REF   1              04,2043   00314 1           ADRES  ULLAGFLG

05935  REF   1              04,2044  0 5500 1           TC     CLEARMRK +2     RELEASE MARK DISPLAY SYSTEM.
0594   REF   1              04,2045  3 2053 0           CAF    V37N99
0595   REF   5  LAST  228   04,2046  0 4607 1           TC     BANKCALL
0596   REF   1              04,2047   20471 1           CADR   GOFLASH
0597                        04,2050  1 2045 0           TCF    -3
0598                        04,2051  1 2045 0           TCF    -4
0599                        04,2052  1 2045 0           TCF    -5

0600                        04,2053   11343 0  V37N99   VN     3799
```

```
R0601    PROGRAM NAME    V37                        ASSEMBLY      SUNDANCE

R0602    LOG SECTION     FRESH START AND RESTART

R0603    FUNCTIONAL DESCRIPTION

R0604          1. CHECK IF NEW PROGRAM ALLOWED. IF BIT 1 OF FLAGWRD2(NODOFLAG) IS SET, AN ALARM 1520 IS CALLED.
R0606          2. CHECK FOR VALIDITY OF PROGRAM SELECTED. IF AN INVALID PROGRAM  IS SELECTED, THE OPERATOR ERROR LIGHT IS
R0608             SET AND CURRENT ACTIVITY, IF ANY, CONTINUES.
R0609          3. SERVICER IS TERMINATED IF IT HAS BEEN RUNNING.
R0610          4. INSTALL IS EXECUTED TO AVOID INTERRUPTING INTEGRATION.
R0611          5. THE ENGINE IS TURNED OFF AND THE DAP IS INITIALIZED FOR COAST.
R0612          6. TRACK AND UPDATE FLAGS ARE SET TO ZERO.
R0613          7. DISPLAY SYSTEM IS RELEASED.
R0614          8. THE FOLLOWING ARE PERFORMED FOR EACH OF THE THREE CASES.
R0615             A. PROGRAM SELECTED IS P00.
R0616                1. RENDEZVOUS AND P25 FLAGS ARE RESET.(KILL P20 AND P25)
R0617                2. STATINT1      IS SCHEDULED BY SETTING RESTART GROUP 2.
R0618                3. MAJOR MODE 00 IS STORED IN THE MODE REGISTER(MODREG).
R0619                4. SUPERBANK 3 IS SELECTED.
R0620                5. NODOFLAG IS RESET.
R0621                6. ALL RESTART GROUPS EXCEPT GROUP 2 ARE CLEARED. CONTRUL ISTRANSFERRED TO RESTART PROGRAM (GOPROG2)
R0623                   WHICH CAUSES ALL CURRENT ACTIVITY TO BE DISCONTINUED AND A 9 MINUTE INTEGRATION CYCLE TO BE
R0625                   INITIATED.
R0626             B. PROGRAM SELECTED IS P20 OR P25.
R0627                1. IF THE CURRENT MAJOR MODE IS THE SAME AS THE SELECTED NEWPROGRAM, THE PROGRAM IS RE-INITIALIZED
R0629                   VIA V37XEQ, ALL RESTART GROUPS, EXCEPT GROUP 4 ARE CLEARED.
R0631                2. IF THE CURRENT MAJOR MODE IS NOT EQUAL TO THE NEW REQUEST, A CHECK IS MADE TO SEE IF THE REQUEST-
R0633                   ED MAJOR MODE HAS BEEN RUNNING IN THE BACKGROUND,
R0634                   AND IF IT HAS, NO NEW PROGRAM IS SCHEDULED, THE EXISTING
R0635                   P20 OR P25 IS RESTARTED TO CONTINUE, AND ITS M M IS SET.
R0636                3. CONTRUL IS TRANSFERRED TO GOPROG2.
R0637             C. PROGRAM SELECTED IS NEITHER P00,P20, NOR P25
R0638                1. V37XEQ IS SCHEDULED (AS A JOB) BY SETTING RESTART GROUP 4
R0639                2. ALL CURRENT ACTIVITY EXCEPT RENDEZVOUS AND TRACKING IS DISCONTINUED BY CLEARING ALL RESTART
R0641                   GROUPS. IF THE RENDEZVOUS OR THE P25 FLAG IS ON, GROUP 2 IS NOT CLEARED, ALLOWING THESE PROGRAMS
R0643                   TO CONTINUE.

R0644    INPUT/OUTPUT INFORMATION

R0645          A. CALLING SEQUENCE

R0646              CONTROL IS DIRECTED TO V37 BY THE VERBFAN ROUTINE.
R0647                 VERBFAN GOES TO C(VERBTAB+C(VERBREG)). VERB 37 = MMCHANG.
R0648                 MMCHANG EXECUTES A   TC POSTJUMP, CADR V37.

R0649          B. ERASABLE INITIALIZATION      NONE

R0650
R0651          C. OUTPUT
```

```
R0652              MAJOR MODE CHANGE

R0653           C. DEBRIS
R0654              MMNUMBER, MPAC +1, MINDEX, BASETEMP +C(MINDEX), FLAGWRD0, FLAGWRD1, FLAGWRD2, MODREG, GOLOC -1,
R0656              GOLOC, GOLOC +1, GOLOC +2, BASETEMP, -PHASE2, PHASE2, -PHASE4

R0657    PROGRAM ANALYSIS

R0658           A. SUBROUTINES CALLED
R0659              ALARM, RELDSP, PINBRNCH, INTSTALL, ENGINOF2, ALLCOAST, V37KLEAN, GOPROG2, FALTON, FINDVAC, SUPERSW,
R0661              DSPMM

R0662           B. NORMAL EXIT          TC ENDOFJOB

R0663           C. ALARMS       1520 (MAJOR MODE CHANGE NOT PERMITTED)

 0664    REF    1                 04,2054  54 774 1  V37        TS      MMNUMBER         SAVE MAJOR MODE
 0665    REF    5  LAST  235      04,2055  3 4346 1             CAF     PRIO30           RESTART AT PINBALL PRIORITY
 0666    REF    2  LAST  222      04,2056  55'264 1             TS      RESTREG

 0667    REF   42  LAST  227      04,2057  3 1277 1             CA      IMODES30         IS IMU BEING INITIALIZED
 0668    REF   26  LAST  233      04,2060  7 4737 1             MASK    BIT6
 0669    REF   44  LAST  228      04,2061  10 000 0             CCS     A
 0670    REF    1                 04,2062  1 2105 0             TCF     CANTROO

 06705   REF   14  LAST  229      04,2063  3 4740 0             CA      BIT5             IS IMUZERO IN PROGRESS
 06706   REF   25  LAST  233      04,2064  7 1300 1             MASK    IMODES33
 06707   REF   45  LAST  238      04,2065  10 000 0             CCS     A                   IF SO DAP IS OFF
 06708   REF    2  LAST  238      04,2066  1 2105 0             TCF     CANTROO

 0671    REF    2  LAST  238      04,2067  4 0774 1             CS      MMNUMBER         IS P70 REQUESTED?
 0672    REF    1                 04,2070  6 2435 1             AD      DEC70
 0673                             04,2071  0 0006 1             EXTEND
 0674    REF    1                 04,2072  1 2430 0             BZF     SETUP70          YES
 0675    REF    7  LAST  221      04,2073  6 4744 1             AD      ONE              IS P71 REQUESTED?
 0676                             04,2074  0 0006 1             EXTEND
 0677    REF    1                 04,2075  1 2427 0             BZF     SETUP71          YES

 0678    REF    3  LAST  238      04,2076  3 0774 0             CA      MMNUMBER         IS NEW REQUEST P00
 0679                             04,2077  0 0006 1             EXTEND
 0680    REF    1                 04,2100  1 2127 0             BZF     ISSERVON         YES, CHECK SERVICER STATUS

 0681    REF    3  LAST  175      04,2101  4 0076 1             CS      FLAGWRD2         NO, IS NODO V37 FLAG SET
 0682    REF    1                 04,2102  7 4744 0             MASK    NODOBIT
 0683    REF   46  LAST  238      04,2103  10 000 0             CCS     A
 0684    REF    1                 04,2104  1 2112 0             TCF     CHECKTAB         NO
 0685    REF   1   LAST  228      04,2105  0 5571 1  CANTROO    TC      ALARM
 0686                             04,2106   01520 1             OCT     1520

 0687    REF    1                 04,2107  0 4450 1  V37BAD     TC      RELDSP           RELEASES DISPLAY FROM ASTRONAUT
 0688   REF    5  LAST  235    04,2110   0 4626 1               TC       POSTJUMP       BRING BACK LAST NORMAL DISPLAY IF THERE
 0689   REF    1               04,2111    21062 0               CADR     PINBRNCH       WAS ONE. OTHERWISE DO AN EOJ.

 0690   REF    1               04,2112   3 2524 0   CHECKTAB CA       NOV37MM        INDEX FOR MM TABLES.
 0691   REF   28  LAST  233    04,2113  54 155 1   AGAINMM  TS       MPAC +1
 0692   REF   29  LAST  239    04,2114  50 155 0            NDX      MPAC +1
 0693   REF    1               04,2115   3 2472 1            CA       PREMM1         OBTAIN WHICH MM THIS IS FOR
 0694   REF    1               04,2116   7 6115 0            MASK     LOW7
 0695                          04,2117   4 0000 0            COM
 0696   REF    4  LAST  238    04,2120   6 0774 0            AD       MMNUMBER
 0697   REF   47  LAST  238    04,2121  10 000 0            CCS      A
 0698   REF   30  LAST  239    04,2122  10 155 1            CCS      MPAC +1        IF GR, SEE IF ANYMORE IN LIST
 0699   REF    1               04,2123   1 2113 1            TCF      AGAINMM        YES, GET NEXT ONE
 0700   REF    1               04,2124   1 2360 1            TCF      V37NONO        LAST TIME OR PASSED MM

 0701   REF   31  LAST  239    04,2125   3 0155 0            CA       MPAC +1
 0702   REF    1               04,2126  54 773 0            TS       MINDEX         SAVE INDEX FOR LATER

 0703   REF    2  LAST  197    04,2127   4 0103 1   ISSERVON CS       FLAGWRD7       V37 FLAG SET - I.E. IS SERVICER GOING
 0704   REF    1               04,2130   7 4737 1            MASK     V37FLBIT
 0705   REF   48  LAST  239    04,2131  10 000 0            CCS      A
 0706   REF    1               04,2132   1 2160 0            TCF      CANV37         NO

 07061  REF    1               04,2133   0 4720 0            TC       SUPERSW
 07062                         04,2134   0 0004 0            INHINT
 07063  REF    6  LAST  186    04,2135   0 4665 0            TC       IBNKCALL       YES, TURN ENGINE OFF
 07064  REF    1               04,2136    75556 0            CADR     ENGINOF1
 0707   REF    3  LAST  236    04,2137   0 5520 0            TC       DOWNFLAG       NOW TURN OFF THE AVERAGE G FLAG AND
 0708   REF    1               04,2140    00163 0            ADRES    AVEGFLAG       WAIT FOR SERVICER TO RETURN TO V37RET.

 0709  *REF    1               04,2141   0 6050 1            TC       KILLTASK
 0710  *REF    1               04,2142    74350 1            CADR     ULLGTASK

 0711   REF    1               04,2143   1 5146 0            TCF      ENDOFJOB

 0712   REF    9  LAST  228    04,2144   4 0074 0   V37RET   CS       FLAGWRD0       IS P20 OR P22 RUNNING?
 0713   REF    2  LAST  196    04,2145   7 4736 0            MASK     RNDVZBIT
 0714   REF   49  LAST  239    04,2146  10 000 0            CCS      A
 0715                          04,2147   1 2151 1            TCF      +2             NO. CHECK FOR P25.
 0716   REF    1               04,2150   1 2156 0            TCF      2.7SPT         YES.  DO 2.7SPOT
 0717   REF   10  LAST  239    04,2151   4 0074 0            CS       FLAGWRD0       IS P25 RUNNING?
 0718   REF    1               04,2152   7 4734 1            MASK     P25FLBIT
 0719   REF   50  LAST  239    04,2153  10 000 0            CCS      A
 0720   REF    1               04,2154   3 2424 1   2.0SPT   CA       OCT37667
 0721   REF   15  LAST  238    04,2155   6 4740 0   2.11SPT  AD       BIT5
 0722   REF    1               04,2156   6 2425 0   2.7SPT   AD       OCT40072
 0723   REF    1               04,2157   0 5361 0            TC       PHSCHNGA

 0724   REF   15  LAST  232    04,2160   3 4746 0   CANV37   CAF      ZERO
 0725                          04,2161   0 0006 1            EXTEND
```

```
L         FRESH START AND RESTART                                                                   USER'S PAGE NO.  19      F3 S3

 0726    REF   2  LAST  226   04,2162  01 007 1               WRITE  SUPERBNK

 0727    REF   1              04,2163  3 2423 0               CAF    ROOAD
 0728    REF   1              04,2164  54 373 1               TS     TEMPFLSH

 0729    REF   1              04,2165  0 5355 1               TC     PHASCHNG
 0730                         04,2166   00014 1               OCT    14

 0731    REF   3  LAST  219   04,2167  0 6060 1  ROO          TC     INTPRET

 0732                         04,2170   77624 1               CALL                        WAIT FOR INTEGRATION TO FINISH
 0733    REF   1              04,2171   27447 0                      INTSTALL
 0734                         04,2172   77776 1  DUMMYAD      EXIT

 0735    REF   4  LAST  239   04,2173  0 5520 0               TC     DOWNFLAG
 0736    REF   1              04,2174   00124 0               ADRES  3AXISFLG               RESET 3-AXIS FLAG

 07362   REF   5  LAST  240   04,2175  0 5520 0               TC     DOWNFLAG
 07364   REF   1              04,2176   00055 1               ADRES  POOHFLAG

 07367   REF   6  LAST  240   04,2177  0 5520 0               TC     DOWNFLAG               CLEAR FOR NORMAL INFLIGHT MARKING
 07368   REF   1              04,2200   00222 0               ADRES  FLT59FLG

 0737    REF   2  LAST  230   04,2201  3 4726 0               CAF    LRBYBIT                CLEAN UP THE R12 FLAGWORD.
 0738    REF   4  LAST  231   04,2202  54 107 0               TS     FLGWRD11

 07382   REF   7  LAST  240   04,2203  0 5520 0               TC     DOWNFLAG               INSURE THAT THE R04FLAG IS CLEAR.
 07384   REF   1              04,2204   00063 1               ADRES  R04FLAG

 073845  REF   8  LAST  240   04,2205  0 5520 0               TC     DOWNFLAG
 07385   REF   1              04,2206   00056 1               ADRES  GLOKFAIL               FLAGWORD 3 BIT 14

 07386   REF   9  LAST  240   04,2207  0 5520 0               TC     DOWNFLAG               INSURE MUNFLAG IS CLEAR.
 07388   REF   1              04,2210   00141 0               ADRES  MUNFLAG

 073881  REF  10  LAST  240   04,2211  0 5520 0               TC     DOWNFLAG               RESET ABORT TARGETING FLAG (USE
 073882  REF   1              04,2212   00217 0               ADRES  ABTTGFLG                 PARAMETERS J1 AND KU)

 0739    REF  11  LAST  240   04,2213  0 5520 0               TC     DOWNFLAG               ALLOW X-AXIS OVERRIDE.
 0740    REF   2  LAST  236   04,2214   00311 1               ADRES  XOVINFLG
 0741    REF   5  LAST  239   04,2215  10 774 1               CCS    MMNUMBER               IS THIS A POOH REQUEST
 0742    REF   1              04,2216  1 2346 0               TCF    NOUVEAU                NO, PICK UP NEW PROGRAM

 0743    REF   2  LAST  230   04,2217  0 4450 1  POOH         TC     RELDSP                 RELEASE DISPLAY SYSTEM

 0744    REF   1              04,2220  3 5010 0               CAF    PRIO5                  SET VARIABLE RESTART PRIORITY FOR
 0745    REF   2  LAST  105   04,2221  55 055 1               TS     PHSPRDT2               POO INTEGRATION.

 0746    REF   1              04,2222  0 6027 1               TC     CLRADMOD               CLRADMOD DOES AN INHINT.
 0747    REF   2  LAST  238   04,2223  4 4744 0            CS     NODOBIT        TURN OFF NODOFLAG.
 0748    REF   4  LAST  238   04,2224  7 0076 1            MASK   FLAGWRD2
 0749    REF   5  LAST  241   04,2225  54 076 1            TS     FLAGWRD2

 0750    REF   2  LAST  234   04,2226  3 4747 1            CA     FIVE           SET RESTART FOR STATEINT1
 0751    REF  14  LAST  235   04,2227  54 001 1            TS     L
 0752                         04,2230  4 0000 0            COM
 0753    REF   2  LAST  224   04,2231  52 754 0            DXCH   -PHASE2

 0754    REF   1              04,2232  4 2426 1            CS     OCT700         TURN OFF P20,P25,IMU IN USE FLAG
 0755    REF  11  LAST  239   04,2233  7 0074 0            MASK   FLAGWRD0
 0756    REF  12  LAST  241   04,2234  54 074 0            TS     FLAGWRD0                                RENDFLG

 0757    REF   1              04,2235  3 4746 0            CAF    DNLADPOO

 0758    REF   7  LAST  227   04,2236  54 333 0  SEUDOPOO  TS     DNLSTCOD       SET UP APPROPRIATE DOWNLIST CODE
 0759    REF   4  LAST  227   04,2237  55'321 1            TS     AGSWORD        (CURRENT LIST WILL BE COMPLETED BEFORE
A0760                                                                             NEW ONE IS STARTED)
 0761    REF   2  LAST  224   04,2240  4 4732 1            CS     NOP07BIT
 07615   REF   2  LAST  218   04,2241  7 0077 0            MASK   FLAGWRD3
 07617   REF   3  LAST  241   04,2242  6 4732 0            AD     NOP07BIT
 0762    REF   3  LAST  241   04,2243  54 077 0            TS     FLAGWRD3

 0763    REF   7  LAST  239   04,2244  0 4665 0            TC     IBNKCALL       INSURE ALLCOAST.
 0764    REF   1              04,2245   40205 1            CADR   ALLCOAST       DOES A RESTORDB.

 0765    REF   1              04,2246  4 4766 0            CS     OCT120         TURN OFF TRACK, UPDATE FLAGS
 0766    REF   2  LAST  222   04,2247  55'071 1            TS     EBANKTEM
 0767    REF   5  LAST  228   04,2250  7 0075 1            MASK   FLAGWRD1
 0768    REF   6  LAST  241   04,2251  54 075 1            TS     FLAGWRD1

 0769    REF   8  LAST  241   04,2252  0 4665 0            TC     IBNKCALL       KILL GROUPS 1,3,5,6
 0770    REF   1              04,2253   12654 0            CADR   V37KLEAN

 0771    REF   6  LAST  240   04,2254  10 774 1            CCS    MMNUMBER       IS IT POOH
 0772    REF   1              04,2255  1 2264 1            TCF    RENDVOO        NO
 0773    REF   9  LAST  241   04,2256  0 4665 0  GOMOD     TC     IBNKCALL       REDUNDANT EXCEPT FOR GROUP 4
 0774    REF   1              04,2257   12651 0            CADR   POOKLEAN

 0775    REF   7  LAST  241   04,2260  3 0774 0            CA     MMNUMBER
 0776    REF   3  LAST  228   04,2261  55'010 0            TS     MODREG

 0777    REF   6  LAST  239   04,2262  0 4626 1  GOGOPROG  TC     POSTJUMP
 0778    REF   1              04,2263   12772 0            CADR   GOPROG2

 0779    REF   4  LAST  241   04,2264  4 1010 0  RENDVOO   CS     MODREG         IS CURRENT PROGRAM 22
 0780    REF   1              04,2265  6 2364 1            AD     OCT26
 0781                         04,2266  0 0006 1            EXTEND
 0782    REF   1              04,2267  1 2306 1            BZF    RESET22        YES - CLEAR RENDEZVOUS FLAG
 0783    REF    8  LAST  241     04,2270   4 0774 1             CS      MMNUMBER         IS NEW PROGRAM P22
 0784    REF    2  LAST  241     04,2271   6 2364 1             AD      OCT26
 0785                             04,2272   0 0006 1             EXTEND
 0786    REF    2  LAST  241     04,2273   1 2306 1             BZF     RESET22


 0787    REF    1                04,2274   6 7767 0             AD      NEG2             IS NEW PROGRAM = P20 OR P25
 0788                             04,2275   0 0006 1             EXTEND
 0789    REF    1                04,2276   1 2320 0             BZF     RENDNOO          YES
 0790    REF    3  LAST  241     04,2277   6 4747 1             AD      FIVE             25
 0791                             04,2300   0 0006 1             EXTEND
 0792    REF    2  LAST  242     04,2301   1 2320 0             BZF     RENDNOO          YES

 0793    REF    1                04,2302   3 2362 1             CA      OCT500           NO, IS EITHER P20 OR P25 RUNNING
 0794    REF   13  LAST  241     04,2303   7 0074 0             MASK    FLAGWRD0
 0795    REF   51  LAST  239     04,2304  10 000 0              CCS     A
 0796    REF    1                04,2305   1 2315 0             TCF     POOFIZZ          YES, LEAVE GROUP 2 TO PICK UP P20 OR P25

 0797    REF    2  LAST  241     04,2306   4 2426 1   RESET22   CS      OCT700           CLEAR RENDEZVOUS,P25
 0798    REF   14  LAST  242     04,2307   7 0074 0             MASK    FLAGWRD0         AND IMU IN USE FLAGS
 0799    REF   15  LAST  242     04,2310  54 074 0              TS      FLAGWRD0
 0800    REF    2  LAST  240     04,2311   0 6027 1             TC      CLRADMOD

 0801                             04,2312   0 0006 1   KILL2     EXTEND                   NO, KILL 2
 0802    REF    8  LAST  225     04,2313   3 4746 0             DCA     NEG0
 0803    REF    3  LAST  241     04,2314  52 754 0              DXCH    -PHASE2

 0804    REF    1                04,2315   3 2422 1   POOFIZZ   CAF     V37QCAD          RESTART POINT FOR V37XEQ
 0805    REF    2  LAST  240     04,2316  54 373 1              TS      TEMPFLSH

 0806    REF    1                04,2317   1 2262 1             TCF     GOGOPROG

 0807    REF    5  LAST  241     04,2320   4 1010 0   RENDNOO   CS      MODREG
 0808    REF    1                04,2321   6 6007 0             AD      OCT24
 0809                             04,2322   0 0006 1             EXTEND
 0810    REF    1                04,2323   1 2312 1             BZF     KILL2            P20 OR P25 ON TOP OF P20 OR P25 -

 0811    REF    4  LAST  242     04,2324   6 4747 1             AD      FIVE
 0812                             04,2325   0 0006 1             EXTEND
 0813    REF    2  LAST  242     04,2326   1 2312 1             BZF     KILL2

 0814    REF    2  LAST  242     04,2327   3 2362 1             CA      OCT500
 0815    REF   16  LAST  242     04,2330   7 0074 0             MASK    FLAGWRD0
 0816    REF    9  LAST  242     04,2331   6 0774 0             AD      MMNUMBER
 0817                             04,2332   4 0000 0             COM
 0818    REF    1                04,2333   6 2365 0             AD      P20REG           IS IT 20 AND IS RENDEZVOUS FLAG ON
 0819                             04,2334   0 0006 1             EXTEND
 0820    REF    1                04,2335   1 2342 1             BZF     STATQUO          YES
 0821    REF    1                04,2336   6 2363 0             AD      OCT305           IS IT 25 AND IS P25 BIT ON
 0822                             04,2337   0 0006 1             EXTEND
```

```
0823  REF   2  LAST  242   04,2340   1 2342 1             BZF     STATQUO        YES, LEAVE AS IS
0824  REF   3  LAST  242   04,2341   1 2312 1             TCF     KILL2

0825  REF   7  LAST  241   04,2342   4 0075 1   STATQUO   CS      FLAGWRD1       SET TRACKFLAG
0826  REF   2  LAST  241   04,2343   7 4766 0             MASK    OCT120             UPDATE FLAG
0827  REF   8  LAST  243   04,2344  26 075 1              ADS     FLAGWRD1

0828  REF   1              04,2345   1 2256 0             TCF     GOMOD

0829  REF   3  LAST  242   04,2346   3 2362 1   NOUVEAU   CAF     OCT500         IS P20 OR P25 FLAG SET
0830  REF  17  LAST  242   04,2347   7 0074 0             MASK    FLAGWRD0
0831  REF  52  LAST  242   04,2350  10 000 0              CCS     A
0832                       04,2351   1 2354 0             TCF     +3             YES
0833  REF  12  LAST  240   04,2352   0 5520 0             TC      DOWNFLAG       NO,RESET IMUINUSE FLAG
0834  REF   1              04,2353    00007 0             ADRES   IMUSE

0835  REF   2  LAST  239   04,2354  50 773 1              INDEX   MINDEX
0836  REF   1              04,2355   3 2525 1             CAF     DNLADMM1       OBTAIN APPROPRIATE DOWNLIST ADDRESS

0837                       04,2356   0 0004 0             INHINT
0838  REF   1              04,2357   1 2236 0             TCF     SEUDOPOO

0839  REF   1              04,2360   0 4355 0   V37NONO   TC      FALTON         COME HERE IF MM REQUESTED DOESNT EXIST

0840  REF   1              04,2361   1 2107 1             TCF     V378AD

0841  REF  19  LAST  227      4741              OCT00010  EQUALS  BIT4
0842                       04,2362    00500 1   OCT500    OCT     500            BITS 7 AND 9
0843                       04,2363    00305 1   OCT305    OCT     305
0844                       04,2364    00026 0   OCT26     OCT     26
0845                       04,2365    00124 0   P20REG    OCT     124

0846                       04,2366   0 0004 0   V37XEQ    INHINT
0847  REF   3  LAST  243   04,2367  50 773 1              INDEX   MINDEX
0848  REF   2  LAST  239   04,2370   3 2472 1             CAF     PREMM1         OBTAIN PRIO, EBANK, AND MM
0849  REF   1              04,2371  55'057 0              TS      MMTEMP
0850  REF   1              04,2372  54 020 1              TS      CYR            SHIFT RIGHT TO BITS 14 - 10

0851  REF   2  LAST  243   04,2373   3 0020 0             CA      CYR
0852  REF   1              04,2374   7 7746 1             MASK    PRIO37
0853  REF   1              04,2375  55'061 0              TS      PHSPRDT4       PRESET GROUP 4 RESTART PRIORITY
0854  REF   1              04,2376  54 063 0              TS      NEWPRIO        STORE PRIO FOR SPVAC

0855  REF   2  LAST  243   04,2377   3 1057 1             CA      MMTEMP         OBTAIN EBANK - BITS 8, 9, 10 OF MMTEMP.
0856                       04,2400   0 0006 1             EXTEND
0857  REF  18  LAST  224   04,2401   7 4735 0             MP      BIT8
0858  REF   1              04,2402   7 4750 0             MASK    LOW3
0859  REF  15  LAST  241   04,2403  54 001 1              TS      L

0860  REF   4  LAST  243   04,2404  50 773 1              INDEX   MINDEX
```

```
 0861   REF   1              04,2405  3 2440 0            CAF      FCADRMM1
 0862   REF   1              04,2406  55 060 1            TS       BASETEMP          MAKE BBCON BY ADDING HI5 OF FCADR
 0863   REF   3  LAST  226   04,2407  7 4341 1            MASK     HI5
 0864   REF  16  LAST  243   04,2410  26 001 1            ADS      L

 0865   REF   2  LAST  244   04,2411  3 1060 0            CA       BASETEMP          OBTAIN GENADR PORTION OF 2CADR.
 0866   REF   1              04,2412  7 5003 0            MASK     LOW10
 0867   REF  16  LAST  175   04,2413  6 4732 0            AD       BIT11

 0868   REF   1              04,2414  0 5107 1            TC       SPVAC

 0869   REF   3  LAST  243   04,2415  3 1057 1  V37XEQC   CA       MMTEMP            UPON RETURN FROM FINDVAC PLACE THE
 0870   REF   2  LAST  239   04,2416  7 6115 0            MASK     LOW7              NEW MM IN MODREG (THE LOW 7 BITS OF
 0871   REF   1              04,2417  0 5316 0            TC       NEWMODEA          PHSPRDT1)

 0872   REF   3  LAST  240   04,2420  0 4450 1            TC       RELDSP            RELEASE DISPLAY
 0873   REF   2  LAST  239   04,2421  0 5146 1            TC       ENDOFJOB          AND EXIT

 0874   REF   1                 5652              NEG7      EQUALS OCT77770

 0875   REF   1                 1057              MMTEMP    EQUALS PHSPRDT3
 0876   REF   1                 1060              BASETEMP  EQUALS TBASE4
 0877   REF   1              04,2422    10371 0   V37QCAD   CADR     V37XEQ +3
 0878   REF   1              04,2423    10172 1   ROOAD     CADR     DUMMYAD
 0880                        04,2424    37667 1   OCT37667  OCT      37667
 0881                        04,2425    40072 0   OCT40072  OCT      40072
 0882                        04,2426    00700 0   OCT700    OCT      700
R0883
 0884   REF   1              04,2427  3 6266 0  SETUP71   CAF      THREE
 0885   REF  17  LAST  229   04,2430  54 002 1  SETUP70   TS       Q
 0886                        04,2431  0 0006 1            EXTEND
 0887   REF   1              04,2432  3 2437 0            DCA      P70CADR
 0888   REF  18  LAST  244   04,2433  6 0002 0            AD       Q
 0889                        04,2434  52 006 0            DTCB

 0890                        04,2435    00106 0  DEC70     DEC      70
 0891   REF   3  LAST  154   E7,1520                      EBANK=   R
 0892   REF   1              04,2436    02132 0  P70CADR   2CADR    P70
 0892   REF   1              04,2437    42067 0
R0893   FOR VERB 37 TWO TABLES ARE MAINTAINED. EACH TABLE HAS AN ENTRY FOR EACH
R0894   MAJOR MODE THAT CAN BE STARTED FROM THE KEYBOARD. THE ENTRIES ARE PUT
R0895   INTO THE TABLE WITH THE ENTRY FOR THE HIGHEST MAJOR MODE COMING FIRST,

R0896   TO THE LOWEST MAJOR MODE WHICH IS THE LAST ENTRY IN EACH TABLE.

R0897           THE FCADRMM TABLE CONTAINS THE FCADR OF THE STARTING JOB OF
R0898   THE MAJOR MODE.    FOR EXAMPLE,

A0899                                            FCADRMM1  FCADR    P79               START OF P 79
A0900                                                      FCADR    PROG18            START OF P 18
```

```
A0901                                                     FCADR  P01              START OF P 01

R0902   NOTE,    THE FIRST ENTRY MUST BE LABLED FCADRMM1.
R0903   ----

0905                         04,2440         FCADRMM1  EQUALS
0906    REF   1              04,2440   26207 0           FCADR  P76ER77
09065   REF   2  LAST  245   04,2441   26207 0           FCADR  P76ER77
0907    REF   1              04,2442   72647 1           FCADR  P75
0908    REF   1              04,2443   72457 1           FCADR  P74
0909    REF   1              04,2444   72225 1           FCADR  P73
0910    REF   1              04,2445   72036 1           FCADR  P72
0911    REF   1              04,2446   71271 0           FCADR  LANDJUNK
0912    REF   1              04,2447   64602 1           FCADR  P63LM
0913    REF   1              04,2450   33274 0           FCADR  P57
0914    REF   1              04,2451   32201 0           FCADR  PROG52
0915    REF   1              04,2452   31404 0           FCADR  P51
0916    REF   1              04,2453   75437 0           FCADR  P47LM
0917    REF   1              04,2454   75411 1           FCADR  P42LM
0918    REF   1              04,2455   75271 1           FCADR  P41LM
0919    REF   1              04,2456   75146 0           FCADR  P40LM
0922    REF   1              04,2457   72643 0           FCADR  P35
0923    REF   1              04,2460   72455 0           FCADR  P34
0924    REF   1              04,2461   72223 1           FCADR  P33
0925    REF   1              04,2462   72034 0           FCADR  P32
0927    REF   1              04,2463   72000 1           FCADR  P30
0928    REF   1              04,2464   50462 1           FCADR  PROG25
0929    REF   1              04,2465   50000 1           FCADR  PROG22
0930    REF   1              04,2466   51441 1           FCADR  PROG21
0931    REF   1              04,2467   50000 1           FCADR  PROG20
0932    REF   1              04,2470   60061 0           FCADR  P12LM
0933    REF   1              04,2471   77654 0           FCADR  P06
R0934            THE PREMM TABLE CONTAINS THE E-BANK,MAJOR MODE, AND PRIORITY
R0935   INFORMATION, IT IS IN THE FOLLOWING FORM,

R0936            PPP PPE EEM MMM MMM

R0937            WHERE THE 7 M BITS CONTAIN THE MAJOR MODE NUMBER
R0938                       3 E BITS CONTAIN THE E-BANK NUMBER
R0939                       5 P BITS CONTAIN THE PRIORITY AT WHICH THE JOB IS
R0940                           TO BE STARTED

R0941            FOR EXAMPLE,

A0942                                           PREMM1    OCT    67213            PRIORITY      33
A0943                                                                             F-BANK         5
A0944                                                                             MAJOR MODE    11
A0945                                                     OCT    25437            PRIORITY       12
A0946                                                                             E-BANK         6
A0947                                                                             MAJOR MODE    31
```

```
R0948   NOTE,     THE FIRST ENTRY MUST BE LABELED PREMM1
 0950                          04,2472                PREMM1    EQUALS
 09505                         04,2472   27715 1                OCT      27715           MM 77 EBANK 7 PRIO 13
 0951                          04,2473   27714 0                OCT      27714           MM 76  EBANK 7  PRIO 13
 0952                          04,2474   27713 1                OCT      27713           MM 75  EBANK 7  PRIO 13
 0953                          04,2475   27712 0                OCT      27712           MM 74  EBANK 7  PRIO 13
 0954                          04,2476   27711 0                OCT      27711           MM 73  EBANK 7  PRIO 13
 0955                          04,2477   27710 1                OCT      27710           MM 72  EBANK 7  PRIO 13
 0956                          04,2500   27704 1                OCT      27704           MM 68  EBANK 7  PRIO 13
 0957                          04,2501   27677 1                OCT      27677           MM 63  EBANK 7  PRIO 13
 0958                          04,2502   27271 0                OCT      27271           MM 57  EBANK 5  PRIO 13
 0959                          04,2503   27264 1                OCT      27264           MM 52  EBANK 5  PRIO 13
 0960                          04,2504   27263 0                OCT      27263           MM 51  EBANK 5  PRIO 13
 0961                          04,2505   27657 0                OCT      27657           MM 47  EBANK 7  PRIO 13
 0962                          04,2506   27652 0                OCT      27652           MM 42  EBANK 7  PRIO 13
 0963                          04,2507   27651 0                OCT      27651           MM 41  EBANK 7  PRIO 13
 0964                          04,2510   27650 1                OCT      27650           MM 40  EBANK 7  PRIO 13
 0967                          04,2511   27643 0                OCT      27643           MM 35  EBANK 7  PRIO 13
 0968                          04,2512   27642 1                OCT      27642           MM 34  EBANK 7  PRIO 13
 0969                          04,2513   27641 1                OCT      27641           MM 33  EBANK 7  PRIO 13
 0970                          04,2514   27640 0                OCT      27640           MM 32  EBANK 7  PRIO 13
 0972                          04,2515   27636 1                OCT      27636           MM 30  EBANK 7  PRIO 13
 0973                          04,2516   27631 0                OCT      27631           MM 25  EBANK 7  PRIO 13
 0974                          04,2517   27626 0                OCT      27626           MM 22  EBANK 7  PRIO 13
 0975                          04,2520   27625 0                OCT      27625           MM 21  EBANK 7  PRIO 13
 0976                          04,2521   27624 1                OCT      27624           MM 20  EBANK 7  PRIO 13
 0977                          04,2522   27614 1                OCT      27614           MM 12  EBANK 7  PRIO 13
 0978                          04,2523   27006 1                OCT      27006           MM 06  EBANK 4  PRIO 13
R0979   NOTE,     THE FOLLOWING CONSTANT IS THE NUMBER OF ENTRIES IN EACH OF
R0980   ----      THE ABOVE LISTS-1(IE, THE NUMBER OF MAJOR MODES(EXCEPT P00)
R0981             THAT CAN BE CALLED FROM THE KEYBOARD MINUS ONE)

 0982                          04,2524   00031 0  NUV37MM  DEC      25               MM'S - 1


 0984                          04,2525                DNLADMM1  EQUALS
 09845  REF   1                04,2525   00002 0                ADRES    RENDEZVL        P77
 0985   REF   2  LAST  246     04,2526   00002 0                ADRES    RENDEZVL        P76
 0986   REF   3  LAST  246     04,2527   00002 0                ADRES    RENDEZVL        P75
 0987   REF   4  LAST  246     04,2530   00002 0                ADRES    RENDEZVL        P74
 0988   REF   5  LAST  246     04,2531   00002 0                ADRES    RENDEZVL        P73
 0989   REF   6  LAST  246     04,2532   00002 0                ADRES    RENDEZVL        P72
 0990   REF   1                04,2533   00004 0                ADRES    DESASCNT        P68
 0991   REF   2  LAST  246     04,2534   00004 0                ADRES    DESASCNT        P63
 0992   REF   1                04,2535   00005 1                ADRES    LUNRSALN        P57
 0993   REF   1                04,2536   00000 1                ADRES    COSTALIL        P52
 0994   REF   2  LAST  246     04,2537   00000 1                ADRES    COSTALIL        P51
 0995   REF   1                04,2540   00003 1                ADRES    ORBMANUL        P47
 0996   REF   2  LAST  246     04,2541   00003 1                ADRES    ORBMANUL        P42
 0997   REF   3  LAST  246     04,2542   00003 1                ADRES    ORBMANUL        P41
 0998    REF   4  LAST  246   04,2543   00003 1              ADRES  ORBMANUL          P40
 1001    REF   7  LAST  246   04,2544   00002 0              ADRES  RENDEZVL          P35
 1002    REF   8  LAST  247   04,2545   00002 0              ADRES  RENDEZVL          P34
 1003    REF   9  LAST  247   04,2546   00002 0              ADRES  RENDEZVL          P33
 1004    REF  10  LAST  247   04,2547   00002 0              ADRES  RENDEZVL          P32
 1006    REF  11  LAST  247   04,2550   00002 0              ADRES  RENDEZVL          P30
 1007    REF  12  LAST  247   04,2551   00002 0              ADRES  RENDEZVL          P25
 1008    REF   2  LAST  246   04,2552   00005 1              ADRES  LUNRSALN          P22
 1009    REF  13  LAST  247   04,2553   00002 0              ADRES  RENDEZVL          P21
 1010    REF  14  LAST  247   04,2554   00002 0              ADRES  RENDEZVL          P20
 1011    REF   3  LAST  246   04,2555   00004 0              ADRES  DESASCNT          P12
 1012    REF   3  LAST  246   04,2556   00000 1              ADRES  COSTALIL          P06
 1013    REF  16  LAST  239      4746          DNLADP00 =       ZERO
 1014                            0000          COSTALIL =       0
 1015                            0001          AGSUPDAT =       1
 1016                            0002          RENDEZVL =       2
 1017                            0003          ORBMANUL =       3
 1018                            0004          DESASCNT =       4
 1019                            0005          LUNRSALN =       5
 1020                         13,2026                   BANK    13
 1021    REF   2  LAST   48   13,2000                   SETLOC  INTINIT
 1022                         13,2026                   BANK

 1023    REF   2 LAST   48 TO   48:     2       2*              COUNT* $$/INTIN

 1024    REF   2  LAST  116   E3,1554                   EBANK=  RRECTCSM

R1025    THIS ROUTINE DOES THE P00 INTEGRATION

 1026                         13,2026   43014 0  STATEUP  SET     BOF               EXTRAPOLATE CM STATE VECTOR
 1027    REF   1              13,2027   01474 1                   VINTFLAG
 1028    REF   1              13,2030   04347 0                   SURFFLAG          ALSO 6X6 W-MATRIX IF LM ON LUNAR
 1029    REF   1              13,2031   26036 0                   DOINT                  SURFACE AND W-MATRIX VALID
 1030                         13,2032   43014 0           BOF     SET                    FOR RENDEZVOUS NAVIGATION.
 1031    REF   1              13,2033   02756 1                   RENDWFLG
 1032    REF   2  LAST  247   13,2034   26036 0                   DOINT
 1033    REF   1              13,2035   01476 0                   DIMOFLAG
 1034                         13,2036   45014 0  DOINT    CLEAR   CALL
 1035    REF   1              13,2037   01667 1                   PRECIFLG          ENGAGES 4-TIME STEP LOGIC IN INTEGRATION
 1036    REF   1              13,2040   27172 0                   INTEGRV           WHEN MODREG = 0

 1037                         13,2041   71214 0           BON     DLOAD
 1038    REF   2  LAST  247   13,2042   04307 1                   SURFFLAG
 1039    REF   1              13,2043   26063 0                   NO-INT
 1040    REF   3  LAST  116   13,2044   01571 0                   TETCSM
 1041    REF   3  LAST  219   13,2045   34041 0           STCALL  TDEC1
 1042    REF   2  LAST  240   13,2046   27447 0                   INTSTALL
 1043                         13,2047   45014 0           CLEAR   CALL              EXTRAPOLATE LM STATE VECTOR
 1044    REF   2  LAST  247   13,2050   01674 0                   VINTFLAG
 1045    REF   1              13,2051   26702 0                   SETIFLGS
 1046                         13,2052   77614 1           BOF                         ALSO 9X9 W-MATRIX IF W IS VALID
 1047   REF   2  LAST   247   13,2053   02756 1                   RENDWFLG
 1048   REF   1               13,2054   26060 0                   DOINT2
 1049                         13,2055   43014 0           SET     SET
 1050   REF   2  LAST   247   13,2056   01476 0                   DIMOFLAG
 1051   REF   1               13,2057   01475 0                   D6OR9FLG
 1052                         13,2060   45014 0  DOINT2   SET     CALL
 1053   REF   2  LAST   247   13,2061   01467 0                   PRECIFLG          DISENGAGE 4 TIME STEP LOGIC IN INTEG.
 1054   REF   2  LAST   247   13,2062   27172 0                   INTEGRV
 1055                         13,2063   77614 1  NO-INT   CLRGO
 1056   REF   1               13,2064   01236 1                   NODOFLAG
 1057   REF   1               13,2065   26670 1                   ENDINT

R1058    THISVINT IS CALLED BY MIDTOAV1 AND2

 1059                         13,2066   43414 1  THISVINT CLEAR   RVQ
 1060   REF   3  LAST   247   13,2067   01674 0                   VINTFLAG
```

```
L        RESTART TABLES                                                              USER'S PAGE NO.   1       EO S3

P0001    RESTART TABLES

R0002    ------------------

R0003    THERE ARE TWO FORMS OF RESTART TABLES FOR EACH GROUP.  THEY ARE KNOWN AS THE EVEN RESTART TABLES AND THE ODD
R0005    RESTART TABLES.  THE ODD TABLES HAVE ONLY ONE ENTRY OF THREE LOCATIONS WHILE THE EVEN TABLES HAVE TWO ENTRIES
R0007    EACH USING THREE LOCATIONS. THE INFORMATION AS TO WHETHER IT IS A JOB, WAITLIST, OR A LONGCALL IS GIVEN BY THE
R0009    WAY THINGS ARE PUT INTO THE TABLES.
R0010          A JOB HAS ITS PRIORITY STORED IN PRDTTAB OF THE CORRECT PHASE SPOT - A POSITIVE PRIORITY INDICATES A
R0012    FINDVAC JOB, A NEGATIVE PRIORITY A NOVAC.  THE 2CADR OF THE JOB IS STORED IN THE CADRTAB.
R0014    FOR EXAMPLE,

A0015                                                5.7SPOT  OCT     23000
A0016                                                         2CADR   SOMEJOB

R0017    A RESTART OF GROUP 5 WITH PHASE SEVEN WOULD THEN CAUSE SOMEJOB TO BE RESTARTED AS A FINDVAC WITH PRIORITY 23.

A0019                                                5.5SPOT  OCT     -23000
A0020                                                         2CADR   ANYJOB

R0021    HERE A RESTART OF GROUP 5 WITH PHASE 7 WOULD CAUSE ANYJOB TO BE RESTARTED AS A NOVAC WITH PRIORITY 23.
R0023    A LONGCALL HAS ITS GENADR OF ITS 2CADR STORED NEGATIVELY AND ITS BBCON STORED POSITIVELY.  IN ITS PRDTTAB IS
R0025    PLACED THE LOCATION OF A DP REGISTER THAT CONTAINS THE DELTA TIME THAT LONGCALL HAD BEEN ORIGINALLY STARTED
R0027    WITH.  EXAMPLE,

A0028                                                3.6SPOT  GENADR  DELTAT
A0029                                                        -GENADR  LONGTASK
A0030                                                         BBCON   LONGTASK

A0031                                                         OCT     31000
A0032                                                         2CADR   JOBAGAIN

R0033    THIS WOULD START UP LONGTASK AT THE APPROPRIATE TIME, OR IMMEDIATELY IF THE TIME HAD ALREADY PASSED. IT SHOULD
R0035    BE NOTED THAT IF DELTAT IS IN A SWITCHED E BANK, THIS INFORMATOIN SHOULD BE IN THE BBCON OFTHE 2CADR OF THE
R0037    TASK.  FROM ABOVE, WE SEE THAT THE SECOND PART OF THIS PHASE WOULD BE STARTED AS A JOB WITH A PRIORITY OF 31.

R0039    WAITLIST CALLS ARE IDENTIFIED BY THE FACT THAT THEIR 2CADR IS STORED NEGATIVELY. IF PRDTTAB OF THE PHASE SPOT
R0041    IS POSITIVE, THEN IT CONTAINS THE DELTA TIME, IF PRDTTAB IS NEGATIVE THEN IT IS THE -GENADR OF AN ERASABLE
R0043    LOCATION CONTAINING THE DELTA TIME, THAT IS, THE TIME IS STORED INDIRECTLY.  IT SHOULD BE NOTED AS ABOVE, THAT
R0045    IF THE TIME IS STORED INDIRECTLY, THE BBCON MUST CONTAIN THE NECESSARY E BANK INFORMATION IF APPLICABLE.  WITH
R0047    WAITLIST WE HAVE ONE FURTHER OPTION, IF -0 IS STORED IN PRDTTAB, IT WILL CAUSE AN IMMEDIATE RESTART OF THE
R0049    TASK.  EXAMPLES,

A0050                                                         OCT     77777           THIS WILL CAUSE AN IMMEDIATE RESTART
A0051                                                        -2CADR   ATASK           OF THE TASK :ATASK:

A0052                                                         DEC     200             IF THE TIME OF THE 2 SECONDS SINCE DUMMY
A0053                                                        -2CADR   DUMMY           WAS PUT ON WAITLIST IS UP, IT WILL BEGIN
A0054                                                                                 IN 10 MS, OTHERWISE IT WILL BEGIN WHEN
A0055                                                                                 IT NORMALLY WOULD HAVE BEGUN.
```

```
A0056                                                    -GENADR DTIME            WHERE DTIME CONTAINS THE DELTA TIME
A0057                                                    -2CADR  TASKTASK         OTHERWISE THIS IS AS ABOVE

R0058   *****    NOW THE TABLES THEMSELVES *****

 0059                            01,2002                  BANK    01
 0060   REF    1                 01,2000                  SETLOC  RESTART
 0061                            01,2002                  BANK

 0062                            01,2000         PRDTTAB  EQUALS  12000           USED TO FIND THE PRIORITY OR DELTATIME
 0063                            01,2001         CADRTAB  EQUALS  12001           THIS AND THE NEXT RELATIVE LOC CONTAIN
A0064                                                                             RESTART 2CADR

 0065   REF    1                                          COUNT*  $$/RSTAB        TABLES IN BANK 1.
 0066   REF    1                 01,2002  0 0010 0 SIZETAB  TC      1.2SPOT -12006
 0067   REF    1                 01,2003  0 0020 0          TC      1.3SPOT -12004
 0068   REF    1                 01,2004  0 0010 0          TC      2.2SPOT -12006
 0069   REF    1                 01,2005  0 0026 0          TC      2.3SPOT -12004
 0070   REF    1                 01,2006  0 0010 0          TC      3.2SPOT -12006
 0071   REF    1                 01,2007  0 0056 1          TC      3.3SPOT -12004
 0072   REF    1                 01,2010  0 0062 0          TC      4.2SPOT -12006
 0073   REF    1                 01,2011  0 0072 1          TC      4.3SPOT -12004
 0074   REF    1                 01,2012  0 0145 1          TC      5.2SPOT -12006
 0075   REF    1                 01,2013  0 0163 0          TC      5.3SPOT -12004
 0076   REF    1                 01,2014  0 0010 0          TC      6.2SPOT -12006
 0077   REF    1                 01,2015  0 0174 0          TC      6.3SPOT -12004
 0078                            01,2016   21000 1 1.2SPOT  OCT     21000           A DUMMY EXAMPLE TO BE REPLACED AS SOON
 0079   REF   30  LAST  224        0074                     EBANK=  STATE
 0080   REF    3  LAST  244      01,2017   05146 1          2CADR   ENDOFJOB        AS THERE IS A LEGITIMATE 1.2SPOT
 0080                            01,2020   04060 0
 0081                            01,2021   00144 0          DEC     100
 0082   REF   31  LAST  250        0074                     EBANK=  STATE
 0083   REF    3  LAST  176      01,2022   05263 0          2CADR   TASKOVER
 0083                            01,2023   04060 0
R0084   ANY MORE GROUP 1.EVEN RESTART VALUES SHOULD GO HERE

 0085   REF    2  LAST  154      01,2024   76300 0 1.3SPOT -GENADR  SAVET-30
 0086   REF    2  LAST  154      E7,1515                    EBANK=  DVCNTR
 0087   REF    2  LAST  239      01,2025   75427 1         -2CADR   ULLGTASK
 0087                            01,2026   03710 1
 00872                           01,2027   32000 0 1.5SPOT  OCT     32000
 00874  REF    2  LAST  157      E7,1654                    EBANK=  HMFAS
 00876  REF    1                 01,2030   03555 1          2CADR   REREPOS
 00876  REF    1                 01,2031   66067 0
R0088   ANY MORE GROUP 1.ODD RESTART VALUES SHOULD GO HERE

 0089   REF    2  LAST  250      01,2016           2.2SPOT  EQUALS  1.2SPOT
R0090   ANY MORE GROUP 2.EVEN RESTART VALUES SHOULD GO HERE

 0091   REF    1                 01,2032   02666 0 2.3SPOT  GENADR  600SECS
 0092    REF    1                01,2033    75136 1             -GENADR STATEINT
 0093    REF    3  LAST   247    E3,1554                         EBANK= RRECTCSM
 0094    REF    2  LAST   251    01,2034    26063 0              BBCON  STATEINT

 0095                            01,2035    05000 1  2.5SPOT     OCT    05000
 0096    REF    4  LAST   251    E3,1554                         EBANK= RRECTCSM
 0097    REF    1                01,2036    02650 0              2CADR  STATINT1
 0097    REF    1                01,2037    26063 0
 0098                            01,2040    02734 0  2.7SPOT     DEC    1500
 0099    REF    4  LAST   198    E7,1456                         EBANK= LOSCOUNT
 0100    REF    1                01,2041    75455 1             -2CADR  P20LEMC1
 0100    REF    1                01,2042    27710 1

 0101                            01,2043    14000 1  2.11SPOT    OCT    14000
 0102    REF    5  LAST   153    E7,1762                         EBANK= P21TIME
 0103    REF    1                01,2044    02476 0              2CADR  P25LEM1
 0103    REF    1                01,2045    50067 0
 0104                            01,2046    10000 0  2.13SPOT    OCT    10000
 0105    REF    5  LAST   251    E7,1456                         EBANK= LOSCOUNT
 0106    REF    1                01,2047    02231 0              2CADR  RELINUS
 0106    REF    1                01,2050    54067 1
 0107                            01,2051    26000 0  2.15SPOT    OCT    26000
 0108    REF    6  LAST   251    E7,1456                         EBANK= LOSCOUNT
 0109    REF    1                01,2052    02735 1              2CADR  R22RSTRT
 0109    REF    1                01,2053    50067 0
 0110                            01,2054    77777 0  2.17SPOT    OCT    77777
 0111    REF    1                E7,1700                         EBANK= VGPREV
 0112    REF    1                01,2055    75436 1             -2CADR  RED02.17
 0112    REF    1                01,2056    03710 1
 0113                            01,2057    00031 0  2.21SPOT    DEC    25
 0114    REF    3  LAST   250    E7,1515                         EBANK= DVCNTR
 0115    REF    1                01,2060    75735 1             -2CADR  R10,R11
 0115    REF    1                01,2061    35710 1
R0116    ANY MORE GROUP 2.ODD RESTART VALUES SHOULD GO HERE.

 0117    REF    3  LAST   250    01,2016                3.2SPOT  EQUALS 1.2SPOT
R0118    ANY MORE GROUP 3.EVEN RESTART VALUES SHOULD GO HERE

 0119    REF    1                01,2062    76355 0  3.3SPOT    -GENADR ZOOMTIME
 0120    REF    4  LAST   251    E7,1515                         EBANK= DVCNTR
 0121    REF    1                01,2063    74107 1             -2CADR  ZOOM
 0121    REF    1                01,2064    05710 1
 01212                           01,2065    20000 0  3.5SPOT     OCT    20000
 01214   REF    3  LAST   212    E7,1453                         EBANK= TTOGO
 01216   REF    1                01,2066    02536 0              2CADR  S40.13
 01216   REF    1                01,2067    56067 0
R0122    ANY MORE GROUP 3.ODD RESTART VALUES SHOULD GO HERE

 0123                            01,2070    04704 0  4.2SPOT     DEC    2500
 0124    REF    4  LAST   251    E7,1453                         EBANK= TTOGO
 0125   REF    1               01,2071   75423 0            -2CADR  TIG-5
 0125   REF    1               01,2072   03710 1
 0126                          01,2073   77777 0             OCT     77777
 0127   REF    5  LAST   251   E7,1453                       EBANK= TTOGO
 0128   REF    1               01,2074   75433 1            -2CADR  REDO4.2
 0128   REF    1               01,2075   03710 1
R0129   ANY MORE GROUP 4.EVEN RESTART VALUES SHOULD GO HERE

 0130                          01,2076   25000 0  4.3SPOT    OCT     25000
 0131   REF    5  LAST   251   E7,1515                       EBANK= DVCNTR
 0132   REF    1               01,2077   03443 1             2CADR   GOABORT
 0132   REF    1               01,2100   64067 1
 0133                          01,2101   00062 0  4.5SPOT    DEC     50
 0134   REF    6  LAST   252   E7,1453                       EBANK= TTOGO
 0135   REF    1               01,2102   75216 0            -2CADR  ULLAGOFF
 0135   REF    1               01,2103   03710 1
 0136                          01,2104   00764 1  4.7SPOT    DEC     500
 0137   REF    6  LAST   252   E7,1515                       EBANK= DVCNTR
 0138   REF    1               01,2105   75370 1            -2CADR  TIG-0
 0138   REF    1               01,2106   03710 1

 0139   REF    3  LAST   205   01,2107   76260 1  4.11SPOT-GENADR TGO +1
 0140   REF    7  LAST   252   E7,1515                       EBANK= DVCNTR
 0141   REF    1               01,2110   74234 1            -2CADR  ENGOFTSK
 0141   REF    1               01,2111   03710 1
 0142                          01,2112   12000 1  4.13SPOT OCT     12000
 0143   REF    6  LAST   215   E7,1462                       FBANK= TRKMKCNT
 0144   REF    1               01,2113   03222 0             2CADR   POSTBURN
 0144   REF    1               01,2114   74067 0

 0145                          01,2115   00764 1  4.15SPOT DEC     500
 0146   REF    7  LAST   252   E7,1453                       EBANK= TTOGO
 0147   REF    1               01,2116   75477 1            -2CADR  TIG-30
 0147   REF    1               01,2117   03710 1
 0148                          01,2120   77777 0  4.17SPOT OCT     77777
 0149   REF    8  LAST   252   E7,1515                       EBANK= DVCNTR
 0150   REF    2  LAST   252   01,2121   75423 0            -2CADR  TIG-5
 0150                          01,2122   03710 1
 0151                          01,2123   13000 0  4.21SPOT OCT     13000
 0152   REF    2  LAST   128   E5,1730                       EBANK= STAR
 0153   REF    1               01,2124   03026 0             2CADR   R51.1 +1
 0153   REF    1               01,2125   30065 1
 0154                          01,2126   77777 0  4.23SPOT OCT     77777
 0155   REF    9  LAST   252   E7,1515                       EBANK= DVCNTR
 0156   REF    1               01,2127   75344 0            -2CADR  IGNITION
 0156   REF    1               01,2130   03710 1
 0157   REF    3  LAST   250   01,2131   01477 1  4.25SPOT GENADR SAVET-30
 0158   REF    1               01,2132   75535 0            -GENADR TIG-35
 0159   REF    4  LAST   252   E7,1477                       EBANK= SAVET-30
 0160   REF    2  LAST   252   01,2133   74067 0             BBCON   TIG-35
 0161                          01,2134   52777 1  4.27SPOT OCT      52777
 0162   REF  10  LAST  252     E7,1515                     EBANK= DVCNTR
 0163   REF   1                01,2135   02133 1           2CADR  P70A
 0163   REF   1                01,2136   42067 0
 0164                          01,2137   52777 1  4.31SPOT OCT      52777
 0165   REF  11  LAST  253     E7,1515                     EBANK= DVCNTR
 0166   REF   1                01,2140   02136 1           2CADR  P71A
 0166   REF   1                01,2141   42067 0
 0167                          01,2142   46777 1  4.33SPOT OCT      46777
 0168   REF  12  LAST  253     E7,1515                     EBANK= DVCNTR
 0169   REF   2  LAST  235     01,2143   02040 1           2CADR  GOPOOEIX
 0169                          01,2144   10067 1
 0170                          01,2145   46777 1  4.35SPOT OCT      46777
 0171   REF  13  LAST  253     E7,1515                     EBANK= DVCNTR
 0172   REF   1                01,2146   05661 0           2CADR  GOPOODOO
 0172   REF   1                01,2147   04067 1
 0173                          01,2150   52777 1  4.37SPOT OCT      52777
 0174   REF   1                E7,1455                     EBANK= WHICH
 0175   REF   1                01,2151   02570 1           2CADR  COMFAIL
 0175   REF   1                01,2152   74067 0
R0176   ANY MORE 4.ODD RESTART VALUES SHOULD GO HERE.

 0177                          01,2153   22000 1  5.2SPOT  OCT      22000
 0178   REF  14  LAST  253     E7,1515                     EBANK= DVCNTR
 0179   REF   1                01,2154   03661 0           2CADR  NORMLIZE
 0179   REF   1                01,2155   64067 1
 0180                          01,2156   00310 0           DEC      200
 0181   REF  15  LAST  253     E7,1515                     EBANK= DVCNTR
 0182   REF   1                01,2157   74164 1          -2CADR  REREADAC
 0182   REF   1                01,2160   01710 0

 0183                          01,2161   00310 0  5.4SPOT  DEC      200
 0184   REF  16  LAST  253     E7,1515                     EBANK= DVCNTR
 0185   REF   2  LAST  253     01,2162   74164 1          -2CADR  REREADAC
 0185                          01,2163   01710 0

 0186                          01,2164   20000 0           OCT      20000
 0187   REF  17  LAST  253     E7,1515                     EBANK= DVCNTR
 0188   REF   1                01,2165   02121 1           2CADR  SERVICER
 0188   REF   1                01,2166   66067 0
R0189   ANY MORE GROUP 5.EVEN RESTART VALUES SHOULD GO HERE

 0190                          01,2167   00310 0  5.3SPOT  DEC      200
 0191   REF  18  LAST  253     E7,1515                     EBANK= DVCNTR
 0192   REF   3  LAST  253     01,2170   74164 1          -2CADR  REREADAC
 0192                          01,2171   01710 0

 0193                          01,2172   77777 0  5.5SPOT  OCT      77777
 0194   REF  19  LAST  253     E7,1515                     EBANK= DVCNTR
 0195   REF   1                01,2173   74335 1          -2CADR  REDO5.5
 0195   REF   1                01,2174   01710 0
 0196                          01,2175   77777 0  5.7SPOT  OCT     77777
 0197    REF  20  LAST  253    E7,1515                     EBANK= DVCNTR
 0198    REF   1               01,2176   74370 0          -2CADR   BIBIBIAS
 0198    REF   1               01,2177   01710 0
R0199    ANY MORE GROUP 5.ODD RESTART VALUES SHOULD GO HERE

 0200    REF   4  LAST  251    01,2016            6.2SPOT  EQUALS 1.2SPOT
 0201                          01,2200   00144 0  6.3SPOT  DEC     100
 0202    REF   6  LAST  214    E7,1441                     EBANK= TIG
 0203    REF   1               01,2201   75061 1          -2CADR   CLOKTASK
 0203    REF   1               01,2202   03710 1

 0204                          01,2203   30000 1  6.5SPOT  OCT     30000           PROTECT INCREMENTING OF TIME2,TIME1 BY
 0205    REF   2  LAST  117    E3,1706                     EBANK= TEPHEM           P27(UPDATE PROGRAM) VIA V70 OR V73.
 0206    REF   1               01,2204   03603 1           2CADR   TIMEDIDR
 0206    REF   1               01,2205   10063 0
 0207                          01,2206   17000 1  6.7SPOT  OCT     17000
 0208    REF   2  LAST  251    E7,1700                     EBANK= VGPREV
 0209    REF   1               01,2207   03355 1           2CADR   RED06.7
 0209    REF   1               01,2210   74067 0
 0210                          01,2211   17000 1  6.11SPOT OCT     17000
 0211    REF   3  LAST  254    E7,1700                     EBANK= VGPREV
 0212    REF   1               01,2212   03364 0           2CADR   FKP5RST
 0212    REF   1               01,2213   74067 0
```

```
L         AOTMARK                                                                                USER'S PAGE NO.   1      EO S3

 0002   REF    1                07,2000                       SETLOC AOTMARK1
 0003                           07,2000                       BANK

 0004   REF    2  LAST  151     E7,1551                       EBANK= XYMARK
 0005   REF    1                                              COUNT* $$/MARK

 0006                           07,2000  0 0004 0  AOTMARK    INHINT
 0013   REF    2  LAST  179     07,2001  3 6263 0             CAF    SIX                 SEE IF EXT. VERB WORKING
 0014   REF    2  LAST  233     07,2002  7 1043 0             MASK   EXTVBACT
 0015   REF   53  LAST  243     07,2003  10 000 0             CCS    A
 0016   REF    1                07,2004  1 2037 0             TCF    MKABORT             YES-ABORT

 0017   REF   21  LAST  195     07,2005  3 4743 0             CAF    BIT2                NO-DISALLOW SOME EXTENDED VERB ACTION
 0018   REF    3  LAST  255     07,2006  27'043 0             ADS    EXTVBACT            BIT2 RESET IN ENDMARK
 0019   REF    3  LAST  234     07,2007  10 400 1  MKVAC      CCS    VAC1USE             LOOK FOR A VAC AREA-DO ABORT IF
 0020   REF    1                07,2010  1 2024 1             TCF    MKVACFND            NONE AVAILABLE
 0021   REF    2  LAST  232     07,2011  10 454 0             CCS    VAC2USE
 0022   REF    2  LAST  255     07,2012  1 2024 1             TCF    MKVACFND
 0023   REF    2  LAST  232     07,2013  10 530 0             CCS    VAC3USE
 0024   REF    3  LAST  255     07,2014  1 2024 1             TCF    MKVACFND
 0025   REF    2  LAST  233     07,2015  10 604 1             CCS    VAC4USE
 0026   REF    4  LAST  255     07,2016  1 2024 1             TCF    MKVACFND
 0027   REF    2  LAST  233     07,2017  10 660 0             CCS    VAC5USE
 0028   REF    5  LAST  255     07,2020  1 2024 1             TCF    MKVACFND
 0029   REF    1                07,2021  52 134 0             DXCH   BUF2
 00292  REF    1                07,2022  0 5712 0             TC     BAILOUT1            ALL VAC AREAS OCCUPIED - ABORT.
 0030                           07,2023   31207 0             OCT    31207

 0031   REF    3  LAST  198     07,2024  6 4743 0  MKVACFND   AD     TWO
 0032   REF    2  LAST  233     07,2025  55'307 0             TS     MARKSTAT            STORE VAC ADR IN LOW 9 OF MARKSTAT

 0033   REF   17  LAST  247     07,2026  3 4746 0             CAF    ZERO
 0034   REF    3  LAST  255     07,2027  51'307 1             INDEX  MARKSTAT
 0035                           07,2030  53'777 0             TS     0 -1                ZERO IN VACUSE REG TO SHOW VAC  OCCUPIED

 0036   REF    2  LAST  191     07,2031  3 5016 0             CAF    PRIO15
 0037   REF    2  LAST  222     07,2032  0 5076 0             TC     FINDVAC             SET UP JOB FOR GETDAT
 0038   REF    3  LAST  255     E7,1551                       EBANK= XYMARK
 0039   REF    1                07,2033   02056 0             2CADR  GETDAT
 0039   REF    1                07,2034   16067 1

 0040                           07,2035  0 0003 1             RELINT
 0041   REF    1                07,2036  1 4622 1             TCF    SWRETURN

 0042   REF    2  LAST  255     07,2037  52 134 0  MKABORT    DXCH   BUF2
 00422  REF    2  LAST  255     07,2040  0 5712 0             TC     BAILOUT1            CONFLICT WITH EXTENDED VERB
 0043                           07,2041   31211 1             OCT    31211

 0044   REF   18  LAST  255     07,2042  3 4746 0  MKRELEAS   CAF    ZERO
 0045   REF    4  LAST  255     07,2043  57'307 1             XCH    MARKSTAT            SET MARKSTAT TO ZERO
```

```
L        AOTMARK                                                                      USER'S PAGE NO.   2      F7 S3

 0046    REF   2  LAST   223    07,2044   7 4775 1               MASK    LOW9          PICK UP VAC AREA ADR
 0047    REF  54  LAST   255    07,2045  10 000 0                CCS     A
 0048    REF  55  LAST   256    07,2046  50 000 1                INDEX   A
 0049                           07,2047  54 000 0                TS      0             SHOW MKVAC AREA AVAILABLE
 0050    REF   8  LAST   238    07,2050   3 4744 1               CAF     ONE
 0051    REF  10  LAST   241    07,2051   0 4665 0               TC      IBNKCALL
 0052    REF   1                07,2052    17704 1               CADR    GOODEND       GO WAKE UP CALLING JOB

 00521   REF  19  LAST   255    07,2053   3 4746 0    KILLAOT    CAF     ZERO
 00522   REF   4  LAST   255    07,2054  55'043 0                TS      EXTVBACT      TERMINATE AOTMARK-ALLOW EXT VERB
 00523   REF   2  LAST   235    07,2055   0 6001 0               TC      GOTUPOOH
```

```
P00524  GETDAT ROUTINE

 0053   REF   5  LAST  255   07,2056  4 1307 0  GETDAT   CS      MARKSTAT       SET BIT12 TO DISCOURAGE MARKRUPT
 00531  REF  15  LAST  233   07,2057  7 4731 1           MASK    BIT12            BIT12 RESET AT GETMARK
 00532  REF   6  LAST  257   07,2060  27'307 0           ADS     MARKSTAT

 0054   REF   1              07,2061  3 2352 1  N71DISP  CAF     V01N71         DISPLAY DETENT AND STARCODE
 0055   REF  10  LAST  236   07,2062  0 4607 1           TC      BANKCALL
 00551  REF   2  LAST  219   07,2063   20323 1           CADR    GOMARKF

 0056   REF   1              07,2064  1 2053 1           TCF     KILLAOT        V34-DOES GOTOPOOH
 0057   REF   1              07,2065  1 2067 0           TCF     DODAT          V33-PROCEED-USE THIS STAR FOR MARKS
 0058   REF   2  LAST  255   07,2066  1 2056 1  ENTERDAT TCF     GETDAT         ENTER-REDISPLAY STAR CODE

 0069   REF   1              07,2067  3 7765 1  DODAT    CAF     HIGH9          PICK DETENT CODE FROM BITS7-9 OF AOTCODE
 0070   REF   8  LAST  214   07,2070  7 1235 0           MASK    AOTCODE        AND SEE IF CODE 1 TO 6
 0071                        07,2071  0 0006 1           EXTEND
 0072   REF  14  LAST  174   07,2072  7 4734 1           MP      BIT9
 0073   REF   4  LAST  255   07,2073  55'551 0           TS      XYMARK         STORE DETENT

 0074                        07,2074  0 0006 1           EXTEND
 0075   REF   3  LAST  257   07,2075  6 2056 0           BZMF    GETDAT         COAS CALIBRATION CODE-NO GOOD HERE

 0076   REF   1              07,2076  6 5652 0           AD      NEG7           SEE IF DETENT 7 FOR COAS
 0077                        07,2077  0 0006 1           EXTEND
 0078   REF   1              07,2100  1 2102 1           BZF     CODE7

 00785  REF   1              07,2101  1 2116 1           TCF     CODE1TO6

 0079   REF   1              07,2102  3 2353 0  CODE7    CAF     V06N87*        CODE 7, COAS SIGHTING, GET OPTIC AXIS
 0080   REF  11  LAST  257   07,2103  0 4607 1           TC      BANKCALL       AZ AND EL OF SIGHTING DEVICE FROM ASTRO
 0081   REF   3  LAST  257   07,2104   20323 1           CADR    GOMARKF

 0082   REF   2  LAST  257   07,2105  1 2053 1           TCF     KILLAOT        V34-DOES GOTOPOOH
 0083                        07,2106  1 2110 1           TCF     +2             PROCEED
 0084   REF   2  LAST  257   07,2107  1 2102 1           TCF     CODE7          ON ENTER, RECYCLE
 00841                       07,2110  0 0006 1           EXTEND
 0085   REF   2  LAST  111   07,2111  3 1345 1           DCA     AZ             PICK UP AZ AND EL IN SP 2S COMP
 0086   REF   1              07,2112  50 120 1           INDEX   FIXLOC
 0087                        07,2113  52 011 0           DXCH    8D             STORE IN 8D AND 9D OF LOCAL VAC
 0095   REF  20  LAST  256   07,2114  3 4746 0           CAF     ZERO           BACKUP SYSTEM TO BE USED
 0096   REF   1              07,2115  1 2132 1           TCF     COASCODE       ZERO APPARENT ROTATION

 0097   REF   5  LAST  257   07,2116  51'551 1  CODE1TO6 INDEX   XYMARK         INDEX AOT POSITION BY DET CODE
 0098   REF   1              07,2117  3 1411 1           CA      AOTEL -1
 0099   REF   2  LAST  257   07,2120  50 120 1           INDEX   FIXLOC
 0100                        07,2121  54 011 0           TS      9D             STORE ELEVATION IN VAC+9D

 0101   REF   6  LAST  257   07,2122  51'551 1           INDEX   XYMARK         INDEX DET CODE 1,2 OR 3
 0102   REF   2  LAST  164   07,2123  3 1403 1           CA      AOTAZ -1
 0103    REF   3  LAST  257   07,2124  50 120 1            INDEX   FIXLOC
 0104                         07,2125  54 010 1            TS      8D            STORE AZIMUTH IN VAC+8D

 0105    REF   3  LAST  257   07,2126  3 1405 1            CA      AOTAZ +1      COMPENSATION FOR APPARENT ROTATION OF
 0106                         07,2127  0 0006 1            EXTEND                AOT FIELD OF VIEW IN LEFT AND RIGTHT
 0107    REF   4  LAST  258   07,2130  5 0120 1            INDEX   FIXLOC        DETENTS IS STORED IN VAC +10D IN SP
 0108                         07,2131  20 010 1            MSU     8D            PRECISION ONES COMPLEMENT
 0109    REF   5  LAST  258   07,2132  50 120 1  CCASCODE  INDEX   FIXLOC
 0110                         07,2133  54 012 0            TS      10D           ROT ANGLE

 0111    REF   4  LAST  240   07,2134  0 6060 1            TC      INTPRET       COMPUTE X AND Y PLANE VECTORS

 011105*                      07,2135   52014 0            CLEAR   GOTO
 01111  *REF   2  LAST  219   07,2136   02276 0                    XDSPFLAG
 01112   REF   1              07,2137   30347 1                    OPTAXIS
```

```
P0112    THE OPTAXIS SUBROUTINE COMPUTES THE X AND Y MARK PLANE VECS AND
R0113    AND ROTATES THEM THRU THE APPARENT FIELD OF VIEW ROTATION UNIQUE TO AOT
R0114    OPTAXIS USES OANB TO COMPUTE THE OPTIC AXIS
01202    REF   2  LAST   47   14,2000                        SETLOC  P50S1
01203                         14,2347                        BANK

0121                          14,2347   77624 1    OPTAXIS   CALL                     GO COMPUTE OA AND X AND Y PLANE VECS
0122     REF   1              14,2350   10557 1                      OANB
0123                          14,2351   70535 0              SLOAD   SR1              LOAD APP ROTATION IN ONES COMP
0124                          14,2352   00013 0                      10D              RESCALE BY 2PI
0125                          14,2353   73406 1              PUSH    SIN              1/2SIN(ROT)  0-1
0126                          14,2354   71525 0              PDDL    COS
0127                          14,2355   74206 0              PUSH    VXSC             1/2COS(ROT)  2-3
0128                          14,2356   00023 0                      18D
0129                          14,2357   74325 0              PDDL    VXSC             1/4COS(ROT)UYP   4-9
0130                          14,2360   00001 0                      0
0131                          14,2361   00031 0                      24D              1/4SIN(ROT)UXP
0132                          14,2362   45445 0              BVSU    STADR            UP 4-9
0133     REF   1              14,2363   60244 0              STODL   YPLANE           YPNB=1/4(COS(ROT)UYP-SIN(ROT)UXP)
0134                          14,2364   65361 0              VXSC    PDDL             UP 2-3  UP 0-1  FOR EXCHANGE
0135                          14,2365   00031 0                      24D              1/4COS(ROT)UXP  PUSH 0-5
0137                          14,2366   53361 0              VXSC    VAD              1/4SIN(ROT)UYP
0138                          14,2367   00023 0                      18D              UP 0-5
01381                         14,2370   77626 0              STADR
0139     REF   2  LAST   151  14,2371   50252 1              STOVL   XPLANE
0140     REF   1              14,2372   24007 0                      L06ZEROS         INITIALIZE AVE STAR VEC ACCUMULATOR
0141     REF   3  LAST   209  14,2373   02767 0              STORE   STARSAV2
01411                         14,2374   77414 0              BOFF    EXIT             IF INFLIGHT &KM MARKING GET SIGHTING
01412    REF   2  LAST   240  14,2375   04753 1                      FLT59FLG         BODY VECTOR FOR THET EST IN ITERATION
01413    REF   1              14,2376   30406 0                      ENDAXIS          LOOP
01414    REF   2  LAST   127  E5,1642                        EBANK=  XSM
01415    REF   1              14,2377   3 5005 1             CA      EBANK5
01416    REF   5  LAST   231  14,2400   54 003 0             TS      EBANK            PLANET ROUTINE USES EBANK5
01417    REF   5  LAST   258  14,2401   0 6060 1             TC      INTPRET
01418                         14,2402   45034 1              RTB     CALL
0142     REF   2  LAST   219  14,2403   21603 1                      LOADTIME
01427    REF   1              14,2404   16607 1                      PLANET
01428    REF   1              14,2405   03575 0              STORE   BODY
01429                         14,2406   77776 1    ENDAXIS   EXIT
0143     REF   7  LAST   257  E7,1551                        EBANK=  XYMARK
01431    REF   1              14,2407   3 5007 0             CA      EBANK7           RESTORE FBANK IN CASE OF PLANET BRANCH
01432    REF   6  LAST   259  14,2410   54 003 0             TS      EBANK
01433    REF   12 LAST   257  14,2411   0 4607 1             TC      BANKCALL
01434    REF   1              14,2412   16140 0              CADR    GETMKS
```

```
P0144   THE OANB ROUTINE COMPUTES THE OPTIC AXIS OF THE SIGHTING INSTRUMENT
R0145   FROM AZIMUTH AND ELEVATION INPUT FROM THE ASTRONAUT.
 01502  REF   1               04,2000                        SETLOC AOTMARK2
 01504                        04,2557                        BANK

 01506  REF   1                                              COUNT* $$/MARK

 0151                         04,2557  44001 0  OANB         SETPD  STQ
 0152                         04,2560  00001 0                      0
 0153   REF   2  LAST  128    04,2561  02736 1                      GCTR            STORE RETURN
 0154                         04,2562  47135 0               SLOAD  RTB
 0155                         04,2563  00012 1                      9D              PICK UP SP ELV
 0156   REF   1               04,2564  21606 1                      CDULOGIC
 0157                         04,2565  71406 0               PUSH   COS
 0158                         04,2566  73525 1               PDDL   SIN             1/2COS(ELV)  PD 0-1
 01581                        04,2567  77626 0               STADR
 0159   REF   4  LAST  153    04,2570  60012 1               STODL  SCAXIS          OAX=1/2SIN(ELV)
 0160                         04,2571  00011 1                      8D              PICK UP AZ SP
 0161                         04,2572  77634 0               RTB
 0162   REF   2  LAST  260    04,2573  21606 1                      CDULOGIC
 0163                         04,2574  71406 0               PUSH   COS
 0164                         04,2575  00025 0               STORE  20D             STORE UYP(Y) 20-21
 0165                         04,2576  73525 1               PDDL   SIN             1/2COS(AZ) PD 2-3
 0166                         04,2577  57406 1               PUSH   DCOMP           PUSH 1/2SIN(AZ) 4-5
 0167                         04,2600  14027 1               STODL  22D             STORE UYP(Z) 22-23
 0168   REF   2  LAST  259    04,2601  24007 0                      LO6ZEROS
 0169                         04,2602  14023 0               STODL  18D             STORE UYP(X) 18-19   UP 4-5
 0170                         04,2603  72405 0               DMP    SL1
 0171                         04,2604  00001 0                      0
 0172   REF   5  LAST  260    04,2605  17767 1               STODL  SCAXIS +2       OAY=1/2COS(ELV)SIN(AZ)
 0173                         04,2606  72405 0               DMP    SL1             UP 2-3
 0174                         04,2607  77626 0               STADR                  UP 0-1
 0175   REF   6  LAST  260    04,2610  50006 1               STOVL  SCAXIS +4       OAZ=1/2COS(ELV)COS(AZ)
 0176                         04,2611  00023 0                      18D             LOAD UYP VEC
 0177                         04,2612  53435 0               VXV    UNIT
 0178   REF   7  LAST  260    04,2613  03765 0                      SCAXIS          UXP VEC=UYP X OA
 0179                         04,2614  00031 0               STORE  24D             STORE UXP
 0180                         04,2615  77650 1               GOTO
 0181   REF   3  LAST  260    04,2616  02736 1                      GCTR
```

```
P0182      SURFSTAR COMPUTES A STAR VECTOR IN SM COORDINATES FOR LUNAR
R0183      SURFACE ALIGNMENT AND EXITS TO AVEIT TO AVERAGE STAR VECTORS.
 0190   RFF   1               15,2000                     SETLOC P50S
 0191                         15,2004                     BANK
 0192   REF   1                                           COUNT* $$/R59

 0193                         15,2004  77131 1  SURFSTAR SSP    AXT,2             INITIALIZE LOOP COUNTER (X1)
 0194   REF   1               15,2005  00052 0                  S2
 0195                         15,2006  00001 0                  1
 0196                         15,2007  00034 0                  280
 0197                         15,2010  71214 0           CLEAR  DLOAO
 0198   REE   1               15,2011  00274 0                  EREEELAG
 0199   PEE   1               15,2012  32161 0                  ONEOEG
 0200   REF   2  LAST  151    15,2013  33572 1           STOVL* DELTHET
 0201                         15,2014  00001 0                  0,1               PICK UP CURSOR MARK CDUS
 0202   REF   4  LAST  104    15,2015  20766 1           STODL* CDUSPOT
 0203                         15,2016  00010 0                  7,1               PICK UP SPIRAL FROM MK VAC
 0204                         15,2017  77634 0           RTB
 0205   REF   3  LAST  260    15,2020  21606 1                  CDULOGIC
 0206                         15,2021  34011 0           STCALL 8D                SPIRAL IN REVS
 0207   REF   1               15,2022  32141 1                  ROTCOMP
 0208   REF   1               15,2023  23773 0           STODL* POINTVSM          YPRIME VEC EOR SROT MFAS. COORDS.
 0209                         15,2024  C0007 0                  6,1               PICK UP CURSOR
 0210                         15,2025  77634 0           RTB
 0211   REF   4  LAST  261    15,2026  21606 1                  COULOGIC
 0212                         15,2027  34013 1           STCALL 10D               CURSOR IN REVS
 0213   REE   2  LAST  261    15,2030  32141 1                  ROTCOMP           COMPUTE YP VEC(NB)
 0214                         15,2031  77624 1           CALL
 0215   RFF   1               15,2032  47656 1                  TRG*NBSM          TRANSFORM YP VEC TO SM AT YROT MARK
 0216   REF   6  LAST  128    15,2033  32715 0           STOVL* STARAD +6
 0217                         15,2034  00002 0                  1,1               PICK UP SPIRAL CDUS
 0218   PEE   5  LAST  261    15,2035  34766 1           STCALL CDUSPOT           GET SINES ANO COSINES OF COUS
 02181  REF   1               15,2036  47526 0                  CO*TR*G
 0219                         15,2037  71214 0           BON    OLOAD
 0220   REE   3  LAST  259    15,2040  04713 0                  FLT59ELG
 0221   REF   1               15,2041  15320 1                  FLTTHET
 0222                         15,2042  00011 1                  8D                COMPUTE INITIAL THETA EST
 0223                         15,2043  43225 0           DSU    DAO
 0224                         15,2044  00013 0                  10D
 0225   REE   1               15,2045  32157 0                  ABOUTONE
 0226   REF   2  LAST  151    15,2046  03564 0  THETRET  STORE  THETEST           INITIAL THET EST MUST BE BETWEEN
 0227                         15,2047  51025 1           DSU    BPL               24 ANO 342 OEGREES
 0228   REF   1               15,2050  32151 0                  OEG342
 0229   REE   1               15,2051  32135 1                  COOLIT
 0230                         15,2052  45345 1           DLOAD  OSU
 0231   REE   3  LAST  261    15,2053  03564 0                  THETEST
 0232   REF   1               15,2054  32153 1                  DEG24
 0233                         15,2055  45040 1           BMN    CALL
 0234   REF   2  LAST  261    15,2056  32135 1                  COOLIT
 0235   REE   1               15,2057  30413 1                  SNBCOMP           POMPUTE 2ST EST OF STAR(SM)
 0236                                15,2060   72441 0             DOT     SLI
 02361   REF    7  LAST   261        15,2061   02715 0                     STARAD +6
 0237    REF    2  LAST   151        15,2062   03566 1  SNBTEST    STORE   ESTER1          SEE IF STAR IN YROT PLANE
 0238                                15,2063   45246 0             ABS     DSU
 0239    REF    1                    15,2064   32155 1                     COS.01
 0240                                15,2065   71240 1             BMN     DLOAD
 0241    REF    1                    15,2066   16275 0                     AVEIT           LESS THAN EPSILON, GOT STAR(SM) IN 24D
 0242    REF    3  LAST   261        15,2067   03572 1                     DELTHET
 0243                                15,2070   77615 0             DAD
 0244    REF    4  LAST   261        15,2071   03564 0                     THETEST         INCREMENT THETA EST BY 1 DEG
 0245    REF    5  LAST   262        15,2072   37564 1             STCALL  THETEST
 0246    REF    2  LAST   261        15,2073   30413 1                     SNBCOMP         COMPUTE 2ND EST OF STAR VEC
 0247                                15,2074   72441 0             DOT     SLI
 02471   REF    8  LAST   262        15,2075   02715 0                     STARAD +6
 0248    REF    2  LAST   151        15,2076   03570 0             STORE   ESTER2          SEE IF SOLUTION BETWEEN ESTER1, ESTER2
 0249                                15,2077   71240 1             BMN     DLOAD
 0250    REF    1                    15,2100   32105 1                     NEGEST2
 0251    REF    3  LAST   262        15,2101   03566 1                     ESTER1
 0252                                15,2102   52044 0             BPL     GOTO
 0253    REF    1                    15,2103   32120 0                     WHICHWAY        NO SOLU, ARE WE GOING IN RIGHT DIRECTION
 0254    REF    1                    15,2104   32110 0                     HOMEIN          SOLUTION BRACKETED, GET FINE CORRECTION
 0255                                15,2105   50145 1  NEGEST2    DLOAD   BMN
 0256    REF    4  LAST   262        15,2106   03566 1                     ESTER1
 0257    REF    2  LAST   262        15,2107   32120 0                     WHICHWAY
 0258                                15,2110   65225 1  HOMEIN     DSU     PDDL
 0259    REF    3  LAST   262        15,2111   03570 0                     ESTER2
 0260    REF    4  LAST   262        15,2112   03570 0                     ESTER2
 0261                                15,2113   77671 1             DDV
 0262                                15,2114   77605 1             DMP
 0263    REF    4  LAST   262        15,2115   03572 1                     DELTHET
 0264    REF    5  LAST   262        15,2116   37572 0             STCALL  DELTHET         FINE SOLUTION, THIS SHOULD GET SNB
 0265    REF    1                    15,2117   32132 0                     NEXTIT

 0266                                15,2120   65246 1  WHICHWAY   ABS     PDDL            ABS(ESTER1) 0-1
 0267    REF    5  LAST   262        15,2121   03570 0                     ESTER2
 0268                                15,2122   44246 1             ABS     BDSU            ABS(ESTER1)-ABS(ESTER2)
 0269                                15,2123   43044 0             BPL     BONSET
 0270    REF    2  LAST   262        15,2124   32132 0                     NEXTIT
 0271    REF    2  LAST   261        15,2125   00014 1                     FREEFLAG
 0272    REF    3  LAST   261        15,2126   32135 1                     COOLIT
 0273                                15,2127   57545 1             DLOAD   DCOMP           REVERSE DIRECTION OF ESTIMATION
 0274    REF    6  LAST   262        15,2130   03572 1                     DELTHET
 0275    REF    7  LAST   262        15,2131   03572 1             STORE   DELTHET
 0276                                15,2132   61145 0  NEXTIT     DLOAD   TIX,2           SEE IF 10 ITERATIONS HAVE BEEN MADE
 0277    REF    6  LAST   262        15,2133   03570 0                     ESTER2
 0278    REF    1                    15,2134   32062 1                     SNBTEST
 0279                                15,2135   77776 1  COOLIT     EXIT
 0280    REF    2  LAST   151        15,2136   25573 1             INCR    NOMKCNT
 02801   REF   13  LAST   259        15,2137   04607 1             TC      BANKCALL
 02802   REF    1                    15,2140   16320 1             CADR    COOLOUT
 0281                            15,2141   71406 0  ROTCOMP  PUSH    COS
 0282                            15,2142   73525 1           PDDL    SIN                 COS(ROT) 0-1
 0283                            15,2143   65361 0           VXSC    PDDL                1/8SIN(ROT)XP 0-5  1/2COS(ROT)  MPAC
 0284   REF    3  LAST   259     15,2144   03525 0                   XPLANE
 0285                            15,2145   52361 1           VXSC    VSU
 0286   REF    2  LAST   259     15,2146   03533 1                   YPLANE
 0287                            15,2147   43456 1           UNIT    RVQ                 1/2UNIT(VEC) IN MPAC

 0288                            15,2150   36314 1  DEG342   2DEC    .94999999
 0288                            15,2151   31461 0
 0289                            15,2152   02104 0  DEG24    2DEC    .06666666
 0289                            15,2153   10417 1
 0290                            15,2154   00002 0  COS.01   2DEC    .0001745
 0290                            15,2155   33372 1
 02901                           15,2156   37777 1  ABOUTONE 2DEC    .99999999
 02901                           15,2157   37775 0
 02902                           15,2160   00055 1  UNEDEG   2DEC    .00277777
 02902                           15,2161   20264 0

 02904 *REF    1                 06,2000                     SETLOC AOTMARK3
 02905                           06,3320                     BANK

 02906                           06,3320   64375 1  FLITTHET VLOAD   MXV
 02907  REF    2  LAST   259     06,3321   03575 0                   BODY
 02908  REF    7  LAST   221     06,3322   01732 0                   REESMMAT            FOR INFLIGHT P57 MARKING COMPUTE INITIAL
 02909                           06,3323   45056 0           UNIT    CALL                THET EST BY 12(STAR X OPTAXIS)
 0291   REF    1                 06,3324   47663 1                   *SMNB*
 02911                           06,3325   72441 0           DOT     SL1
 02912  REF    8  LAST   260     06,3326   03765 0                   SCAXIS
 02913                           06,3327   41326 0           ARCCOS  DMP
 02914  REF    1                 06,3330   23773 0                   3/4                 12 SCALED BY 16
 02915                           06,3331   52012 0           SL4     GOTO
 02916  REF    1                 06,3332   32046 1                   THETRET
```

```
L        ADTMARK                                                                                  USER'S PAGE NO.  10      E7 S3

P0292    SUBROUTINE TO COMPUTE STAR VEC IN NB COORDINATES

 0294    REF    3  LAST  259   14,2000                       SETLOC P50S1
 0295                          14,2413                       BANK

 02951                         14,2413   77620 0  SNBCOMP    STQ
 02952   REF    2  LAST  128   14,2414   02745 0                    QMIN
 0296                          14,2415   41345 0             DLOAD  DMP
 0297    REF    6  LAST  262   14,2416   03564 0                    THETEST
 0298    REF    1              14,2417   30454 1                    DP1/12
 0299                          14,2420   71406 0             PUSH   COS               COS(T/12) 0-1
 0300                          14,2421   73525 1             PDDL   SIN
 0301                          14,2422   41525 0             PDDL   PUSH              SIN(T/12) 2-3
 0302    REF    7  LAST  264   14,2423   03564 0                    THETEST
 0303                          14,2424   65356 1             SIN    PDDL              SIN(T) 4-5
 0304                          14,2425   41346 0             COS    DMP
 0305                          14,2426   00003 1                    2                 COS(T)SIN(T/12) 6-7
 0306                          14,2427   47315 0             PDVL   VXV
 0307    REF    2  LAST  261   14,2430   03773 1                    POINTVSM
 0308    REF    9  LAST  263   14,2431   03765 0                    SCAXIS
 0309                          14,2432   74372 1             VSL1   VXSC              UP 6-7
 03091                         14,2433   77626 0             STADR
 0310                          14,2434   63746 1             STODL  24D               COS(T)SIN(T/12)(YP X OA)
 0311                          14,2435   77605 1             DMP                      UP 4-5  UP 2-3
 0312                          14,2436   51361 1             VXSC   BVSU
 0313    REF    3  LAST  264   14,2437   03773 1                    POINTVSM          SIN(T)SIN(T/12)YP
 0314                          14,2440   00031 0                    24D
 0315                          14,2441   14031 0             STODL  24D
 0316                          14,2442   74561 0             VXSC   VSR1              UP 0-1
 0317    REF   10  LAST  264   14,2443   03765 0                    SCAXIS
 0318                          14,2444   53455 0             VAD    UNIT
 0319                          14,2445   00031 0                    24D
 03211                         14,2446   34031 1             STCALL 24D               STAR(NB)
 03212   REF    1              14,2447   47665 1                    *NBSM*
 03213                         14,2450   00031 0             STORE  24D               STAR(SM)
 03214                         14,2451   77650 1             GOTO
 03215   REF    3  LAST  264   14,2452   02745 0                    QMIN

 0323                          14,2453   02525 1  DP1/12     2DEC   .083333333
 0323                          14,2454   12525 0
```

```
P0324   GETMKS ROUTINE

 0326   REF   2  LAST   255    07,2000                            SETLOC AOTMARK1
 0327                          07,2140                            BANK
 0328   REF   2 LAST  255 TO  260:   132    132*                  COUNT* $$/MARK

 0329   REF  21  LAST   257    07,2140  3 4746 0  GETMKS          CAF     ZERO              INITIALIZE MARK ID REGISTER AND MARK CNT
 03291  REF   3  LAST   262    07,2141  55'573 0                  TS      NOMKCNT
 0330   REF   1                07,2142  55'236 0                  TS      XCOUNT
 0331   REF   1                07,2143  55'237 1                  TS      YCOUNT
 0332   REF   8  LAST   259    07,2144  55'551 0                  TS      XYMARK
 0333   REF   1                07,2145  55'762 1                  TS      XMKCNTR
 0334   REF   1                07,2146  55'763 0                  TS      YMKCNTR
 0335   REF   1                07,2147  4 0104 0                  CS      FLAGWRD8
 0336   REF  19  LAST   243    07,2150  7 4735 0                  MASK    BIT8
 0337                          07,2151  0 0006 1                  EXTEND
 0338   REF   1                07,2152  1 2156 0                  BZF     SETSURF           SURFFLAG FLAG SET, JAM ONE IN WHATMARK
 03381  REF   1                07,2153  3 0105 0                  CA      FLAGWRD9
 03382  REF  20  LAST   243    07,2154  7 4741 0                  MASK    BIT4              SEE IF CURSOR-SPIRAL MARKING
 03383  REF  56  LAST   256    07,2155  10 000 0                  CCS     A
 03384  REF   9  LAST   256    07,2156  3 4744 1  SETSURF         CA      ONE
 0339   REF   2  LAST   151    07,2157  55'550 1                  TS      WHATMARK

 0340   REF   3  LAST   256    07,2160  3 4775 0  PASTIT          CAF     LOW9              FREE UP MARKRUPT RETAINING MKVAC ADR
 0341   REF   7  LAST   257    07,2161  7 1307 0                  MASK    MARKSTAT
 0342   REF   8  LAST   265    07,2162  55'307 0                  TS      MARKSTAT
 0343   REF   3  LAST   265    07,2163  51'550 0                  INDEX   WHATMARK
 0344   REF   1                07,2164  3 2566 0                  CAF     MKVB54            DISPLAY MARK REQUEST
 0345   REF  14  LAST   262    07,2165  0 4607 1                  TC      BANKCALL
 0346   REF   1                07,2166   20331 1                  CADR    GOMARK2

 0347   REF   3  LAST   257    07,2167  1 2053 1                  TCF     KILLAOT           V34-DOES GOTOPOOH
 0348   REF   1                07,2170  1 2212 0                  TCF     MARKCHEX          VB33-PROCEED, GOT MARKS, COMPUTE LOS
 0349   REF  27  LAST   238    07,2171  4 4737 1                  CS      BIT6
 0350   REF  32  LAST   239    07,2172  7 0154 0                  MASK    MPAC
 0351                          07,2173  0 0006 1                  EXTEND
 0352   REF   4  LAST   257    07,2174  1 2056 1                  BZF     GETDAT            VB32 RECYCLE TO V01N71
 0353   REF   4  LAST   265    07,2175  4 1550 1                  CS      WHATMARK          ENTER-REVERSE CURSOR OR SPIRAL REQUEST
 0354   REF   5  LAST   265    07,2176  55'550 1                  TS      WHATMARK
 0355   REF   9  LAST   265    07,2177  11'551 0                  CCS     XYMARK
 0356                          07,2200  1 2202 1                  TCF     +2                IF ONE, SET ZERO
 0357   REF  10  LAST   265    07,2201  3 4744 1                  CAF     ONE               IF ZERO, SET ONE
 0358   REF  10  LAST   265    07,2202  55'551 0                  TS      XYMARK
 0359                          07,2203  0 0006 1  PREPAST         EXTEND
 0360   REF   2  LAST   265    07,2204  3 1763 1                  DCA     XMKCNTR
 0361   REF   2  LAST   265    07,2205  53'237 1                  DXCH    XCOUNT            UPDATE DISPLAY COUNTERS
 0362   REF  19  LAST   229    07,2206  3 4730 1                  CAF     BIT13
 0363   REF  11  LAST   265    07,2207  51'551 1                  INDEX   XYMARK
 0364   REF   3  LAST   265    07,2210  27'236 0                  ADS     XCOUNT
 0365   REF   1                07,2211  1 2160 0                  TCF     PASTIT
 0366   REF   9  LAST  265   07,2212   4 1307 0  MARKCHEX CS      MARKSTAT     SET BIT12 TO DISCOURAGE MARKRUPT
 0367   REF  16  LAST  257   07,2213   7 4731 1           MASK    BIT12
 0368   REF  10  LAST  266   07,2214  27'307 0            ADS     MARKSTAT
 0369   REF   4  LAST  265   07,2215   7 4775 1           MASK    LOW9
 0370   REF  12  LAST  265   07,2216  55'551 0            TS      XYMARK       JAM MARK VAC ADR IN XYMARK FOR AVESTAR
 0371   REF  22  LAST  265   07,2217   3 4746 0           CAF     ZERO
 0372   REF   2  LAST  151   07,2220  55'552 0            TS      MKDEX        SET MKDEX ZERO FOR LOS VEC CNTR
 0373   REF   3  LAST  265   07,2221  11'762 1            CCS     XMKCNTR
 0374                        07,2222   1 2224 0           TCF     +2
 0375   REF   1              07,2223   1 2331 0           TCF     MKALARM
 0376   REF   4  LAST  266   07,2224  55'762 1            TS      XMKCNTR
 0377   REF   2  LAST  265   07,2225  11'763 0            CCS     YMKCNTR
 0378                        07,2226   1 2230 0           TCF     +2
 0379   REF   2  LAST  266   07,2227   1 2331 0           TCF     MKALARM
 0380   REF   3  LAST  266   07,2230  55'763 0            TS      YMKCNTR
 0381                        07,2231   4 0000 0           COM
 0382   REF   5  LAST  266   07,2232   6 1762 0           AD      XMKCNTR
 0383                        07,2233   0 0006 1           EXTEND
 0384   REF   1              07,2234   6 2237 0           BZMF    AVESTAR
 0385   REF   4  LAST  266   07,2235   3 1763 1           CA      YMKCNTR
 0386   REF   6  LAST  266   07,2236  55'762 1            TS      XMKCNTR

 0389   REF   7  LAST  266   07,2237   4 1762 1  AVESTAR  CS      XMKCNTR
 0390                        07,2240   0 0006 1           EXTEND
 0391   REF   1              07,2241   7 4741 0           MP      EIGHT        GET C(L)=-8 MARKCNTR
 0392   REF  13  LAST  266   07,2242   4 1551 0           CS      XYMARK
 0393   REF  17  LAST  244   07,2243   6 0001 0           AD      L            ADD - MARK VAC ADR SET IN MARKCHEX
 0394   REF   6  LAST  258   07,2244  50 120 1            INDEX   FIXLOC
 0395   REF   1              07,2245  54 046 1            TS      X1           JAM - CDU ADR OF X-MARK IN X1

 0396   REF   7  LAST  266   07,2246   3 0120 1           CA      FIXLOC       SET PD POINTER TO ZERO
 0397   REF   1              07,2247  54 166 1            TS      PUSHLOC

 0398   REF   6  LAST  259   07,2250   0 6060 1           TC      INTPRET
 0399                        07,2251    43014 0           BON     BON
 0400   REF   3  LAST  247   07,2252    04307 1                   SURFFLAG
 0401   REF   1              07,2253    32004 1                   SURFSTAR
 0402   REF   4  LAST  261   07,2254    04713 0                   FLT59FLG
 04021  REF   2  LAST  266   07,2255    32004 1                   SURFSTAR
 04022                       07,2256    77773 1           VLOAD*
 04023                       07,2257    00002 0                   1,1
 0403   REF   6  LAST  261   07,2260    24766 0           STOVL   CDUSPOT
 0404   REF   3  LAST  263   07,2261    03533 1                   YPLANE
 0405                        07,2262    77624 1           CALL
 0406   REF   2  LAST  261   07,2263    47656 1                   TRG*NBSM     CONVERT IT TO STABLE MEMBER
 0407                        07,2264    76606 0           PUSH    VLOAD*
 0408                        07,2265    00001 0                   0,1          PUT X-MARK CDUS IN CDUSPOT FOR TRG*NBSM
 0409   REF   7  LAST  266   07,2266    24766 0           STOVL   CDUSPOT
 0410   REF   4  LAST  263   07,2267    03525 0                   XPLANE
 0411                        07,2270    77624 1           CALL
```

```
0412   REF   3  LAST  266   07,2271   47656 1                    TRG*NBSM        CONVERT IT TO STABLE-MEMBER
0413                        07,2272   53435 0            VXV     UNIT            UNIT(XPSM * YPSM)
0414                        07,2273   77626 0            STADR
0415                        07,2274   77746 1            STORE   24D

04151                       07,2275   77776 1  AVFIT     EXIT
04152  REF  17  LAST  266   07,2276  3 4731 0            CAF     BIT12           INCREMENT STAR VEC COUNTER
04153  REF   3  LAST  266   07,2277  27'552 0            ADS     MKDEX           MKDEX WAS INITIALIZED ZERO IN MARKCHEX
04154  REF   7  LAST  266   07,2300  0 6060 1            TC      INTPRET
0416                        07,2301   63335 1            SLOAD   PDVL
0417   REF   4  LAST  267   07,2302   03553 1                    MKDEX
0418                        07,2303   00031 0                    24D             LOAD CURRENT VECTOR
0419                        07,2304   70322 0            VSR3    V/SC
0420                        07,2305   00001 0                    0
0421                        07,2306   14031 0            STODL   24D             VEC/N
0422                        07,2307   00001 0                    0
0423                        07,2310   56225 1            DSU     DDV
0424   REF   1              07,2311   16571 0                    DP1/8           (N-1)/N
0425                        07,2312   53361 0            VXSC    VAD
0426   REF   4  LAST  259   07,2313   02767 0                    STARSAV2        ADD VEC TO PREVIOUSLY AVERAGED VEC
0427                        07,2314   00031 0                    24D             (N-1)/N AVESTVEC + VEC/N
04271                       07,2315   77656 1            UNIT
0428   REF   5  LAST  267   07,2316   02767 0            STORE   STARSAV2
0429                        07,2317   77776 1            EXIT
0430   REF   8  LAST  266   07,2320  11'762 1  COOLOUT   CCS     XMKCNTR         SEE IF MARK PAIR IN MKVAC
0431   REF   2  LAST  266   07,2321  1 2236 0            TCF     AVESTAR -1      THERE IS-GO GET IT-DECREMENT COUNTER
0432   REF   4  LAST  265   07,2322  11'573 0            CCS     NOMKCNT         IF ANY MKS NOT USED DISPLAY V50N25
04321  REF   1              07,2323  1 2334 0            TCF     ASKASTR         AND THE NUMBER MKS NOT USED
04322  REF   5  LAST  242   07,2324  3 4747 1  ENDMARKS  CAF     FIVE
0434   REF   7  LAST  198   07,2325  0 5205 0            TC      WAITLIST
0435   REF  14  LAST  266   E7,1551                      EBANK=  XYMARK
0436   REF   1              07,2326   02042 0            2CADR   MKRELEAS
0436   REF   1              07,2327   16067 1

0437   REF   1              07,2330  0 5474 0            TC      ENDMARK

0438   REF  11  LAST  238   07,2331  0 5571 1  MKALARM   TC      ALARM           NOT A PAIR TO PROCESS-DO GETMKS
0439                        07,2332   00111 0            OCT     111
0440   REF   2  LAST  259   07,2333  1 2140 1            TCF     GETMKS

04401  REF   1              07,2334  3 4310 1  ASKASTR   CAE     OCT16
04402  REF   2  LAST  105   07,2335  55'044 1            TS      DSPTEM1
04403  REF   5  LAST  267   07,2336  3 1573 1            CA      NOMKCNT
04404  REF   3  LAST  267   07,2337  55'045 0            TS      DSPTEM1 +1
04405  REF   1              07,2340  3 2351 1            CAE     V50N25
04406  REF  15  LAST  265   07,2341  0 4607 1            TC      BANKCALL
04407  REF   1              07,2342   20350 0            CADR    GOMARK2R

04408  REF   4  LAST  265   07,2343  1 2053 1            TCF     KILLAOT         V34 TERMINATE
04409  REF   1              07,2344  1 2324 1            TCF     ENDMARKS        PRO - PROCEED ANYWAY
```

```
 0441    REF   5  LAST  265   07,2345  1 2056 1             TCF     GETDAT

 04411   REF  13  LAST   90   07,2346  3 4742 1             CAF     BIT3
 04412   REF   1              07,2347  0 5466 0             TC      BLANKET
 04414   REF   4  LAST  250   07,2350  0 5146 1             TC      ENDOFJOB

 04415                        07,2351   14431 1  V50N25     VN      5025
 04416                        07,2352   00307 0  V01N71     VN      171
 0442                         07,2353   01527 0  V06N87*    VN      687
```

```
P0443   MARKRUPT IS ENTERED FROM INTERUPT LEAD-INS AND PROCESSES CHANNEL 16
R0444   CAUSED BY X,Y MARK OR MARK REJECT OR BY THE RATE OF DESCENT SWITCH

 0445   REF  2  LAST  165   07,2354  54 016 1  MARKRUPT TS      BANKRUPT
 0446   REF  5  LAST  215   07,2355  3 0033 1           CA      CDUY           STORE CDUS AND TIME NOW-THEN SEE IF
 0447   REF  7  LAST  158   07,2356  54 063 0           TS      ITEMP3         WE NEED THEM
 0448   REF  8  LAST  215   07,2357  3 0034 0           CA      CDUZ
 0449   REF  3  LAST   97   07,2360  54 064 1           TS      ITEMP4
 0450   REF  7  LAST  208   07,2361  3 0032 0           CA      CDUX
 0451   REF  3  LAST  158   07,2362  54 065 0           TS      ITEMP5
 0452                       07,2363  0 0006 1           EXTEND
 0453   REF  8  LAST  216   07,2364  3 0025 0           DCA     TIME2
 0454   REF  4  LAST  142   07,2365  52 062 1           DXCH    ITEMP1
 0455   REF 19  LAST  244   07,2366  56 002 0           XCH     Q
 0456   REF  2  LAST  165   07,2367  54 012 0           TS      QRUPT

 0470   REF  1              07,2370  3 4767 0           CAF     OCT140         SEE IF ROD INPUT
 0471                       07,2371  0 0006 1           EXTEND
 0472   REF  2  LAST  229   07,2372  02 016 1           RAND    NAVKEYIN
 0473                       07,2373  0 0006 1           EXTEND
 0474   REF  1              07,2374  6 2376 1           BZMF    FINDKEY

 04741  REF  1              07,2375  0 2441 1           TC      DESCBITS       ROD INPUT
 0475   REF  1              07,2376  0 2451 0  FINDKEY  TC      VALIDCHK       NO ROD INPUT-SEE IF VALID MARKRUPT
 0476   REF 16  LAST  239   07,2377  3 4740 0           CAF     BIT5           GOOD RUPT-SEE IF MARK REJECT

 0477                       07,2400  0 0006 1           EXTEND
 0478   REF  3  LAST  269   07,2401  02 016 1           RAND    NAVKEYIN
 0479   REF 57  LAST  265   07,2402  10 000 0           CCS     A
 0480   REF  1              07,2403  1 2572 1           TCF     MKREJ          ITS A MARK REJECT

 0481   REF  6  LAST  265   07,2404  11'550 1  CHKWHAT  CCS     WHATMARK
 0482   REF  1              07,2405  1 2425 1           TCF     XMKRUPT        +1 FOR CURSOR MARK
 0483   REF  1              07,2406  1 2410 1           TCF     FINDMARK       0  FOR INFLIGHT MARK
 0484   REF  1              07,2407  1 2427 0           TCF     YMKRUPT        -1 FOR SPIRAL

 0485   REF 21  LAST  265   07,2410  3 4741 1  FINDMARK CAF     BIT4           SEE IF Y MARK
 0486                       07,2411  0 0006 1           EXTEND
 0487   REF  4  LAST  269   07,2412  02 016 1           RAND    NAVKEYIN
 0488   REF 58  LAST  269   07,2413  10 000 0           CCS     A

 0489   REF  2  LAST  269   07,2414  1 2427 0           TCF     YMKRUPT        ITS Y MARK OR SPIRAL MARK
 0490   REF 14  LAST  268   07,2415  3 4742 1           CAF     BIT3           SEE IF X MARK
 0491                       07,2416  0 0006 1           EXTEND
 0492   REF  5  LAST  269   07,2417  02 016 1           RAND    NAVKEYIN
 0493   REF 59  LAST  269   07,2420  10 000 0           CCS     A
 0494   REF  2  LAST  269   07,2421  1 2425 1           TCF     XMKRUPT        ITS A X MARK

 0495   REF 12  LAST  267   07,2422  0 5571 1  113ALRM  TC      ALARM          NO INBITS IN CHANNEL 16
 0496                       07,2423   00113 1           OCT     113
```

```
0497    REF   8  LAST  201   07,2424  0 5272 0           TC      RESUMF

0498    REF  23  LAST  266   07,2425  3 4746 0 XMKRUPT   CAF     ZERO
0499                         07,2426  1 2430 0           TCF     +2                SET STORE INDEX ZERO
0500    REF  11  LAST  265   07,2427  3 4744 1 YMKRUPT   CAF     ONE
0501    REF  15  LAST  267   07,2430 55'551 0            TS      XYMARK            SET MARK ID REG
0503    REF  60  LAST  265   07,2431 50 000 1            INDEX   A
0504    REF   9  LAST  267   07,2432  4 1762 1           CS      XMKCNTR
0505    REF   6  LAST  267   07,2433  6 4747 1           AD      FIVE
0506                         07,2434  0 0006 1           EXTEND
0507    REF   1              07,2435  6 2467 0           BZMF    VACSTOR           IF 7TH MARK, STORE DATA AS 6TH MARK
0508    REF  16  LAST  270   07,2436 51'551 1            INDEX   XYMARK
0509    REF  10  LAST  270   07,2437 25'762 0            INCR    XMKCNTR
0510    REF   2  LAST  270   07,2440  1 2467 1           TCF     VACSTOR

051001  REF  18  LAST  202   07,2441  7 4736 0 DESCBITS  MASK    BIT7
051002*REF  18  LAST  266   07,2442 54 001 1            TS      L

051006  REF   2  LAST  197   07,2443  3 4740 0           CAF     AVEGFBIT
051007  REF   3  LAST  239   07,2444  7 0103 1           MASK    FLAGWRD7
051008  REF  61  LAST  270   07,2445 10 000 0            CCS     A
051009*REF   1              07,2446  1 2462 1           TCF     RODIN
05101   REF   2  LAST  255   07,2447  0 2451 0           TC      VALIDCHK
051011  REF   1              07,2450  1 2404 1           TCF     CHKWHAT           THIS IS BACK UP MARK

051012  REF  11  LAST  266   07,2451 11'307 0 VALIDCHK  CCS     MARKSTAT
051014  REF   1              07,2452  1 2456 0           TCF     CHK12

051015  REF  13  LAST  265   07,2453  0 5571 1 ALM112    TC      ALARM             MARKRUPT NOT ALLOWED
051016                       07,2454   00112 0           OCT     112
051017  REF   9  LAST  270   07,2455  0 5272 0           TC      RESUMF

051018  REF  18  LAST  267   07,2456  7 4731 1 CHK12     MASK    BIT12
051019  REF  62  LAST  270   07,2457 10 000 0            CCS     A
05102   REF   1              07,2460  1 2453 0           TCF     ALM112
051021  REF  20  LAST  269   07,2461  0 0002 0           TC      Q

05103  *REF  19  LAST  270   07,2462 10 001 1 RODIN      CCS     L
05104  *REF   4  LAST  255   07,2463  4 4743 1           CS      TWO
05105  *REF  12  LAST  270   07,2464  6 4744 1           AD      ONE
05106  *REF   1              07,2465 27'746 1            ADS     RODCOUNT
05107  *REF  10  LAST  270   07,2466  0 5272 0           TC      RESUME
```

```
P0511   DATA STORE ROUTINE

 0512                               07,2467  0 0006 1  VACSTOR  EXTEND
 0513   REF   5  LAST  269          07,2470  3 0062 0           DCA      ITEMP1         STORE MARK TIME FOR DOWNLINK
 0514   REF   3  LAST  214          07,2471  53'562 0           DXCH     TSIGHT

 0515   REF   5  LAST  266          07,2472  3 4775 0           CAF      LOW9
 0516   REF  12  LAST  270          07,2473  7 1307 0           MASK     MARKSTAT       GRAB MARK VAC ADR
 0517   REF   5  LAST  267          07,2474  55'552 0           TS       MKDEX
 0518   REF  17  LAST  270          07,2475  51'551 1           INDEX    XYMARK
 0519   REF  11  LAST  270          07,2476  11'762 1           CCS      XMKCNTR        DECREMENT COUNTER TO START STORE AT ZERO
 0520                               07,2477  0 0006 1           EXTEND
 0521   REF   2  LAST  266          07,2500  7 4741 0           MP       EIGHT
 0522   REF  20  LAST  270          07,2501  56 001 0           XCH      L
 0523   REF  18  LAST  271          07,2502  6 1551 1           AD       XYMARK
 0524   REF   6  LAST  271          07,2503  27'552 0           ADS      MKDEX          MK VAC ADR + 8(CNTR-1) + MARK ID
 0525   REF   8  LAST  269          07,2504  3 0063 1           CA       ITEMP3
 0526   REF   7  LAST  271          07,2505  51'552 1           INDEX    MKDEX
 0527                               07,2506  54 000 0           TS       0              STORE CDUY
 0528   REF   4  LAST  269          07,2507  3 0064 0           CA       ITEMP4
 0529   REF   8  LAST  271          07,2510  51'552 1           INDEX    MKDEX
 0530                               07,2511  54 002 1           TS       2              STORE CDUZ
 0531   REF   4  LAST  269          07,2512  3 0065 1           CA       ITEMP5
 0532   REF   9  LAST  271          07,2513  51'552 1           INDEX    MKDEX
 0533                               07,2514  54 004 1           TS       4              STORE CDUX
 0534   REF   1                     07,2515  1 2516 0  ENDSTOR  TCF      REMARK
```

```
P0535   REMARK AND CURSOR-SPIRAL KEYIN ROUTINE

 0536   REF   3  LAST  255   07,2516  3 5016 0  REMARK    CAF     PRIO15        ENTER JOB TO CHANGE DISPLAY
 0537   REF   5  LAST  235   07,2517  0 5063 1            TC      NOVAC
 0538   REF  19  LAST  271   E7,1551                      EBANK=  XYMARK
 0539   REF   1              07,2520   02523 1            2CADR   CHANGEVB
 0539   REF   1              07,2521   16067 1

 0540   REF  11  LAST  270   07,2522  0 5272 0            TC      RESUME

 0541   REF   7  LAST  269   07,2523  3 1550 0  CHANGEVB  CA      WHATMARK
 0542                        07,2524  0 0006 1            EXTEND
 0543   REF   1              07,2525  1 2203 0            BZF     PREPAST       RE-DISPLAY VERB54 FOR INFLIGHT MARK
 0544   REF  13  LAST  271   07,2526  4 1307 0            CS      MARKSTAT      SET BIT12 TO DISCOURAGE MARK
 0545   REF  19  LAST  270   07,2527  7 4731 1            MASK    BIT12
 0546   REF  14  LAST  272   07,2530 27'307 0            ADS     MARKSTAT

 0547   REF   8  LAST  272   07,2531 51'550 0            INDEX   WHATMARK
 0548   REF   1              07,2532  3 2563 0            CAF     V06N79*       EITHER V21N79 OR V 22N79 LOAD VERB
 0549   REF  16  LAST  267   07,2533  0 4607 1            TC      BANKCALL
 0550   REF   1              07,2534   20345 1            CADR    GOMARKER

 0551   REF   5  LAST  267   07,2535  1 2053 1            TCF     KILLAOT       VB34-TERMINATE
 0552   REF   1              07,2536  1 2543 0            TCF     N79DISP
 0553   REF   2  LAST  272   07,2537  1 2543 0            TCF     N79DISP

 0554   REF   2  LAST  165   07,2540  3 4750 1            CAF     SEVEN
 0555   REF   2  LAST  268   07,2541  0 5466 0            TC      BLANKET
 0556   REF   5  LAST  268   07,2542  0 5146 1            TC      ENDOFJOB

 0557   REF   2  LAST  272   07,2543  3 2563 0  N79DISP   CAF     V06N79*       ENTER-DISPLAY V06N79 FOR VERIFY
 0558   REF  17  LAST  272   07,2544  0 4607 1            TC      BANKCALL
 0559   REF   2  LAST  272   07,2545   20345 1            CADR    GOMARKER

 0560   REF   6  LAST  272   07,2546  0 2053 0            TC      KILLAOT
 0561   REF   1              07,2547  1 2555 1            TCF     SURFAGAN
 0562   REF   3  LAST  272   07,2550  1 2543 0            TCF     N79DISP

 0563   REF  20  LAST  272   07,2551  4 1551 0            CS      XYMARK
 0564   REF   3  LAST  255   07,2552  6 6263 0            AD      SIX
 0565   REF   3  LAST  272   07,2553  0 5466 0            TC      BLANKET
 0566   REF   6  LAST  272   07,2554  0 5146 1            TC      ENDOFJOB

 0569   REF  21  LAST  272   07,2555 51'551 1  SURFAGAN  INDEX   XYMARK
 0570   REF   4  LAST  214   07,2556  3 1240 0            CA      CURSOR
 0571   REF  10  LAST  271   07,2557 51'552 1            INDEX   MKDEX
 0572                        07,2560 54 006 0            TS      6
 0573   REF   2  LAST  272   07,2561  1 2203 0            TCF     PREPAST

 0574                        07,2562   05517 1  V22N79    VN      2279          SPIRAL LOAD DISPLAY
```

```
0575                       07,2563   01517 0  V06N79*   VN      679
0576                       07,2564   05317 1  V21N79    VN      2179           CURSOR LOAD DISPLAY

0577                       07,2565   15307 1  MKVB53    VN      5371           SPIRAL MARK REQUEST
0578                       07,2566   15507 1  MKVB54    VN      5471           X OR Y MARK
0579                       07,2567   15107 0  MKVB52    VN      5271           CURSOR MARK REQUEST
0580                       07,2570   04000 0  DP1/8     2DEC    .125
0580                       07,2571   00000 1
```

```
P0581    MARK REJECT ROUTINE

 0582    REF  22  LAST  272   07,2572  51'551 1  MKREJ     INDEX   XYMARK
 0583    REF  12  LAST  271   07,2573  11'762 1            CCS     XMKCNTR
 0584    REF   1              07,2574  1 2600 1            TCF     REJMK          REJECT MARK

 0585    REF  14  LAST  270   07,2575  0 5571 1            TC      ALARM
 0586                         07,2576   00115 1            OCT     115            NO MARK OF THIS KIND TO REJECT
 0587    REF  12  LAST  272   07,2577  0 5272 0            TC      RESUME

 0588    REF  23  LAST  274   07,2600  51'551 1  REJMK     INDEX   XYMARK
 0589    REF  13  LAST  274   07,2601  55'762 1            TS      XMKCNTR        STORE DECREMENTED MARK COUNTER

 0590    REF   4  LAST  272   07,2602  3 5016 0            CAF     PRIO15         ENTER JOB TO RE-DISPLAY MARK REQUEST
 0591    REF   6  LAST  272   07,2603  0 5063 1            TC      NOVAC
 0592    REF  24  LAST  274   E7,1551                      EBANK=  XYMARK
 0593    REF   3  LAST  272   07,2604   02203 1            2CADR   PREPAST
 0593                         07,2605   16067 1

 0594    REF  13  LAST  274   07,2606  0 5272 0            TC      RESUME
 0001                          07,2607                      BANK    7
 0002  REF   1                 43,2000                      SETLOC  EXTVERBS
 0003                          43,2000                      BANK

 0004  REF   4  LAST  209      E5,1737                      EBANK=  OGC

 0005  REF   1                                              COUNT*  $$/EXTVB
R0006  FAN-OUT

 0007  REF  33  LAST  265      43,2000  50 154 1  GOEXTVB   INDEX   MPAC       VERB-40 IS IN MPAC
 0008  REF   1                 43,2001  0 2002 1            TC      LST2FAN    FAN AS BEFORE.

 0009  REF   1                 43,2002  0 2126 0  LST2FAN   TC      VBZERO     VB40 ZERO (USED WITH NOUN 20 OR 72 ONLY)
 0010  REF   1                 43,2003  0 2177 1            TC      VBCOARK    VB41 COARSE ALIGN (USED WITH NOUN 20 OR
A0011                                                                                                          72 ONLY)
 0012  REF   1                 43,2004  0 2344 0            TC      IMUFINEK   VB42 FINE ALIGN IMU
 0013  REF   1                 43,2005  0 2702 0            TC      IMUATTCK   VB43  LOAD IMU ATTITUDE ERROR METERS.
 0014  REF   1                 43,2006  0 2310 1            TC      RRDESEND   VB44 TERMINATE CONTINUOUS DESIGNATE
 0015  REF   1                 43,2007  0 2116 0            TC      ALM/END    VB45 SPARE
 0016  REF   2  LAST  275      43,2010  0 2116 0            TC      ALM/END    VB46 SPARE
 0017  REF   1                 43,2011  0 2403 1            TC      V47TXACT   VB47 AGS INITIALIZATION
 0018  REF   1                 43,2012  0 3134 1            TC      DAPDISP    VB48  LOAD A/P DATA
 0019  REF   1                 43,2013  1 3011 0            TCF     CREWMANU   VB49 START AUTOMATIC ATTITUDE MANEUVER
 0020  REF   1                 43,2014  0 2375 1            TC      GOLOADLV   VB50 PLEASE PERFORM
 0021  REF   3  LAST  275      43,2015  0 2116 0            TC      ALM/END    VB51 SPARE
 0022  REF   2  LAST  275      43,2016  0 2375 1            TC      GOLOADLV   VB52 PLEASE MARK X - RETICLE.
 0023  REF   3  LAST  275      43,2017  0 2375 1            TC      GOLOADLV   VB53 PLEASE MARK Y - RETICLE.
 0024  REF   4  LAST  275      43,2020  0 2375 1            TC      GOLOADLV   VB54 PLEASE MARK X OR Y - RETICLE
 0025  REF   1                 43,2021  0 2415 0            TC      ALINTIME   VB55 ALIGN TIME
 0026  REF   1                 43,2022  0 3020 0            TC      TRMTRACK   VB56 TERMINATE TRACKING - P20 + P25
 0027  REF   1                 43,2023  0 2333 0            TC      LRON       VB57 PERMIT  LANDING RADAR UPDATES
 0028  REF   1                 43,2024  0 2336 0            TC      LROFF      VB58 INHIBIT LANDING RADAR UPDATES
 0029  REF   1                 43,2025  0 2147 1            TC      LRPOS2K    VB59 COMMAND LR TO POSITION 2.
 0030  REF   1                 43,2026  0 2174 1            TC      RATEDISP   VB60 DISPLAY DAP ESTIMATED RATES
 0031  REF   1                 43,2027  0 2164 0            TC      DAPATTER   VB61 DISPLAY DAP ATTITUDE ERROR
 0032  REF   1                 43,2030  0 2167 0            TC      TOTATTER   VB62 DISPLAY TOTAL ATTITUDE ERROR
 0033  REF   1                 43,2031  0 2430 1            TC      R04        VB63 SAMPLE RADAR ONCE PER SECOND
 0034  REF   1                 43,2032  0 2674 0            TC      VB64       VB64 CALCULATE,DISPLAY S-BAND ANT ANGLES
 0035  REF   1                 43,2033  0 3224 0            TC      SNUFFOUT   VB65 DISABLE U,V JETS DURING DPS BURNS.
 0036  REF   1                 43,2034  0 3141 0            TC      ATTACHED   VB66 ATTACHED   MOVE THIS TO OTHER STATE
 0037  REF   1                 43,2035  0 3216 1            TC      V67        VB67 W MATRIX MONITOR
 0038  REF   1                 43,2036  0 2341 0            TC      TEROFF     VB68 TAKE OUT TERRAIN MODEL IN DESCENT
 0039  REF   1                 43,2037  0 2037 1  VERB69    TC      VERB69     VB69 FORCE A HARDWARE RESTART
 0040  REF   1                 43,2040  0 3727 0            TC      V70UPDAT   VB70 UPDATE LIFTOFF TIME.
 0041  REF   1                 43,2041  0 3731 1            TC      V71UPDAT   VB71 UNIVERSAL UPDATE - BLOCK ADDRESS.
 0042  REF   1                 43,2042  0 3733 0            TC      V72UPDAT   VB72 UNIVERSAL UPDATE - SINGLE ADDRESS.
 0043  REF   1                 43,2043  0 3735 0            TC      V73UPDAT   VB73 UPDATE AGC TIME (OCTAL).
 0044  REF   1                 43,2044  0 3040 0            TC      DNEDUMP    VB74 INITIALIZE DOWN-TELEMETRY PROGRAM
A0045                                                                                  FOR ERASABLE DUMP.
 0046  REF   1                 43,2045  0 3227 0            TC      OUTSNUFF   VB75 ENABLE U,V JETS DURING DPS BURNS.
```

```
L       EXTENDED VERBS                                                                                USER'S PAGE NO.   2      E5 S4

 0047   REF   1                 43,2046  0 3000 1            TC       MINIMP         V876 MINIMUM IMPULSE MODE
 0048   REF   1                 43,2047  0 3003 1            TC       NOMINIMP       V877 RATE COMMAND MODE
 0049   REF   1                 43,2050  0 2420 0            TC       R77            V878 START LR SPURIOUS RETURN TEST
 0050   REF   1                 43,2051  0 2630 0            TC       R77END         V879 TERMINATE LR SPURIOUS RETURN TEST
 0051   REF   1                 43,2052  0 3044 1            TC       LEMVEC         V880 UPDATE LEM STATE VECTOR
 0052   REF   1                 43,2053  0 3047 1            TC       CSMVEC         V881 UPDATE CSM STATE VECTOR
 0053   REF   1                 43,2054  0 2741 1            TC       V82PERF        V882 REQUEST ORBIT PARAM DISPLAY (R30)
 0054   REF   1                 43,2055  0 2751 0            TC       V83PERF        V883 REQUEST REND PARAM DISPLAY (R31)
 0055   REF   4  LAST  275      43,2056  0 2116 0            TC       ALM/END        V884 SPARE
 0056   REF   1                 43,2057  0 3232 1            TC       VERB85         V885 DISPLAY RR LOS AZ AND ELEV
 0057   REF   5  LAST  276      43,2060  0 2116 0            TC       ALM/END        V886 SPARE
 0058   REF   6  LAST  276      43,2061  0 2116 0            TC       ALM/END        V887 SPARE
 0059   REF   7  LAST  276      43,2062  0 2116 0            TC       ALM/END        V888 SPARE
 0060   REF   1                 43,2063  0 2757 0            TC       V89PERF        V889 ALIGN XORZ LEM AXIS ALONG LOS (R63)
 0061   REF   1                 43,2064  0 2766 1            TC       V90PERF        V890 OUT OF PLANE RENDEZVOUS DISPLAY
 0062   REF   1                 43,2065  0 3077 1            TC       GOSHOSUM       V891 DISPLAY BANK SUM.
 0063   REF   1                 43,2066  0 3057 0            TC       SYSTEST        V892 OPERATE IMU PERFORMANCE TEST.
 0064   REF   1                 43,2067  0 3072 1            TC       WMATRXNG       V893 CLEAR RENDWFLG
 0065   REF   8  LAST  276      43,2070  0 2116 0            TC       ALM/END        V894 SPARE
 0066   REF   1                 43,2071  0 3054 0            TC       UPDATOFF       V895 NO STATE VECTOR UPDATE ALLOWED
 0067   REF   1                 43,2072  0 3211 0            TC       VER896         V896 INTERRUPT INTEGRATION AND GO TO P00
 0068   REF   5  LAST  275      43,2073  0 2375 1            TC       GOLOADLV       V897 PLEASE VERIFY ENGINE FAILURE
 0069   REF   9  LAST  276      43,2074  0 2116 0            TC       ALM/END        V898 SPARE
 0070   REF   6  LAST  276      43,2075  0 2375 1            TC       GOLOADLV       V899 PLEASE ENABLE ENGINE

R0071   END OF EXTENDED VERB FAN


 0072   REF   5  LAST  256      43,2076  11'043 0  TESTXACT CCS      EXTVBACT       ARE EXTENDED VERBS BUSY
 0073   REF  10  LAST  276      43,2077  0 2116 0            TC       ALM/END        YES, TURN ON OPERATOR LIGHT
 0074   REF   2  LAST  233      43,2100  3 0100 0            CA       FLAGWRD4       ARE PRIORITY DISPLAYS USING DSKY
 0075   REF   1                 43,2101  7 2125 1            MASK     OC24100
 00751  REF  63  LAST  270      43,2102  10 000 0            CCS      A
 00752  REF  11  LAST  276      43,2103  0 2116 0            TC       ALM/END        YES
 0076   REF   1                 43,2104  3 4353 0            CAF      OCT25          SET BITS 1, 3, AND 5
 0077   REF   6  LAST  276      43,2105  55'043 0  SETXTACT TS       EXTVBACT       NO. SET FLAG TO SHOW EXT VERB DISPLAY
A0078                                                                                SYSTEM BUSY

 0079   REF  21  LAST  270      43,2106  3 0002 0            CA       Q
 0080   REF  34  LAST  275      43,2107  54 155 1            TS       MPAC +1

 0081   REF   5  LAST  270      43,2110  4 4743 1            CS       TWO            BLANK EVERYTHING EXCEPT MM AND VERB
 0082   REF   1                 43,2111  0 4145 0            TC       NVSUB
 0083                           43,2112  0 2113 0            TC       +1
 00835  REF   2  LAST  232      43,2113  10 067 1            CCS      NEWJOB
 00836  REF   1                 43,2114  0 5113 1            TC       CHANG1

 0084   REF  35  LAST  276      43,2115  0 0155 0            TC       MPAC +1

 0087   REF   6  LAST  220         5474            TERMEXTV EQUALS   ENDEXT
 0088    REF    7  LAST  276        5474              ENDEXTVB EQUALS ENDEXT

 0091    REF    2  LAST  243    43,2116  0 4355 0  ALM/END  TC       FALTON          TURN ON OPERATOR ERROR LIGHT
 0092    REF    7  LAST  241    43,2117  0 4626 1  GOPIN    TC       POSTJUMP
 0093    REF    2  LAST  239    43,2120   21062 0           CADR     PINBRNCH

 0094    REF    6  LAST  242    43,2121  3 1010 1  CHKPOOH  CA       MODREG          CHECK FOR POO OR POO-.
 0095                           43,2122  0 0006 1           EXTEND
 0096    REF    1               43,2123  1 6763 1           BZF      TCQ
 0097    REF   12  LAST  276    43,2124  0 2116 0           TC       ALM/END

 00971                          43,2125   24100 0  OC24100  OCT      24100
```

```
P0098               VBZERO         VERB 40              DESCRIPTION
R0099
R0100                     1. REQUIRE NOUN 20 (ICDU ANGLES) OR NOUN 72 (RCDU ANGLES).
R0101                    2. FOR N20, CHECK IMUCADR IN AN EFFORT TO AVOID A 1210 RESTART.
R0102                       FOR N72, CHECK IF EITHER RADAR IS IN USE.
R0103                     3. EXECUTE THE CDU ZERO.
R0104                     4. STALL UNTILL THE ZERO IS DONE.
R0105                     5. DON'T DIFFERENIATE BETWEEN A BAD OR GOOD RETURN.
R0106                     6. EXIT, RE-ESTABLISHING THE INTERRUPTED DISPLAY (IF ANY).

 0110    REF    1                43,2126  0 2202 0  VBZERO    TC      OP/INERT
 0111    REF    1                43,2127  0 2131 0            TC      IMUZEROK          RETURN HERE IF NOUN = ICDU(20)
 0112    REF    1                43,2130  0 2140 0            TC      RRZEROK           RETURN HERE IF NOUN = RCDU(72)
 0113    REF    1                43,2131  0 2411 1  IMUZEROK  TC      CKMODCAD
 01131   REF   18  LAST   272    43,2132  0 4607 1            TC      BANKCALL          KEYBOARD REQ FOR ISS CDUZERO
 0114    REF    2  LAST   220    43,2133   16701 0            CADR    IMUZERO

 0115    REF   19  LAST   278    43,2134  0 4607 1            TC      BANKCALL          STALL
 0116    REF    2  LAST   220    43,2135   17735 0            CADR    IMUSTALL
 0117                            43,2136  0 2137 0            TC      +1

 0118    REF    1                43,2137  0 2117 1            TC      GOPIN             IMUZERO

 0120    REF    1                43,2140  0 2653 0  RRZEROK   TC      RDRUSECK
 01202   REF   20  LAST   278    43,2141  0 4607 1            TC      BANKCALL
 0121    REF    1                43,2142   52334 1            CADR    RRZERO

 0122    REF   21  LAST   278    43,2143  0 4607 1  RWAITK    TC      BANKCALL
 0123    REF    1                43,2144   17733 0            CADR    RADSTALL
 0124                            43,2145  1 2146 1            TCF     +1
 0125    REF    2  LAST   278    43,2146  0 2117 1            TC      GOPIN             RRZERO

R0126               LRPOS2K            VERB 59              DESCRIPTION
R0127                     COMMAND LANDING RADAR TO POSITION 2
R0129                    1. EXIT WITH OP ERROR IF SOMEONE IS USING EITHER RADAR.
R0130                     2. ALARM WITH CODE 523 IF POS 2 IS NOT INDICATED WITHIN
R0131                        THE PRESCRIBED TIME.
R01311                    3. RE-ESTABLISH THE DISPLAYS.

 0132    REF    4  LAST   270    43,2147  3 0103 0  LRPOS2K   CA      FLAGWRD7
 01322   REF    3  LAST   270    43,2150  7 4740 1            MASK    AVEGFBIT
 01324                           43,2151  0 0006 1            EXTEND
 01326   REF    1                43,2152  1 2161 1            BZF     LRPOS2K1          AVERAGE G NOT ON
 0133    REF    5  LAST   240    43,2153  4 0107 0            CS      FLGWRD11
 01332   REF    3  LAST   240    43,2154  7 4726 1            MASK    LRBYBIT
 01334                           43,2155  0 0006 1            EXTEND
 0134    REF   13  LAST   277    43,2156  1 2116 1            BZF     ALM/END           IF AVE G ON AND NOT P12- OPERATOR ERROR
 01341   REF    8  LAST   277    43,2157  0 4626 1            TC      POSTJUMP
 01343   REF    1                43,2160   53577 1            CADR    V59GP63
 01344   REF    2  LAST   278    43,2161  0 2653 0  LRPOS2K1  TC      RDRUSECK
 01346  REF  22  LAST  278   43,2162  0 4607 1           TC      BANKCALL
 01347  REF   1              43,2163   53566 1           CADR    LRP2COMM        COMMAND LR TO POS2
R0135   V61      VERB 61, DISPLAY DAP ATTITUDE ERRORS ON FDAI ATTITUDE ERROR NEEDLES.

 0137   REF  13  LAST  243   43,2164  0 5520 0  DAPATTER TC      DOWNFLAG
 0138   REF   1              43,2165   00013 0           ADRES   NEEDLFLG
 0139   REF   2  LAST  275   43,2166  1 2171 0           TCF     TOTATTER +2

R0140   V62      VERB 62, DISPLAY TOTAL ATTITUDE ERRORS ON FDAI ATTITUDE ERROR NEEDLES.

 0142   REF   1              43,2167  0 5506 1  TOTATTER TC      UPFLAG
 0143   REF   2  LAST  279   43,2170   00013 0           ADRES   NEEDLFLG
 01431  REF  14  LAST  279   43,2171  0 5520 0      +2   TC      DOWNFLAG
 01432  REF   1              43,2172   00000 1           ADRES   NEED2FLG
 0144   REF   3  LAST  278   43,2173  0 2117 1           TC      GOPIN

R01441  V60      VERB 60, DISPLAY DAP ESTIMATED RATES ON FDAI ATTITUDE ERROR NEEDLES.

 01443  REF   2  LAST  279   43,2174  0 5506 1  RATEDISP TC      UPFLAG
 01444  REF   2  LAST  279   43,2175   00000 1           ADRES   NEED2FLG
 01445  REF   4  LAST  279   43,2176  0 2117 1           TC      GOPIN

R0145
```

```
P0146           VBCOARK      VERB 41              DESCRIPTION
R0147               COARSE ALIGN IMU OR RADAR
R0148              1. REQUIRE NOUN 20 OR NOUN 72 OR TURN ON OPERATOR ERROR.
R0149               2. REQUIRE EXT VERB DISPLAY SYS AVAILABLE OR TURN ON OPERATOR ERROR LIGHT AND GO TO PINBRNCH.
R0151               CASE 1      NOUN 20      (ICDU ANGLES)
R0152               3. SET EXT VERB DISPLAY ACTIVE FLAG.
R0153               4. DISPLAY FLASHING V25,N22 (LOAD NEW ICDU ANGLES).
R0154                  RESPONSES
R0155                    A. TERMINATE
R0156                       1. RELEASE EXT VERB DISPLAY SYSTEM
R0157                    B. PROCEED
R0158                      1. COARSE ALIGN TO THE EXISTING THETAD'S (ICORK2).
R0168                    C. ENTER
R0169                      1. COARSE ALIGN TO THE LOADED THETAD'S (ICORK2).
R0170               ICORK2
R0171                  1. RE-DISPLAY VERB 41.
R0172                  2. EXECUTE IMUCOARS (IMU COARSE ALIGN).
R0173                  3. EXECUTE IMUSTALL (ALLOW TIME FOR DATA TRANSFER).
R0174                  4. RELEASE EXT VERB DISPLAY SYSTEM.
R0175               CASE 2      NOUN 72      (RCDU ANGLES)
R01755                EXIT WITH OP ERROR IF SOMEONE IS USING EITHER RADAR.
R0176               5. DISPLAY FLASHING V24,N73 (LOAD NEW RR TRUNION ANGLE AND NEW SHAFT ANGLE).
R0178                  RESPONSES
R0179                  A. TERMINATE
R0180                     1. RELEASE EXT VERB DISPLAY SYS.
R0181                  B. PROCEED OR ENTER
R0182                     1. EXECUTE AURLOKON (ASK OPERATOR FOR LOCK-ON REQUIREMENTS).
R0184                     2. RE-DISPLAY VERB 41.
R0185                     3. SCHEDULE RRDESK2 WITH PRIORITY 20.
R0186                     4. RELEASE EXT VERB DISPLAY SYS.

R0187                  AURLOKON

R0188                1. FLASH V04 N12 R1 = 00006 R2 = 00002
R0189                     RESPONSES
R0190                     A. TERMINATE
R0194                     B. PROCEED
R0195                        1. RESET LOCK-ON SWITCH
R01951                       2. SET CONTINUOUS DESIGNATE FLAG
R01952                       3. DISABLE R25
R0196                   C. V22 E 1 E, R1 = 00001, PROCEED
R0197                        1. SET LOCK-ON SWITCH
 0198    REF   2  LAST  276   43,2177  0 2202 0  VBCOARK   TC      OP/INERT
 0199    REF   1              43,2200  0 2213 0            TC      IMUCOARK          RETURN HERE IF NOUN = ICDU(20)
 0200    REF   1              43,2201  0 2235 1            TC      RRDESNBK          RETURN HERE IF NOUN = RCDU(72)
R0201           RETURNS TO L+1 IF IMU OR L+2 IF RR.

 0202    REF   2  LAST  242   43,2202  4 6007 1  OP/INERT  CS      OCT24
 0203    REF   2  LAST  233   43,2203  6 1001 1            AD      NOUNREG
 0204                         43,2204  0 0006 1            EXTEND
```

```
0205   REF   2  LAST  277   43,2205  1 6763 1            BZF     TCQ            IF = 20.

0207   REF   1              43,2206  6 2212 1            AD      RRIMUDIF       -52
0208                        43,2207  0 0006 1            EXTEND
0209   REF   2  LAST  167   43,2210  1 6760 1            BZF     Q+1

0210   REF  14  LAST  278   43,2211  0 2116 0            TC      ALM/END        ILLEGAL.

0211                        43,2212   77713 1  RRIMUDIF  DEC     -52            THE IMU
0213   REF   2  LAST  278   43,2213  0 2411 1  IMUCOARK  TC      CKMODCAD
0214   REF   1              43,2214  0 2076 1            TC      TESTXACT       COARSE ALIGN FROM KEYBOARD.
0215   REF   1              43,2215  3 2233 1            CAF     VNLODCDU       CALL FOR THETAD LOAD
0216   REF  23  LAST  279   43,2216  0 4607 1            TC      BANKCALL
0217   REF   1              43,2217   20323 1            CADR    GOXDSPF
0218   REF   1              43,2220  0 5474 0            TC      TERMEXTV
0219                        43,2221  1 2222 0            TCF     +1

0220   REF   1              43,2222  3 2234 0  ICORK2    CAF     IMUCOARV       RE-DISPLAY COARSE ALIGN VERB.
0221   REF  24  LAST  281   43,2223  0 4607 1            TC      BANKCALL
0222   REF   2  LAST  219   43,2224   20632 1            CADR    EXDSPRET

0223   REF  25  LAST  281   43,2225  0 4607 1            TC      BANKCALL       CALL MODE SWITCHING PROG
0224   REF   1              43,2226   16765 1            CADR    IMUCOARS

0225   REF  26  LAST  281   43,2227  0 4607 1            TC      BANKCALL       STALL
0226   REF   3  LAST  278   43,2230   17735 0            CADR    IMUSTALL
0227   REF   1              43,2231  0 5474 0            TC      ENDEXTVB
0228   REF   2  LAST  281   43,2232  0 5474 0            TC      ENDEXTVB

0229                        43,2233   06226 1  VNLODCDU  VN      2522
0230                        43,2234   12200 0  IMUCOARV  VN      4100
```

```
L       EXTENDED VERBS                                                                     USER'S PAGE NO.   8     E5 S4

P0231               DESIGNATE TO DESIRED GIMBAL ANGLES.

 0232   REF   3  LAST  278   43,2235  0 2653 0  RRDESNBK TC      RDRUSECK
 0234   REF   2  LAST  281   43,2236  0 2076 1           TC      TESTXACT
 0235   REF  20  LAST  231   43,2237  3 0110 1  RRWAIT   CA      RADMODES          IS A REMODE OR REPOSITION IN PROGRESS
 02351  REF   1              43,2240  7 7731 1           MASK    BIT14&11
 02352  REF   1                 4727            REFTAG9  =       REMODBIT
 02353  REF   2  LAST  198      4732            REFTAG10 =       REPOSBIT
 02354                       43,2241  0 0006 1           EXTEND
 02355  REF   1              43,2242  1 2246 1           BZF     OKTOGO            NO - CONTINUE

 02356  REF  27  LAST  281   43,2243  0 4607 1           TC      BANKCALL          YES - WAIT UNTIL FINISHED TO PREVENT
 02357  REF   1              43,2244   01735 1           CADR    2SECDELY          CONFLICTS IN RR DESIGNATE
 02358  REF   1              43,2245  1 2237 1           TCF     RRWAIT

 02359  REF   3  LAST  242   43,2246  0 6027 1  OKTOGO   TC      CLRADMOD
 0243   REF   1              43,2247  3 2266 1           CAF     VNLDRCDU          ASK FOR GIMBAL ANGLES.
 0244   REF  28  LAST  282   43,2250  0 4607 1           TC      BANKCALL
 0245   REF   2  LAST  281   43,2251   20323 1           CADR    GOXDSPF
 0246   REF   2  LAST  281   43,2252  0 5474 0           TC      TERMEXTV
 0247                        43,2253  1 2247 0           TCF     -4                V33

 0248   REF  29  LAST  282   43,2254  0 4607 1           TC      BANKCALL          ASK OP FOR LOCK ON REQUIREMENTS.
 0249   REF   1              43,2255   46000 0           CADR    AURLOKON

 0250   REF   1              43,2256  3 2234 0           CAF     OPTCOARV          RE-DISPLAY OUR OWN VERB
 0251   REF  30  LAST  282   43,2257  0 4607 1           TC      BANKCALL
 0252   REF   3  LAST  281   43,2260   20632 1           CADR    EXDSPRET

 0253   REF   1              43,2261  3 4727 1           CAF     PRIO20
 0254   REF   3  LAST  255   43,2262  0 5076 0           TC      FINDVAC
 0255   REF   7  LAST  251   E7,1456                     EBANK=  LOSCOUNT
 0256   REF   1              43,2263   02267 0           2CADR   RRDESK2
 0256   REF   1              43,2264   66107 1

 0257   REF   3  LAST  282   43,2265  1 5474 1           TCF     TERMEXTV          FREES DISPLAY.

 0258                        43,2266   06111 0  VNLDRCDU VN      2473
 0259   REF   2  LAST  281   43,2234            OPTCOARV EQUALS  IMUCOARV          DIFFERENT NOUNS.

 0260   REF  31  LAST  282   43,2267  0 4607 1  RRDESK2  TC      BANKCALL
 0261   REF   1              43,2270   52466 1           CADR    RRDESNB

 0262                        43,2271  0 2272 1           TC      +1                DUMMY NEEDED SINCE DESRETRN DOES INCR
 02621  REF   9  LAST  232   43,2272  3 0167 1           CA      PRIORITY
 02622  REF   6  LAST  271   43,2273  7 4775 1           MASK    LOW9
 02623  REF  64  LAST  276   43,2274  10 000 0           CCS     A
 02624  REF  65  LAST  282   43,2275  50 000 1           INDEX   A
 02625  REF  66  LAST  282   43,2276  54 000 0           TS      A                 RELEASE THIS JOBS VAC AREA.
 02626                       43,2277  4 0000 0           COM                       INSURE ENDOFJOB DOES A NOVAC END (BZMF).
```

```
L        FXTENDFD VFRBS                                                                                    USER'S PAGF NO.   9      E5 S4

 02627  REF  10  LAST  282   43,2300  26 167 0            AOS      PRIORITY
 0263   REF  32  LAST  282   43,2301  0 4607 1            TC       BANKCALL          WAIT FOR COMPLETION OF OESIGNATE
 0264   RFF   2  LAST  278   43,2302   17733 0            CADR     RAOSTALL
 0265                        43,2303  0 2305 0            TC       +2                BADEND-NO LOCKON OR OUT OF LIMITS
 0266   REF   7  LAST  272   43,2304  0 5146 1            TC       ENOOFJOB          GOODEND-LOCKON ACHIEVED
 0267   REF  15  LAST  274   43,2305  0 5571 1            TC       ALARM
 0268                        43,2306   00503 1            OCT      503               TURN ON ALARM LIGHT -503 DFSIGNATF FAIL
 0269   REF   8  LAST  283   43,2307  0 5146 1            TC       ENOOFJOB


 0270   REF  21  LAST  282   43,2310  10 110 0  RRDESEND  CCS      RADMOOES          TFRMINATE CONTINUOUS DFSIGNATF ONLY
 0271   REF   5  LAST  279   43,2311  1 2117 0            TCF      GOPIN
 0272   REF   6  LAST  283   43,2312  1 2117 0            TCF      GOPIN
 0273                        43,2313  1 2314 1            TCF      +1
 02731  REF  22  LAST  283   43,2314  3 C110 1  REMODCHK  CA       RADMODFS          CHECK FOR REMODE OR RFPOSITION
 02732  KFF   2  LAST  282   43,2315  7 7731 1            MASK     BIT14&11
 027325 REF   2  LAST  282       4727           REFTAG1   =        REMODBIT
 027326 REF   3  LAST  282       4732           REFTAG2   =        RFPOSBIT
 02733                       43,2316  0 C006 1            EXTENO
 02734  REF   1              43,2317  1 2324 1            BZF      NOREMODE          NO

 02735  RFF   1              43,2320  3 '4770 0           CAF      1SEC              YFS- WAIT 1 SECONO AND CHFCK AGAIN
 02736  REF  33  LAST  283   43,2321  0 4607 1            TC       BANKCALL
 02737  KEF   3  LAST  220   43,2322   01736 1            CADR     DELAYJOB
 02738  REF   1              43,2323  0 2314 0            TC       REMOOCHK
 02771  REF   4  LAST  282   43,2324  0 6027 1  NCREMODE  TC       CLRADMOD
 02773  REF   2  LAST  283   43,2325  3 4770 0            CAF      1SFC
 02774  REF  34  LAST  283   43,2326  0 4607 1            TC       BANKCALL
 02775  RFF   4  LAST  283   43,2327   01736 1            CAOR     OELAYJOB
 0278   REF  15  LAST  279   43,2330  0 5520 0            TC       DOWNFLAG          ENABLE R25 GIMBAL MONITOR
 0279   REF   1              43,2331   00126 1            ADRES    NORRMON
 02795  REF   7  LAST  283   43,2332  1 2117 0            TCF      GOPIN

 0280   REF   1                  7731           B1T14&11  =        PRIO22
A02812


 02814  REF   1              23,2000                      SFTLOC   EXTVB1
 02816                       23,2000                      BANK
 02818  REF   1                                           COUNT*   $$/EXTVB

 0282   REF   1              23,2000  0 4636 0  AURLOKON  TC       MAKECAOR
 0283   REF   2  LAST  106   23,2001  55'112 0            TS       DESRET
 0284   REF   6  LAST  276   23,2002  3 4743 0            CAF      TWO
 0285   REF   1              23,2003  55'051 0            TS       UPTIONX +1
 0286   REF   4  LAST  272   23,2004  3 6263 0            CAF      SIX               OPTION CODE FOR V04N12
 02862  RFF   2  LAST  283   23,2005  55'050 1            TS       OPTIONX

 02864  RFF   1              23,2006  3 2037 1     -5     CAF      V04N1272
 02866  REF  35  LAST  283   23,2007  0 4607 1            TC       BANKCALL                R2    00001  LOCK-ON
```

```
L        EXTENDED VERBS                                                                             USER'S PAGE NO.  10      F5 S4

 02868  REF   3  LAST  272    23,2010   20345 1               CADR   GOMARKER
 02869  REF   8  LAST  277    23,2011  1 5474 1               TCF    ENDEXT               V34
 0287                         23,2012  1 2017 1               TCF    +5                   V33
 0288                         23,2013  1 2005 1               TCF    -5                   V32
 0289   REF  15  LAST  269    23,2014  3 4742 1               CAF    BIT3
 0290   REF   4  LAST  272    23,2015  0 5466 0               TC     BLANKET
 0291   REF   9  LAST  283    23,2016  0 5146 1               TC     ENDOFJOB

 0292   REF   3  LAST  283    23,2017  3 1051 1      +5       CA     OPTIONX +1
 0293   REF  22  LAST  255    23,2020  7 4743 1               MASK   BIT2
 0294   REF  67  LAST  282    23,2021  10 000 0               CCS    A
 0295   REF   1               23,2022  1 2026 0               TCF    NOLOKON
 0296   REF   3  LAST  279    23,2023  0 5506 1               TC     UPFLAG
 0297   REF   1               23,2024   00012 1               ADRES  LOKONSW
 0298   REF   1               23,2025  1 2034 0               TCF    AURLKON1

 0299   REF  16  LAST  283    23,2026  0 5520 0  NOLOKON      TC     DOWNFLAG             IF NO LOCK-ON, SET BIT15 OF RADMODES TO
 02991  REF   2  LAST  284    23,2027   00012 1               ADRES  LOKONSW              INDICATE THAT CONTINUOUS DESIGNATION IS
 02992  REF   4  LAST  284    23,2030  0 5506 1               TC     UPFLAG               WANTED (TO BE TERMINATED BY V44.)
 02993  REF   1               23,2031   00264 1               ADRES  CDESFLAG
 0302   REF   5  LAST  284    23,2032  0 5506 1               TC     UPFLAG               SET NO RR ANGLE MONITOR FLAG.
 0303   REF   2  LAST  283    23,2033   00126 1               ADRES  NORRMON              (DISABLE R25 RR GIMBAL MONITOR IN T4RUPT
 0304                         23,2034  0 0003 1  AURLKON1 RELINT
 0305   REF   3  LAST  283    23,2035  3 1112 1               CA     DESRET
 0306   REF   1               23,2036  1 4631 0               TCF    BANKJUMP


 03064                        23,2037   01014 0  V04N1272 VN     412
 03065                        23,2040   77757 1  -LOKONFG OCT    -20

 03066                        43,2333                         BANK   43
 03067  REF   2  LAST  275    43,2000                         SETLOC EXTVERBS
 03068                        43,2333                         BANK
 03069  REF   2 LAST  275 TO  283:     219    219*            COUNT* $$/EXTVB

 0307   REF   6  LAST  284    43,2333  0 5506 1  LRON         TC     UPFLAG               PERMIT INCORPORATION OF LR DATA       V57
 0308   REF   1               43,2334   00254 1               ADRES  LRINH
 0309   REF   8  LAST  283    43,2335  0 2117 1               TC     GOPIN

 0342   REF  17  LAST  284    43,2336  0 5520 0  LROFF        TC     DOWNFLAG             INHIBIT INCORPORATION OF LR DATA      V58
 0343   REF   2  LAST  284    43,2337   00254 1               ADRES  LRINH
 034305 REF   9  LAST  284    43,2340  0 2117 1               TC     GOPIN

 03431  REF   7  LAST  284    43,2341  0 5506 1  TEROFF       TC     UPFLAG               BYPASS TERRAIN MODEL
 03432  REF   1               43,2342   00023 0               ADRES  NOTERFLG
 0344   REF  10  LAST  284    43,2343  1 2117 0               TCF    GOPIN


 0345   REF   5  LAST  275    F5,1737                         EBANK= OGC
```

```
R0346               IMUFINEK      VERB 42             DESCRIPTION
R0347                    FINE ALIGN IMU
R0348                    1. REQUIRE EXT VERB DISPLAY AVAILABLE AND SET BUSY FLAG OR TURN ON OPER ERROR AND GO TO PINBRNCH.
R0350                    2. DISPLAY FLASHING V25,N93....LOAD DELTA GYRO ANGLES....
R0351                       RESPONSES
R0352                       A. TERMINATE
R0353                          1. RELEASE EXT VERB DISPLAY SYSTEM.
R0354                       B. PROCEED OR ENTER
R0355                          1. RE-DISPLAY VERB 42
R0356                          2. EXECUTE IMUFINE (IMU FIVE ALIGN MODE SWITCHING).
R0357                          3. EXECUTE IMUSTALL (ALLOW FOR DATA TRANSFER)
R0358                             A. FAILED
R0359                                1. RELEASE EXT VERB DISPLAY SYSTEM.
R0360                             B. GOOD
R0361                                1. EXECUTE IMUPULSE (TORQUE IRIGS).
R0362                                2. EXECUTE IMUSTALL AND RELEASE EXT VERB DISPLAY SYSTEM.

 0364   REF   3  LAST  281   43,2344  0 2411 1  IMUFINEK TC      CKMODCAD
 0365   REF   3  LAST  282   43,2345  0 2076 1           TC      TESTXACT        FINE ALIGN WITH GYRO TORQUING.
 0366   REF   1              43,2346  3 2373 1           CAF     VNLODGYR        CALL FOR LOAD OF GYRO COMMANDS
 0367   REF  36  LAST  283   43,2347  0 4607 1           TC      BANKCALL
 0368   REF   3  LAST  282   43,2350   20323 1           CADR    GOXDSPF
 0369   REF   4  LAST  282   43,2351  0 5474 0           TC      TERMEXTV
 0370                        43,2352  0 2353 0           TC      +1              PROCEED WITHOUT A LOAD

 0371   REF   1              43,2353  3 2374 0           CAF     IMUFINEV        RE-DISPLAY OUR OWN VERB
 0372   REF  37  LAST  285   43,2354  0 4607 1           TC      BANKCALL
 0373   REF   4  LAST  282   43,2355   20632 1           CADR    EXDSPRET

 0374   REF  38  LAST  285   43,2356  0 4607 1           TC      BANKCALL        CALL MODE SWITCH PROG
 0375   REF   1              43,2357   17175 1           CADR    IMUFINE

 0376   REF  39  LAST  285   43,2360  0 4607 1           TC      BANKCALL        HIBERNATION
 0377   REF   4  LAST  281   43,2361   17735 0           CADR    IMUSTALL
 0378   REF   3  LAST  281   43,2362  0 5474 0           TC      ENDEXTVB

 0379   REF   1              43,2363  3 2372 0  FINEK2   CAF     LGYROBIN        PINBALL LEFT COMMANDS IN OGC REGIST5RS
 0380   REF  40  LAST  285   43,2364  0 4607 1           TC      BANKCALL
 0381   REF   1              43,2365   17310 0           CADR    IMUPULSE

 0382   REF  41  LAST  285   43,2366  0 4607 1           TC      BANKCALL        WAIT FOR PULSES TO GET OUT.
 0383   REF   5  LAST  285   43,2367   17735 0           CADR    IMUSTALL
 0384   REF   4  LAST  285   43,2370  0 5474 0           TC      ENDEXTVB
 0385   REF   5  LAST  285   43,2371  0 5474 0           TC      ENDEXTVB

 0386   REF   6  LAST  284   43,2372   02737 0  LGYROBIN ECADR   OGC
 0387                        43,2373   06335 1  VNLODGYR VN      2593
 0388                        43,2374   12400 0  IMUFINEV VN      4200
R0389               GOLOADLV      VERB 50             DESCRIPTION
R0390                             AND OTHER PLEASE
```

```
R0391                            DO SOMETHING VERBS
R0392                   PLEASE PERFORM, MARK, CALIBRATE, ETC.
R0393                   1. PRESSING ENTER ON DSKY INDICATES REQUESTED ACTION HAS BEEN  PERFORMED, AND THE PROGRAM DOES THE
R0395                      SAME RECALL AS A COMPLETED LOAD.
R0396                   2. THE EXECUTION OF A VERB 33 (PROCEED WITHOUT DATA) INDICATES THE REQUESTED ACTION IS NOT DESIRED.

 0398   REF   1                40,2000                      SBANK= PINSUPER        FOR LOADLV1 AND SHOWSUM CADR'S.

 0399   REF   1                43,2375  0 4424 1  GCLOADLV TC     FLASHOFF

 0400   REF   1                43,2376  3 4172 1           CAF    PINSUPBT
 0401                          43,2377  0 0006 1           EXTEND
 0402   REF   3  LAST  240     43,2400  01 007 1           WRITE  SUPERBNK
 0403   REF   9  LAST  278     43,2401  0 4626 1           TC     POSTJUMP
 0404   REF   1                43,2402   62021 0           CADR   LOADLV1
R0405   VERB 47 - AGS INITIALIZATION - R47.

R0406           SEE LOG SECTION AGS INITIALIZATION FOR OTHER PERTINENT REMARKS.

 0407   REF   4  LAST  285     43,2403  0 2076 1  V47TXACT TC     TESTXACT         NO OTHER EXTVERB.
 0408   REF   1                43,2404  3 4731 0           CAF    PRIO4
 0409   REF   4  LAST  282     43,2405  0 5076 0           TC     FINDVAC
 0410   REF   8  LAST  220     E6,1771                     EBANK= AGSK
 0411   REF   1                43,2406   02005 0           2CADR  AGSINIT
 0411   REF   1                43,2407   64066 0
 0412   REF  10  LAST  284     43,2410  0 5146 1           TC     ENDOFJOB

 0413   REF   4  LAST  110     43,2411  3 1301 1  CKMODCAD CA     MODECADR
 0414                          43,2412  0 0006 1           EXTEND
 0415   REF   3  LAST  281     43,2413  1 6763 1           BZF    TCQ
 0416   REF  15  LAST  281     43,2414  0 2116 0           TC     ALM/END          SOMEBODY IS USING MODECADR SO EXIT
```

```
P0417              ALINTIME      VERB 55              DESCRIPTION
R0418                       REQUIRE P00 OR P00-.
R0419                    1. SET EXT VERB DISPLAY BUSY FLAG.
R0420                    2. DISPLAY FLASHING V25,N24 (LOAD DELTA TIME FOR AGC CLOCK.
R0421                    3. REQUIRE EXECUTION OF VERB 23.
R0422                    4. ADD DELTA TIME, RECEIVED FROM INPUT REGISTER, TO THE COMPUTER TIME.
R0424                    5. RELEASE EXT VERB DISPLAY SYSTEM

 0425  REF   5  LAST  286   43,2415  0 2076 1  ALINTIME TC      TESTXACT
 0426  REF  10  LAST  286   43,2416  0 4626 1           TC      POSTJUMP         NO ROOM IN 43
 0427  REF   1              43,2417   64002 1           CADR    R33

 0428                       42,2002                     BANK    42
 0429  REF   2  LAST   48   42,2000                     SETLOC  S8AND
 0430                       42,2002                     BANK
 0431  REF   1                                          COUNT*  $$/R33

 0432  REF   1              42,2002  3 5012 1  R33      CAF     PRIO7
 0433  REF   1              42,2003  0 5137 1           TC      PRIOCHNG
 0434  REF   1              42,2004  3 2034 1           CAF     VNLODDT
 0435  REF  42  LAST  285   42,2005  0 4607 1           TC      BANKCALL
 0436  REF   4  LAST  285   42,2006   20323 1           CADR    GOXDSPF
 0437  REF   9  LAST  284   42,2007  0 5474 0           TC      ENDEXT           TERMINATE
 0438  REF  10  LAST  287   42,2010  0 5474 0           TC      ENDEXT           PROCEED
 0439  REF   1              42,2011  4 2033 1           CS      DEC23            DATA IN OR RESEQUENCE(UNLIKELY)
 0440  REF  36  LAST  276   42,2012  6 0154 1           AD      MPAC             RECALL LEFT VERB IN MPAC
 0441                       42,2013  0 0006 1           EXTEND
 0442  REF   1              42,2014  1 2016 0           BZF     UPDATIME         GO AHEAD WITH UPDATE ONLY IF RECALL
 0443  REF  11  LAST  287   42,2015  0 5474 0           TC      ENDEXT             WITH V23 (DATA IN).

 0444                       42,2016  0 0004 0  UPDATIME INHINT                   DELTA TIME IS IN DSPTEM1, +1.
 0445  REF  24  LAST  270   42,2017  3 4746 0           CAF     ZERO
 0446  REF  37  LAST  287   42,2020  54 156 1           TS      MPAC     +2      NEEDED FOR TP AGREE
 0447  REF  21  LAST  271   42,2021  54 001 1           TS      L                ZERO T1 + 2 WHILE ALIGNING.
 0448  REF   9  LAST  269   42,2022  52 025 1           DXCH    TIME2
 0449  REF  38  LAST  287   42,2023  52 155 1           DXCH    MPAC
 0450  REF   2  LAST  105   42,2024  53 051 0           DXCH    DSPTEM2 +1       INCREMENT
 0451  REF  39  LAST  287   42,2025  20 155 1           DAS     MPAC

 0452  REF   1              42,2026  0 7300 0           TC      TPAGREE          FORCE SIGN AGREEMENT.
 0453  REF  40  LAST  287   42,2027  52 155 1           DXCH    MPAC             NEW CLOCK.
 0454  REF  10  LAST  287   42,2030  20 025 1           DAS     TIME2
 0455                       42,2031  0 0003 1           RELINT
 0456  REF  12  LAST  287   42,2032  0 5474 0  UPDTMEND TC      ENDEXT

 0457                       42,2033   00027 1  DEC23    DEC     23               V 23

 0458                       42,2034   06230 0  VNLODDT  VN      2524             V25N24 FOR LOAD DELTA TIME
```

```
P0459              SET UP FOR RADAR SAMPLING.

 0460                                42,2035                                 BANK    42
 0461   REF    3  LAST   284         43,2000                                 SETLOC  EXTVERBS
 0462                                43,2420                                 BANK

 0463   REF    1                     E4,1571                                 EBANK=  RSTACK

 0464   REF    1                                                             COUNT*  $$/R0477

 0465   REF    4  LAST   282         43,2420   0 2653 0   R77                TC      RDRUSECK         TRY TO AVOID THE 1210.
 0466   REF    4  LAST   241         43,2421   3 0077 1                      CA      FLAGWRD3         IS R04 RUNNING?
 0467   REF    1                     43,2422   7 4734 1                      MASK    R04FLBIT
 0468   REF   68  LAST   284         43,2423  10 000 0                       CCS     A
 0469   REF   16  LAST   286         43,2424   0 2116 0                      TC      ALM/END          YES.
 0470   REF    8  LAST   284         43,2425   0 5506 1                      TC      UPFLAG
 0471   REF    1                     43,2426    00117 0                      ADRES   R77FLAG
 0472   REF    1                     43,2427   1 2434 1                      TCF     R04Z

 0473   REF    5  LAST   288         43,2430   0 2653 0   R04                TC      RDRUSECK         TRY TO AVOID THE 1210.
 0474   REF    6  LAST   287         43,2431   0 2076 1                      TC      TESTXACT
 0475   REF    9  LAST   288         43,2432   0 5506 1                      TC      UPFLAG
 0476   REF    2  LAST   240         43,2433    00063 1                      ADRES   R04FLAG          SET R04FLAG FOR ALARMS

 0477   REF    1                     43,2434   3 4732 0   R04Z               CAF     EBANK4
 0478   REF    7  LAST   259         43,2435  54 003 0                       TS      EBANK
 0479   REF    1                     43,2436   3 2651 1                      CAF     1SEC+1           SAMPLE ONCE PER SECOND
 0480   REF    2  LAST   124         43,2437  55'770 1                       TS      RSAMPDT
 0481   REF   25  LAST   287         43,2440   3 4746 0                      CAF     ZERO
 0482   REF    1                     43,2441  55'767 1                       TS      RTSTLOC
 0483   REF    1                     43,2442  55'566 1                       TS      RFAILCNT         ZERO BAD SAMPLE COUNTER

 0484                                43,2443   0 0004 0                      INHINT
 0485   REF    1                     43,2444   4 2652 0                      CS      LRPOSCAL         INITIALIZE
 0486   REF   23  LAST   283         43,2445   7 0110 0                      MASK    RADMODES             BIT9   LR RANGE  LOW SCALE =0
 0487   REF   24  LAST   288         43,2446  54 110 0                       TS      RADMODES             BIT6   LR POS 1 =0
 0488   REF    2  LAST   288         43,2447   3 2652 1                      CAF     LRPOSCAL             BIT3   RR RANGE  LOW SCALE =0
 0489                                43,2450   0 0006 1                      EXTEND
 0490   REF    4  LAST   230         43,2451  02 033 0                       RAND    CHAN33
 0491   REF   25  LAST   288         43,2452  26 110 0                       ADS     RADMODES
 0492                                43,2453   0 0003 1                      RELINT

 0493   REF    5  LAST   288         43,2454   4 0077 0                      CS      FLAGWRD3         CHECK R04FLAG      R04 =1    R77 =0
 0494   REF    2  LAST   288         43,2455   7 4734 1                      MASK    R04FLBIT
 0495   REF   69  LAST   288         43,2456  10 000 0                       CCS     A
 0496   REF    1                     43,2457   1 2606 1                      TCF     R04K

 0497   REF   13  LAST   270         43,2460   3 4744 1                      CAF     ONE              INDICATES RENDEZVOUS DESIRED
 0498   REF    4  LAST   284         43,2461  55'051 0                       TS      OPTIONX +1
 0499   REF   16  LAST   284         43,2462   3 4742 1   R04A               CAF     BIT3             OPTION CODE FOR V04N12
 0500   REF   5  LAST  288   43,2463  55'050 1             TS      OPTIONX
 0501   REF   1              43,2464  3 2646 1             CAF     V04N12X
 0502   REF  43  LAST  287   43,2465  0 4607 1             TC      BANKCALL              R2   00001  RENDEZVOUS RADAR
 0503   REF   4  LAST  284   43,2466   20345 1             CADR    GOMARKFR                   00002  LANDING RADAR
 0504   REF   1              43,2467  1 2614 1             TCF     R04END           V34
 0505                        43,2470  1 2475 1             TCF     +5               V33
 0506   REF   1              43,2471  1 2464 1             TCF     R04A +2          R2
 0507   REF  17  LAST  288   43,2472  3 4742 1             CAF     BIT3
 0508   REF   5  LAST  284   43,2473  0 5466 0             TC      BLANKET
 0509   REF  11  LAST  286   43,2474  0 5146 1             TC      ENDOFJOB

 0510   REF   6  LAST  289   43,2475  3 1051 1             CA      OPTIONX +1       SAVE DESIRED OPTION     RR =1      LR =2
 0511   REF   1              43,2476  55'764 1             TS      RTSTDEX

 0512   REF   5  LAST  283   43,2477  3 6263 0  RC4X       CAF     SIX              RR OR LR DESIRED
 0513   REF   2  LAST  289   43,2500  7 1764 1             MASK    RTSTDEX
 0514   REF  70  LAST  288   43,2501  10 000 0             CCS     A
 0515   REF   1              43,2502  1 2610 0             TCF     R04L             LANDING RADAR
 0516   REF   1              43,2503  55'766 0             TS      RTSTBASE         FOR RR   BASE = 0, MAX = 1

 0517   REF  23  LAST  284   43,2504  3 4743 0  RC4B       CAF     BIT2             IS RR AUTO MODE DISCRETE PRESENT
 0518                        43,2505  0 0006 1             EXTEND
 0519   REF   5  LAST  288   43,2506  02 033 0             RAND    CHAN33
 0520                        43,2507  0 0006 1             EXTEND
 0521   REF   1              43,2510  1 2521 1             BZF     R04C             YES

 0522   REF   1              43,2511  3 2650 0             CAF     201R04           REQUEST SELECTION OF RR AUTO MODE
 0523   REF   4  LAST  267   43,2512  55'044 1             TS      DSPTEM1
 0524   REF   1              43,2513  3 2647 0             CAF     V50N25X
 0525   REF  44  LAST  289   43,2514  0 4607 1             TC      BANKCALL
 0526   REF   1              43,2515   20337 1             CADR    GOMARK4
 0527   REF   2  LAST  289   43,2516  1 2614 1             TCF     R04END           V34
 0528   REF   1              43,2517  1 2504 0             TCF     R04B             V33
 0529                        43,2520  1 2511 1             TCF     -7               E

 0530   REF  28  LAST  233   43,2521  3 4727 1  R04C       CAF     BIT14            ENABLE RR AUTO TRACKER
 0531                        43,2522  0 0006 1             EXTEND
 0532   REF  18  LAST  231   43,2523  05 012 1             WOR     CHAN12

 0533   REF   7  LAST  283   43,2524  3 4743 0             CAF     TWO
 0534   REF   1              43,2525  55'765 0             TS      RTSTMAX          FOR SEQUENTIAL STORAGE

 0535   REF   8  LAST  267   43,2526  0 5205 0             TC      WAITLIST
 0536   REF   2  LAST  288   E4,1571                       EBANK=  RSTACK
 0537   REF   1              43,2527   02162 0             2CADR   RADSAMP
 0537   REF   1              43,2530   32104 0
 0538                        43,2531  0 0003 1             RELINT

 0539   REF   6  LAST  288   43,2532  4 0077 0             CS      FLAGWRD3         CHECK R04FLAG       R04 =1     R77 =0
 0540   REF   3  LAST  288   43,2533  7 4734 1             MASK    R04FLBIT
 0541   REF  71  LAST  289    43,2534  10 000 0               CCS     A
 0542   REF  11  LAST  284    43,2535  1 2117 0               TCF     GOPIN              R77

 0543   REF   6  LAST  289    43,2536  3 6263 0               CAF     SIX                RR OR LR
 0544   REF   3  LAST  289    43,2537  7 1764 1               MASK    RTSTDEX
 0545   REF  72  LAST  290    43,2540  10 000 0               CCS     A
 0546   REF   1               43,2541  1 2556 1               TCF     R04LR              LR

 0547   REF   1               43,2542  3 2642 0  R04RR        CAF     V16N72             DISPLAY RR CDU ANGLES (1/SEC)
 0548   REF  45  LAST  289    43,2543  0 4607 1               TC      BANKCALL                     R1  +  XXX.XX DEG   TRUNNION
 0549   REF   4  LAST  257    43,2544   20323 1               CADR    GOMARKF                      R2  +  XXX.XX DEG   SHAFT
 0550   REF   3  LAST  289    43,2545  1 2614 1               TCF     R04END             V34       R3     BLANK
 0551                         43,2546  1 2550 1               TCF     +2                 V33
 0552   REF   1               43,2547  1 2542 1               TCF     R04RR              V32

 0553   REF   1               43,2550  3 2643 1               CAF     V16N78             DISPLAY RR RANGE AND RANGE RATE (1/SEC)
 0554   REF  46  LAST  290    43,2551  0 4607 1               TC      BANKCALL                     R1  +- XXX.XX NM     RANGE
 0555   REF   5  LAST  290    43,2552   20323 1               CADR    GOMARKF                      R2  +- XXXX.X FPS    RANGE RATE
 0556   REF   4  LAST  290    43,2553  1 2614 1               TCF     R04END             V34       R3     BLANK
 0557   REF   1               43,2554  1 2572 1               TCF     R04Y               V33
 0558   REF   2  LAST  290    43,2555  1 2542 1               TCF     R04RR              V32

 0559   REF   1               43,2556  3 2644 0  R04LR        CAF     V16N66             DISPLAY LR RANGE AND POSITION (1/SEC)
 0560   REF  47  LAST  290    43,2557  0 4607 1               TC      BANKCALL                     R1  +- XXXXX. FT     LR RANGE
 0561   REF   6  LAST  290    43,2560   20323 1               CADR    GOMARKF                      R2  +  0000X.        POS. NO.
 0562   REF   5  LAST  290    43,2561  1 2614 1               TCF     R04END             V34       R3     BLANK
 0563                         43,2562  1 2564 0               TCF     +2                 V33
 0564   REF   2  LAST  290    43,2563  1 2556 1               TCF     R04LR              V32

 0565   REF   1               43,2564  3 2645 1               CAF     V16N67             DISPLAY LR VELX, VELY, VELZ (1/SEC)
 0566   REF  48  LAST  290    43,2565  0 4607 1               TC      BANKCALL                     R1  +- XXXXX. FPS   LR V(X)
 0567   REF   7  LAST  290    43,2566   20323 1               CADR    GOMARKF                      R2  +- XXXXX. FPS   LR V(Y)
 0568   REF   6  LAST  290    43,2567  1 2614 1               TCF     R04END             V34       R3  +- XXXXX. FPS   LR V(Z)
 0569   REF   2  LAST  290    43,2570  1 2572 1               TCF     R04Y               V33
 0570   REF   3  LAST  290    43,2571  1 2556 1               TCF     R04LR              V32

 0571   REF  26  LAST  288    43,2572  3 4746 0  R04Y         CAF     ZERO               TO TERMINATE SAMPLING
 0572   REF   3  LAST  288    43,2573  55'770 1               TS      RSAMPDT
 0573   REF  49  LAST  290    43,2574  0 4607 1               TC      BANKCALL
 0574   REF   2  LAST  282    43,2575   01735 1               CADR    2SECDELY           WAIT FOR LAST RADARUPT
 0575   REF   2  LAST  288    43,2576  3 2651 1               CAF     1SEC+1             SAMPLE ONCE PER SECOND
 0576   REF   4  LAST  290    43,2577  55'770 1               TS      RSAMPDT
 0577   REF  27  LAST  290    43,2600  3 4746 0               CAF     ZERO               FOR STORING RESULTS
 0578   REF   2  LAST  288    43,2601  55'767 1               TS      RTSTLOC
 0579   REF   2  LAST  289    43,2602  11'766 0               CCS     RTSTBASE            CHECK WHICH RADAR HAD BEEN SAMPLED
 0582   REF  14  LAST  288    43,2603  4 4744 0               CS      ONE                WAS LR
 0583   REF   8  LAST  289    43,2604  6 4743 0               AD      TWO                WAS RR
 0584   REF   1               43,2605  1 2476 1               TCF     R04X -1

 0585   REF   1               43,2606  3 4757 0  R04K         CAF     250MS+1            SAMPLE 4 LR COMPONENTS PER SECOND.
 0586   REF   5  LAST  290    43,2607  55'770 1              TS      RSAMPDT

 0587   REF   9  LAST  290    43,2610  3 4743 0  RC4L        CAF     TWD
 0588   REF   3  LAST  290    43,2611  55'766 0              TS      RTSTBASE          FOR LR   8ASE = 2, MAX = 3
 0589   REF   7  LAST  290    43,2612  3 6263 0              CAF     SIX
 0590   REF   2  LAST  289    43,2613  1 2525 0              TCF     R04C +4
 0591   REF  28  LAST  290    43,2614  3 4746 0  R04END      CAF     ZERO              ZERD RSAMPDT
 0592   REF   6  LAST  291    43,2615  55'770 1              TS      RSAMPDT           TO TERMINATE SAMPLING
 0593   REF  20  LAST  265    43,2616  3 4735 1              CAF     8IT8              WAIT 1.28 SECDNDS FDR POSSI8LE
 0594   REF  50  LAST  290    43,2617  0 4607 1              TC      8ANKCALL          PENDING RUPT.
 0595   REF   5  LAST  283    43,2620   01736 1              CADR    DELAYJDB

 0596                         43,2621  0 0004 0              INHINT
 0597   REF  29  LAST  289    43,2622  4 4727 0              CS      BIT14             DISABLE RR AUTO TRACKER
 0598                         43,2623  0 0006 1              EXTEND
 0599   REF  19  LAST  289    43,2624  03 C12 1              WAND    CHAN12

 0600   REF  18  LAST  284    43,2625  0 5520 0              TC      DDWNFLAG
 0601   REF   3  LAST  288    43,2626   00063 1              ADRES   R04FLAG           SIGNAL END DF R04.

 0602   REF  13  LAST  287    43,2627  0 5474 0              TC      ENDEXT

 0603   REF   2  LAST  288    43,2630  3 4732 0  R77END      CAF     EBANK4            TD TERMINATE SAMPLING
 0604   REF   8  LAST  288    43,2631  54 003 0              TS      EBANK
 0605   REF  29  LAST  291    43,2632  3 4746 0              CAF     ZERO
 0606   REF   7  LAST  291    43,2633  55'770 1              TS      RSAMPDT
 0607   REF  28  LAST  265    43,2634  3 4737 0              CAF     BIT6              WAIT 320 MS FDR PDSSIBLF
 0608   REF  51  LAST  291    43,2635  0 4607 1              TC      BANKCALL          PENDING RUPT.
 0609   REF   6  LAST  291    43,2636   01736 1              CADR    DELAYJ08

 0610   REF  19  LAST  291    43,2637  0 5520 0              TC      DDWNFLAG
 0611   REF   2  LAST  288    43,2640   00117 0              ADRES   R77FLAG
 0612   REF  12  LAST  290    43,2641  1 2117 0              TCF     GDPIN

 0613                         43,2642   C4110 0  V16N72      VN      1672
 0614                         43,2643   C4116 0  V16N78      VN      1678
 0615                         43,2644   04102 0  V16N66      VN      1666
 0616                         43,2645   C4103 1  V16N67      VN      1667
 0617                         43,2646   01014 0  V04N12X     VN      412
 0618                         43,2647   14431 1  V50N25X     VN      5025
 0619                         43,2650   00201 1  201R04      DCT     00201
 0620                         43,2651   00145 1  1SEC+1      DEC     101
 0621   REF   1                  4757            250MS+1     EQUALS  CALLCODE
 0622                         43,2652   00444 0  LRPDSCAL    DCT     444
 0627    REF  10  LAST  231     43,2653   3 0101 1  RDRUSECK CA       FLAGWRD5         IS R77 RUNNING?
 0628    REF   2  LAST  231     43,2654   7 4732 1           MASK     R77FLBIT
 0629    REF  73  LAST  290     43,2655   10 000 0           CCS      A
 0630    REF  17  LAST  288     43,2656   0 2116 0           TC       ALM/END          YES.
 0631    REF   5  LAST  278     43,2657   4 0103 1           CS       FLAGWRD7         IS SERVICER RUNNING AND HENCE POSSIBLY
 0632    REF   2  LAST  239     43,2660   7 4737 1           MASK     V37FLBIT         R12 USING THE LR?
 0633    REF  74  LAST  292     43,2661   10 000 0           CCS      A
 0634    REF   1                43,2662   1 2667 0           TCF      CHECKRR          NO
 0635    REF   6  LAST  278     43,2663   3 0107 1           CA       FLGWRD11         YES, IS R12 ON?
 0636    REF   4  LAST  278     43,2664   7 4726 1           MASK     LRBYBIT          BIT 15
 0637                           43,2665   0 0006 1           EXTEND
 0638    REF  18  LAST  292     43,2666   1 2116 1           BZF      ALM/END          YES
 0639    REF   9  LAST  243     43,2667   4 0075 1  CHECKRR  CS       FLAGWRD1         IS THE TRACK FLAG SET AND HENCE POSSIBLY
 0640    REF   1                43,2670   7 4740 1           MASK     TRACKBIT         P20 USING THE RR?
 0641    REF  75  LAST  292     43,2671   10 000 0           CCS      A
 0642    REF  22  LAST  276     43,2672   0 0002 0           TC       Q                NOT ALLOWED DURING P20
 0643    REF  19  LAST  292     43,2673   0 2116 0           TC       ALM/END          P22 OR P25,  (R65)
 0653    REF   3 LAST  284 TO  287:      53    272*          COUNT* $$/EXTVB

 0655    REF   7  LAST  288     43,2674   0 2076 1  VB64     TC       TESTXACT         IF DISPLAY SYS. NOT BUSY,MAKE IT BUSY.
 0656    REF   2  LAST  286     43,2675   3 4731 0           CAF      PRIO4
 0657    REF   5  LAST  286     43,2676   0 5076 0           TC       FINDVAC
 0658    REF   3  LAST  122     E4,1571                      EBANK=   ALPHASB
 0659    REF   1                43,2677    03617 1           2CADR    SBANDANT         CALC.,DISPLAY S-BAND ANTENNA ANGLES.
 0659    REF   1                43,2700    64104 0
 0660    REF  12  LAST  289     43,2701   0 5146 1           TC       ENDOFJOB
```

```
P0661                 IMUATTCK      VERB 43             DESCRIPTION
R0662                     LOAD IMU ATTITUDE ERROR METERS
R0663                        1. REQUIRE POO OR FRESH START.
R0664                        2. REQUIRE COARSE ALIGN ENABLE AND ZERO ICDU BITS OFF.
R0665                        3. REQUIRE THAT NEEDLES BE OFF.
R0666                        4. REQUEST LOAD OF N22  (VAUES TO BE DISPLAYED).
R0667                        5. ON PROCEED OR ENTER RE-DISPLAY V43 AND SEND PULSES.

 0668   REF   1                  43,2702  0 2121 1  IMUATTCK TC      CHKPOOH       VB 76 - LOAD IMU ATT. ERROR METERS

 0669   REF   3  LAST  190       43,2703  3 4754 0           CAF     BITS4&5       SEE IF COARSE ALIGN ENABLE AND ZERO IMU
 0670                            43,2704  0 0006 1           EXTEND                CDUS BITS ARE ON
 0671   REF  20  LAST  291       43,2705  02 012 0           RAND    CHAN12
 0672   REF  76  LAST  292       43,2706  10 000 0           CCS     A
 0673   REF  20  LAST  292       43,2707  1 2116 1           TCF     ALM/END       NOT ALLOWED IF IMU COARSE OR IMU ZERO ON

 0674   REF   1                  43,2710  3 4346 1           CAF     BIT13-14      BOTH BITS 13 AND 14 MUST BE 1
 0675                            43,2711  0 0006 1           EXTEND                INDICATING THE MODE SELECTED IS OFF.
 0676   REF   1                  43,2712  06 031 0           RXOR    CHAN31
 0677   REF   2  LAST  293       43,2713  7 4346 0           MASK    BIT13-14
 0678                            43,2714  0 0006 1           EXTEND
 0679                            43,2715  1 2717 0           BZF     +2            NEEDLES IS OFF.
 0680   REF  21  LAST  293       43,2716  1 2116 1           TCF     ALM/END       EXIT.  NEEDLES IS ON.

 0681   REF   8  LAST  292       43,2717  0 2076 1           TC      TESTXACT

 0682   REF   2  LAST  281       43,2720  3 2233 1           CAF     VNLODCDU
 0683   REF  52  LAST  291       43,2721  0 4607 1           TC      BANKCALL
 0684   REF   5  LAST  287       43,2722   20323 1           CADR    GOXDSPF
 0685   REF  14  LAST  291       43,2723  0 5474 0           TC      ENDEXT        V34
 0686                            43,2724  0 2725 0           TC      +1
 0687   REF   1                  43,2725  3 2740 0           CAF     V43K          REDISPLAY OUR VERB.
 0688   REF  53  LAST  293       43,2726  0 4607 1           TC      BANKCALL
 0689   REF   5  LAST  285       43,2727   20632 1           CADR    EXDSPRET
 0690   REF  29  LAST  291       43,2730  3 4737 0           CAF     BIT6
 0691                            43,2731  0 0006 1           EXTEND
 0692   REF  21  LAST  293       43,2732  05 012 1           WOR     CHAN12        ENABLE ERROR COUNTERS.
 0693   REF  10  LAST  291       43,2733  3 4743 0           CAF     TWO
 0694   REF   9  LAST  289       43,2734  0 5205 0           TC      WAITLIST      PUT OUT COMMANDS IN .32 SECONDS.
 0695   REF   8  LAST  207          0321                     EBANK=  THETAD
 0696   REF   1                  43,2735   02035 0           2CADR   ATTCK2
 0696   REF   1                  43,2736   64100 1
 0697   REF  15  LAST  293       43,2737  1 5474 1           TCF     ENDEXT

 0698                            42,2035                     BANK    42
 0699   REF   1                  42,2000                     SETLOC  PINBALL3      SOMETHING IN B42.
 0700                            42,2035                     BANK

 0701   REF   1                                              COUNT*  $$/EXTVB
 0702   REF  11  LAST  293    42,2035  3 4743 0  ATTCK2    CAF     TWO               PUT OUT COMMANDS.
 0703   REF  23  LAST  292    42,2036  54 002 1    +1      TS      Q                 CDU WILL LIMIT EXCESS DATA.
 0704   REF  77  LAST  293    42,2037  50 000 1            INDEX   A
 0705   REF   9  LAST  293    42,2040  3 0321 1            CA      THETAD
 0706                         42,2041  0 0006 1            EXTEND
 0707   REF   1               42,2042  7 2053 1            MP      ATTSCALE
 0708   REF  24  LAST  294    42,2043  50 002 0            INDEX   Q
 0709   REF   2  LAST  184    42,2044  56 050 1            XCH     CDUXCMD
 0710   REF  25  LAST  294    42,2045  10 002 1            CCS     Q
 0711   REF   2  LAST  293    42,2046  1 2036 1            TCF     ATTCK2 +1

 0712   REF   1               42,2047  3 7761 0            CAF     13,14,15
 0713                         42,2050  0 0006 1            EXTEND
 0714   REF   6  LAST  231  ` 42,2051  05 014 1            WOR     CHAN14
 0715   REF   4  LAST  250    42,2052  1 5263 1            TCF     TASKOVER          LEAVE ERROR COUNTERS ENABLED.

 0716                         42,2053   03146 1  ATTSCALE DEC     0.1

 0717                         07,2607                      BANK    7
 0718   REF   4  LAST  288    43,2000                      SETLOC  EXTVERBS
 0719                         43,2740                      BANK

 0720   REF   4 LAST  292 TO  293:    36   308*            COUNT*  $$/EXTVB

 0721                         43,2740   12600 1  V43K      VN      4300
R0722              V82PERF    VERB 82              DESCRIPTION
R0723                  REQUEST ORBIT PARAMETERS DISPLAY (R30)
R0724   1. IF AVERAGE G IS OFF:
R0725             FLASH DISPLAY V04N06. R2 INDICATES WHICH SHIP'S STATE VECTOR IS
R0726              TO BE UPDATED. INITIAL CHOICE IS THIS SHIP (R2=1). ASTRONAUT
R0727              CAN CHANGE TO OTHER SHIP BY V22EXE, WHERE X NOT EQ 1.
R0728             SELECTED STATE VECTOR UPDATED BY THISPREC (OTHPREC).
R0729             CALLS SR30.1 (WHICH CALLS TFFCONMU + TFFRP/RA) TO CALCULATE
R0730              RPER (PERIGEE RADIUS), RAPO (APOGEE RADIUS), HPER (PERIGEE
R0731              HEIGHT ABOVE LAUNCH PAD OR LUNAR LANDING SITE), HAPO (APOGEE
R0732              HEIGHT AS ABOVE), TPER (TIME TO PERIGEE), TFF (TIME TO
R0733              INTERSECT 300 KFT ABOVE PAD OR 35KFT ABOVE LANDING SITE).
R0734             FLASH MONITOR V16N44 (HAPO, HPER, TFF).TFF IS -59M59S IF IT WAS
R0735              NOT COMPUTABLE, OTHERWISE IT INCREMENTS ONCE PER SECOND.
R0736              ASTRONAUT HAS OPTION TO MONITOR TPER BY KEYING IN N 32 E.
R0737              DISPLAY IS IN HMS, IS NEGATIVE (AS WAS TFF), AND INCREMENTS
R0738              ONCE PER SECOND ONLY IF TFF DISPLAY WAS -59M59S.

R0739   2. IF AVERAGE G IS ON:
R0740             CALLS SR30.1 APPROX EVERY TWO SECS.  STATE VECTOR IS ALWAYS
R0741              FOR THIS VEHICLE. V82 DOES NOT DISTURB STATE VECTOR.  RESULTS
R0742              OF SR30.1 ARE RAPO, RPER, HAPO, HPER, TPER, TFF.
R0743             FLASH MONITOR V16N44 (HAPO, HPER, TFF).
R0744             IF MODE IS P11, THEN CALL DELRSPL SO ASTRONAUT CAN MONITOR
R0745              RESULTS BY N50E. SPLASH COMPUTATION DONE ONCE PER TWO SECS.
```

```
 0746   REF   9  LAST  293   43,2741  0 2076 1  V82PERF  TC      TESTXACT

 0747   REF   2  LAST  287   43,2742  3 5012 1           CAF     PRIO7              LESS THAN LAMBERT.  R30,V82
 0748   REF   2  LAST  287   43,2743  0 5137 1           TC      PRIOCHNG
 0749                        43,2744  0 0006 1           EXTEND
 0750   REF   1              43,2745  3 2750 1           DCA     V82CON
 0751   REF   1              43,2746  0 5167 1           TC      SUPDXCHZ           V82CALL IN DIFF SUPERBANK FROM V82PERF

 0752   REF   2  LAST  121   E4,1707                     EBANK=  HAPO
 0753   REF   1              43,2747   03244 0  V82CON   2CADR   V82CALL
 0753   REF   1              43,2750   44104 1


R0754                VB83PERF     VERB 83             DESCRIPTION
R0755                    REQUEST RENDEZVOUS PARAMETER DISPLAY (R31)
R0756                    1. SET EXT VERB DISPLAY BUSY FLAG.
R0757                    2. SCHEDULE R31CALL WITH PRIORITY 5.
R0758                       A. DISPLAY
R0759                           R1  RANGE
R0760                           R2  RANGE RATE
R0761                           R3  THETA

 0762   REF  10  LAST  295   43,2751  0 2076 1  V83PERF  TC      TESTXACT

 0763   REF  24  LAST  289   43,2752  3 4743 0           CAF     BIT2
 0764   REF  10  LAST  293   43,2753  0 5205 0           TC      WAITLIST
 0765   REF   1              E7,1611                     EBANK=  TSTRT
 0766   REF   1              43,2754   03741 0           2CADR   R31CALL
 0766   REF   1              43,2755   60107 1
 0767   REF  13  LAST  292   43,2756  0 5146 1           TC      ENDOFJOB

R0768   VERB 89 DESCRIPTION     RENDEZVOUS FINAL ATTITUDE ROUTINE (R63)

R0769   CALLED BY VERB 89 ENTER DURING P00. PRIO 10 USED.  CALCULATES AND
R0770   DISPLAYS FINAL FDAI BALL ANGLES TO POINT LM +X OR +Z AXIS AT CSM.

R0771   1. KEY IN V 89 E ONLY IF IN PROG 00. IF NOT IN P00, OPERATOR ERROR AND
R0772   EXIT R63, OTHERWISE CONTINUE.

R0773   2. IF IN P00, DO IMU STATUS CHECK ROUTINE (R02BOTH). IF IMU ON AND ITS
R0774   ORIENTATION KNOWN TO LGC, CONTINUE.

R0775   3. FLASH DISPLAY V 04 N 06.  R2 INDICATES WHICH SPACECRAFT AXIS IS TO
R0776   BE POINTED AT CSM.  INITIAL CHOICE IS PREFERRED (+Z) AXIS (R2=1).
R0777   ASTRONAUT CAN CHANGE TO (+X) AXIS (R2 NOT = 1) BY V 22 E 2 E.  CONTINUE
R0778   AFTER KEYING IN PROCEED.

R0779   4. BOTH VEHICLE STATE VECTORS UPDATED BY CONIC EQS.

R0780   5. HALF MAGNITUDE UNIT LOS VECTOR (IN STABLE MEMBER COORDINATES) AND
```

```
R0781   HALF MAGNITUDE UNIT SPACECRAFT AXIS VECTOR (IN BODY COORDINATES)
R0782   PREPARED FOR VECPOINT.

R0783   6. GIMBAL ANGLES FROM VECPOINT TRANSFORMED INTO FDAI BALL ANGLES BY
R0784   BALLANGS. FLASH DISPLAY V 06 N 18 AND AWAIT RESPONSE.

R0785   7. RECYCLE - RETURN TO STEP 4.
R0786      TERMINATE - EXIT R63.
R0787      PROCEED - RESET 3AXISFLG AND CALL R60LEM FOR ATTITUDE MANEUVER.


 0788   REF   2  LAST  293   43,2757  0 2121 1  V89PERF   TC      CHKPOOH
 0789   REF  11  LAST  295   43,2760  0 2076 1            TC      TESTXACT
 0790   REF   1              43,2761  3 4730 1            CAF     PRIO10
 0791   REF   6  LAST  292   43,2762  0 5076 0            TC      FINDVAC
 0792   REF   3  LAST  122   E4,1577                      EBANK=  RONE
 0793   REF   1              43,2763   C2024 0            2CADR   V89CALL
 0793   REF   1              43,2764   54104 0
 0794   REF  14  LAST  295   43,2765  0 5146 1            TC      ENDOFJOB

R0795            V90PERF     VERB 90              DESCRIPTION
R0796                REQUEST RENDEZVOUS OUT-OF-PLANE DISPLAY (R36)
R0797                1. SET EXT VERB DISPLAY BUSY FLAG.
R0798                2. SCHEDULE R36 CALL WITH PRIORITY 10
R0799                  A. DISPLAY
R0800                       TIME OF EVENT - HOURS , MINUTES , SECONDS
R0801                       Y  OUT-OF-PLANE POSITION - NAUTICAL MILES
R0802                       YDOT  OUT-OF-PLANE VELOCITY - FEET/SECOND
R0803                       PSI  ANGLE BTW LINE OF SIGHT AND FORWARD
R0804                           DIRECTION VECTOR IN HORIZONTAL PLANE - DEGREES

 0805   REF   6  LAST  292   43,2766  4 C103 1  V90PERF   CS      FLAGWRD7
 08051  REF   3  LAST  292   43,2767  7 4737 1            MASK    V37FLBIT
 08052                       43,2770  0 0006 1            EXTEND
 08053  REF  22  LAST  293   43,2771  1 2116 1            BZF     ALM/END          AVERAGE G ON: ILL EAGLE
 08055  REF  12  LAST  296   43,2772  0 2076 1            TC      TESTXACT
 0806   REF   3  LAST  295   43,2773  3 5012 1            CAF     PRIO7            R36,V90
 0807   REF   7  LAST  296   43,2774  0 5076 0            TC      FINDVAC
 0808   REF   7  LAST  254   E7,1441                      EBANK=  TIG
 0809   REF   1              43,2775   02677 0            2CADR   R36
 0809   REF   1              43,2776   10107 0
 0810   REF  15  LAST  296   43,2777  1 5146 0            TCF     ENDOFJOB
R0811            MINIMP      VERB 76              DESCRIPTION
R0812                MINIMUM IMPULSE MODE
R0813                1. SET MINIMUM IMPULSE RHC MODE FLAG TO 1.

 0814   REF  10  LAST  288   43,3000  0 5506 1  MINIMP    TC      UPFLAG           SET PULSES = 1 (MIN. IMPULSE MODE)
 0815   REF   1              43,3001   00303 1            ADRES   PULSEFLG
 0816   REF  13  LAST  291   43,3002  1 2117 0            TCF     GOPIN            RETURN VIA PINBRNCH
```

```
R0817                NOMINIMP     VERB 77             DESCRIPTION
R0818                    RATE COMMAND MODE
R0819                    1. SET MINIMUM IMPULSE RHC MODE FLAG TO 0. (ZERO INDICATES NOT MINIMUM IMPULSE MODE.).
R0821                    2. MOVE CDUX,CDUY,CDUZ INTO CDUXD,CDUYD,CDUZD.

 0822    REF  20  LAST  291    43,3003   0 5520 0  NOMINIMP TC      DOWNFLAG         SET PULSES = 0 (NOT MINIMUM IMPULSE MODE
 0823    REF   2  LAST  296    43,3004    0C303 1           ADRES   PULSEFLG
 08235                         43,3005   0 0004 0           INHINT
 0824    REF  11  LAST  256    43,3006   0 4665 0           TC      IBNKCALL
 0825    REF   1               43,3007    40154 0           CADR    ZATTEROR
 0826    REF  14  LAST  296    43,3010   0 2117 1           TC      GOPIN
```

```
P0827            CREWMANU     VERB 49            DESCRIPTION
R0828                START AUTOMATIC ATTITUDE MANEUVER
R0829                1. REQUIRE PROGRAM 00 ACTIVE.
R0830                2. SET EXT VERB DISPLAY BUSY FLAG.
R0831                3. SCHEDULE R62DISP WITH PRIORITY 10.
R0832                4. RELEASE EXT VERB DISPLAY.

R0833              R62DISP
R0834                1. DISPLAY FLASHING V06,N22.
R0835                   RESPONSES
R0836                   A. TERMINATE
R0837                      1. GO TO GOTOPOOH.
R0838                   B. PROCEED
R0839                      1. SET 3AXISFLG TO INDICATE MANEUVER IS SPECIFIED BY 3 AXIS.
R0841                      2. EXECUTE R60LEM (ATTITUDE MANEUVER).
R0842                   C. ENTER
R0843                      1. REPEAT FLASHING V06,N22.

 0844  REF   3  LAST  296   43,3011  0 2121 1  CREWMANU TC      CHKPOOH         DEMAND POO

 0845  REF  13  LAST  296   43,3012  0 2076 1           TC      TESTXACT

 0846  REF   2  LAST  296   43,3013  3 4730 1           CAF     PRIO10
 0847  REF   8  LAST  296   43,3014  0 5076 0           TC      FINDVAC
 0848  REF   2  LAST  140   E6,1675                     EBANK=  BCDU
 0849  REF   1              43,3015   02103 1           2CADR   R62DISP
 0849  REF   1              43,3016   46106 1
 0850  REF  16  LAST  296   43,3017  0 5146 1           TC      ENDOFJOB
```

```
P0851   TRMTRACK      VERB 56                        DESCRIPTION
R0852                 TERMINATE TRACKING (P20 AND P25).
R0853                 1. KNOCK DOWN RENDEZVOUS, TRACK, AND UPDATE FLAGS.
R0854                 2. REQUIRE P20 OR  P25 NOT RUNNING ALONE OR GO TO GOTOPOOH (REQUEST PROGRAM 00).
R0856                 3. SCHEDULE V56TOVAC WITH PRIORITY 30.

R0857                 V56TOVAC
R0858                 1. EXECUTE INTSTALL (IF INTEGRATION IS RUNNING, STALL UNTIL IT IS FINISHED.).
R0860                 2. ZERO GROUP 2 TO HALT P20.
R0861                 3. TRANSFER CONTROL TO GOPROG2 (SOFTWARE RESTART).

 0862    REF   1                43,3020  3 6017 1  TRMTRACK CA      BITS9+7          IS REND OR P25 FLAG ON
 0863    REF  18   LAST  243    43,3021  7 0074 0           MASK    FLAGWRD0
 0864                           43,3022  0 0006 1           EXTEND
 0865    REF  15   LAST  297    43,3023  1 2117 0           BZF     GOPIN            NO

 0870    REF  21   LAST  297    43,3024  0 5520 0           TC      DOWNFLAG         ENSURE SEARCH FLAG IS OFF
 0871    REF   1                43,3025   00037 0           ADRES   SRCHOPTN

 0872    REF   2   LAST  292    43,3026  3 4740 0           CA      TRACKBIT         IS TRACK FLAG ON?
 0873    REF  10   LAST  292    43,3027  7 0075 1           MASK    FLAGWRD1
 0874                           43,3030  0 0006 1           EXTEND
 0875    REF   1                43,3031  1 3034 1           BZF     CLRRND
 0876    REF  11   LAST  287    43,3032  0 4626 1           TC      POSTJUMP
 0877    REF   1                43,3033   64054 1           CADR    TRMTRAK1

 08773   REF   2   LAST  299    43,3034  4 6017 0  CLRRND   CS      BITS9+7          TURN OFF RENDVZFLG AND P25FLAG
 08774   REF   3   LAST  239       4736            REFTAG5  =       RNDVZBIT
 08775   REF   2   LAST  239       4734            REFTAG6  =       P25FLBIT
 08776   REF  19   LAST  299    43,3035  7 0074 0           MASK    FLAGWRD0
 08777   REF  20   LAST  299    43,3036  54 074 0           TS      FLAGWRD0
 08778   REF  16   LAST  299    43,3037  1 2117 0           TCF     GOPIN

 0878    REF   3   LAST  235       6000                     SETLOC  FFTAG5
 08782                             6017                     BANK

 08785                             6017   00500 1  BITS9+7  OCT     500


 0879    REF   3   LAST  287    42,2000                     SETLOC  SBAND            BANK 42
 0880                           42,2054                     BANK

 0881    REF   2 LAST  293 TO  294:     15     15*          COUNT*  $$/EXTVB

 08814   REF  30   LAST  291    42,2054  3 4727 1  TRMTRAK1 CAF     BIT14
 08815   REF   3   LAST  233    42,2055  55 073 0           TS      AGSCODE

 0882    REF   8   LAST  267    42,2056  0 6060 1           TC      INTPRET
 0883                           42,2057   43014 0           CLEAR   CLEAR            TURN OFF UPDATFLG AND IMUSE
 0884    REF   2   LAST  243    42,2060   00267 1                   IMUSE
 0885   REF    1                42,2061   00670 0                       UPDATFLG
 0889                           42,2062   77624 1             CALL
 0890   REF    3  LAST  247     42,2063   27447 0                       INTSTALL        DONT INTERRUPT INTEGRATION
 0891                           42,2064   77776 1             EXIT

 0892   REF    2  LAST  240     42,2065  0 5355 1             TC        PHASCHNG
 0893                           42,2066   00002 0             OCT       2               KILL GROUP 2 TO HALT P20 ACTIVITY

 0894                           42,2067  0 0004 0             INHINT
 0895   REF   12  LAST  297     42,2070  0 4665 0             TC        IBNKCALL        ZERO THE COMMANDED RATES TO STOP
 0896   REF    1                42,2071   40166 1             CADR      STOPRATE        MANEUVER

 0897   REF   13  LAST  300     42,2072  0 4665 0             TC        IBNKCALL
 0898   REF    1                42,2073   40115 0             CADR      RESTORDB

 0899   REF    5  LAST  283     42,2074  0 6027 1             TC        CLRADMOD        CLEAR BITS 10 + 15 OF RADMODES.

 0900   REF   31  LAST  299     42,2075  4 4727 0             CS        BIT14           DISABLE LOCKON
 0901                           42,2076  0 0006 1             EXTEND
 0902   REF   22  LAST  293     42,2077  03 012 1             WAND      CHAN12
 09022  REF    3  LAST  299     42,2100  4 4740 1             CS        TRACKBIT        TURN OFF TRACKFLG
 09023  REF   11  LAST  299     42,2101  7 0075 1             MASK      FLAGWRD1
 09024  REF   12  LAST  300     42,2102  54 075 1             TS        FLAGWRD1
 09025  REF    3  LAST  299     42,2103  4 6017 0             CS        BITS9+7         TURN OFF RENDVZFLG AND P25FLAG
 09026  REF    4  LAST  299        4736             REFTAG7   =         RNDVZBIT
 09027  REF    3  LAST  299        4734             REFTAG8   =         P25FLBIT
 09028  REF   21  LAST  299     42,2104  7 0074 0             MASK      FLAGWRD0
 09029  REF   22  LAST  300     42,2105  54 074 0             TS        FLAGWRD0

 0903   REF   12  LAST  299     42,2106  0 4626 1             TC        POSTJUMP
 0904   REF    2  LAST  241     42,2107   12772 0             CADR      GOPROG2         CAUSE RESTART.

R0905                DNEDUMP       VERB 74              DESCRIPTION
R0906                    INITIALIZE DOWN-TELEMETRY PROGRAM FOR ERASABLE MEMORY DUMP.
R0907                    1. SET EXT VERB DISPLAY BUSY FLAG.
R0908                    2. REPLACE CURRENT DOWNLIST WITH ERASABLE MEMORY.
R0909                    3. RELEASE EXT VERB DISPLAY.

 0910   REF    5  LAST  294     43,2000                       SETLOC EXTVERBS
 0911                           43,3040                       BANK

 0912   REF    5 LAST  294 TO  299:     65   373*             COUNT* $$/EXTVB

 0913                              0400                       EBANK= 400
 0914   REF    1                43,3040  3 3043 0  DNEDUMP    CAF       LDNDUMP1
 0915   REF    3  LAST  230     43,3041  54 335 0             TS        DNTMGOTO
 0916   REF   17  LAST  299     43,3042  0 2117 1             TC        GOPIN

 0917   REF    2  LAST  275     43,3040            V74        EQUALS DNEDUMP
 0918   REF    1                43,3043   03723 1  LDNDUMP1   REMADR DNDUMP1
```

```
R0919               LEMVEC      VERB 80                    DESCRIPTION
R0920                   UPDATE LEM STATE VECTOR
R0921                      RESET VEHUPFLG TC 0

 0922   REF  22  LAST  299    43,3044  0 5520 0  LEMVEC    TC      DOWNFLAG
 0923   REF   1               43,3045   00026 0            ADRES   VEHUPFLG        VB 80 - VEHUPFLG DOWN INDICATES LEM

 0924   REF   1               43,3046  0 3051 0            TC      NOUPDOWN
R0925               CSMVEC      VERB 81                    DESCRIPTION
R0926                   UPDATE CSM STATE VECTOR
R0927                      SET   VEHUPFLG TO 1

 0928   REF  11  LAST  296    43,3047  0 5506 1  CSMVEC    TC      UPFLAG
 0929   REF   2  LAST  301    43,3050   00026 0            ADRES   VEHUPFLG        VB 81 - VEHUPFLG UP INDICATES CSM

 0930   REF  23  LAST  301    43,3051  0 5520 0  NOUPDOWN TC      DOWNFLAG
 0931   REF   1               43,3052   00030 1            ADRES   NOUPFLAG

 0932   REF  18  LAST  300    43,3053  1 2117 0            TCF     GOPIN

R0933               UPDATOFF   VERB95       . DESCRIPTION
R0934                   INHIBIT STATE VECTOR UPDATES BY INCORP
R0935                      SET NOUPFLAG TO 1

 0936   REF  12  LAST  301    43,3054  0 5506 1  UPDATOFF TC      UPFLAG          VB 95 SET NOUPFLAG
 0937   REF   2  LAST  301    43,3055   00030 1            ADRES   NOUPFLAG

 0938   REF  19  LAST  301    43,3056  0 2117 1            TC      GOPIN
```

```
P0939               SYSTEST      VERB 92              DESCRIPTION
R0940                 OPERATE IMU PERFORMANCE TEST.
R0941                   1. REQUIRE PROGRAM 00 OR TURN ON OPERATOR ERROR.
R0942                   2. SET EXT VERB BUSY FLAG.
 0943    REF   2  LAST  132   E5,1417                               EBANK= QPLACE

 0944    REF   4  LAST  298   43,3057  0 2121 1  SYSTEST   TC       CHKPOOH              DEMAND P00

 09442   REF   7  LAST  289   43,3060  4 0077 0            CS       FLAGWRD3             DO NOT ALLOW P07 IN FLIGHT
 09444   REF   4  LAST  241   43,3061  7 4732 1            MASK     NOP07BIT             IF FLAG IS SET, TURN ON OE LITE AND EXIT
 09446                        43,3062  0 0006 1            EXTEND
 09448   REF  23  LAST  296   43,3063  1 2116 1            BZF      ALM/END
 0945    REF  14  LAST  298   43,3064  0 2076 1            TC       TESTXACT

 0946    REF   2  LAST  283   43,3065  3 7731 0            CAF      PRIO22
 0947    REF   9  LAST  298   43,3066  0 5076 0            TC       FINDVAC
 0948    REF   3  LAST  302   E5,1417                      EBANK= QPLACE
 0949    REF   1              37,2000                      SBANK= IMUSUPER
 0950    REF   1              43,3067   02002 1            2CADR    REDO
 0950    REF   1              43,3070   76065 0
 0951    REF  17  LAST  298   43,3071  0 5146 1            TC       ENDOFJOB

R0952    VERB 93              CLEAR RENDWFLG, CAUSES W-MATRIX TO BE RE-INITIALIZED.

 0953                         43,3072  0 0004 0  WMATRXNG INHINT
 0954    REF   1              43,3073  4 4744 0            CS       RENDWBIT
 0955    REF  11  LAST  292   43,3074  7 0101 0            MASK     FLAGWRD5
 0956    REF  12  LAST  302   43,3075  54 101 0            TS       FLAGWRD5

 0957    REF  20  LAST  301   43,3076  0 2117 1            TC       GOPIN

 0958    REF   1              43,3077            GOSHOSUM EQUALS SHOWSUM

 0959    REF   5  LAST  302   43,3077  0 2121 1  SHOWSUM   TC       CHKPOOH              *
 0960    REF  15  LAST  302   43,3100  0 2076 1            TC       TESTXACT             *
 0961    REF   4  LAST  296   43,3101  3 5012 1            CAF      PRIO7                ALLOW OTHER CHARINS.
 0962    REF   3  LAST  295   43,3102  0 5137 1            TC       PRIOCHNG
 0963    REF   1              43,3103  3 4744 1            CAF      S+1                  *
 0964    REF   2  LAST  113   43,3104  55'376 0            TS       SKEEP6               * SHOWSUM OPTION
 0965    REF   1              43,3105  3 4746 0            CAF      S+ZERO               *
 0966    REF   3  LAST  223   43,3106  55'362 0            TS       SMODE                * TURN OFF SELF-CHECK
 0967    REF   1              43,3107  3 3250 0            CA       SELFADRS             *
 0968    REF   3  LAST  233   43,3110  55'361 0            TS       SELFRET              *
 0969    REF   1              43,3111  0 3525 0            TC       STSHOSUM             * ENTER ROPECHK

 0970    REF   2  LAST  112   43,3112  23'372 0  SDISPLAY LXCH      SKEEP2               * BANK # FOR DISPLAY
 0971    REF   2  LAST  112   43,3113  23'373 1           LXCH      SKEEP3               * BUGGER WORD FOR DISPLAY
 0972    REF   1              43,3114  3 3247 0  NOKILL    CA       ADRS1                *
 0973    REF  41  LAST  287   43,3115  54 156 1            TS       MPAC +2              *
 0974    REF   1              43,3116  3 3127 0            CA       VNCON                * 0501
```

```
0975   REF  54  LAST  293   43,3117  0 4607 1              TC      BANKCALL       *
0976   REF   6  LAST  293   43,3120   20323 1              CADR    GOXDSPF        *
0977                        43,3121  0 3124 0              TC      +3             *
0978   REF   1              43,3122  0 3636 1              TC      NXTBNK         *
0979   REF   1              43,3123  0 3114 0              TC      NOKILL         *
0980   REF   2  LAST  302   43,3124  3 3250 0              CA      SELFADRS
0981   REF   2  LAST  112   43,3125  55'371 1              TS      SKEEP1

0982   REF  16  LAST  293   43,3126  0 5474 0              TC      ENDEXT         *

0983                        43,3127   01201 0  VNCON       VN      501            *

0984   REF   3  LAST  302   43,3130  3 1376 1  ENDSUMS     CA      SKEEP6         *
0985                        43,3131  0 0006 1              EXTEND                 *
0986   REF   2  LAST  234   43,3132  1 3341 0              BZF     SELFCHK        * ROPECHK, START SELFCHK AGAIN.
0987   REF   2  LAST  302   43,3133  0 3525 0              TC      STSHOSUM       * START SHOWSUM AGAIN.
```

```
R0988           DAPDISP     VERB 48                DESCRIPTION
R0989               LOAD AUTO PILOT  DATA
R0990               1. REQUIRE EXT VERB DISPLAY AVAILABLE AND SET BUSY FLAG.
R0991               2. EXECUTE DAPDATA1, DAPDATA2, AND DAPDATA3.
R0992               3. RELEASE EXT VERB DISPLAY SYSTEM.
R0993   KEY
R0994   THE FOLLOWING IS A KEY TO THE 5 DIGITS OF THE DAP DATA CODE (N46)

R0995   DIGIT A - VEHICLE CONFIGURATION
R0996           1 - LM ALONE, ASCENT
R0997           2 - LM ALONE, DESCENT
R0998           3 - CSM AND LM DOCKED

R0999   DIGIT B - ACCELERATION CODE
R1000           0 - 2 JET TRANSLATION, RCS SYSTEM A PREFERRED
R1001           1 - 2 JET TRANSLATION, RCS SYSTEM B PREFERRED
R1002           2 - 4 JET TRANSLATION, RCS SYSTEM A PREFERRED (NOT MEANINGFUL)
R1003           3 - 4 JET TRANSLATION, RCS SYSTEM B PREFERRED (NOT MEANINGFUL)

R1004   DIGIT C - ACA SCALING
R1005           0 - FINE
R1006           1 - NORMAL

R1007   DIGIT D - DEADBAND
R1008           0 - 0.3 DEG
R1009           1 - 1.0 DEG
R1010           2 - 5.0 DEG
R1011          (3 - 5.0 DEG BY DEFAULT)

R1012   DIGIT E - MANEUVER RATE
R1013           0 - 0.2 DEG/SEC
R1014           1 - 0.5 DEG/SEC
R1015           2 - 2.0 DEG/SEC
R1016           3 -10.0 DEG/SEC

 1017   REF  16  LAST  302   43,3134  0 2076 1  DAPDISP  TC      TESTXACT
 1018   REF   5  LAST  302   43,3135  3 5012 1           CAF     PR107           R03
 1019   REF   4  LAST  302   43,3136  0 5137 1           TC      PRIOCHNG
 1020   REF  13  LAST  300   43,3137  0 4626 1           TC      POSTJUMP
 1021   REF   1              43,3140   40004 1           CADR    DAPDATA1
 1022                        34,2000                     BANK    34
 1023   REF   1              20,2000                     SETLOC  LOADDAP
 1024                        20,2004                     BANK

 1025   REF   1                                          COUNT*  $$/R03

 1026   REF   2  LAST  221   30,2000                     SBANK=  LOWSUPER        FOR SUBSEQUENT LOW 2CADR'S.

 1027   REF   1              20,2004  3 2114 1  DAPDATA1 CAF     BOOLSMSK        SET DISPLAY ACCORDING TO DAPBOOLS BITS.
 1028   REF   6  LAST  230   20,2005  7 0111 1           MASK    DAPBOOLS        LM
 1029   REF   1                20,2006  55'340 0            TS       DAPDATR1         LM
 1030   REF   9  LAST  227     20,2007  4 0106 1            CS       FLGWRD10         SET BIT 14 TO BE COMPLEMENT OF APSFLAG.
 1031   REF   2  LAST  224     20,2010  7 4730 0            MASK     APSFLBIT
 1032   REF  78  LAST  294     20,2011  10 000 0            CCS      A
 1033   REF  32  LAST  300     20,2012  3 4727 1            CAF      BIT14
 1034   REF   2  LAST  305     20,2013  27'340 0            ADS      DAPDATR1
 1035   REF   3  LAST  305     20,2014  31'340 1  CHKDATA1  CAE      DAPDATR1         IF BITS 13 AND 14 ARE BOTH ZERO, FORCE
 1036   REF   3  LAST  293     20,2015  7 4346 0            MASK     BIT13-14           A ONE INTO BIT 13.
 1037                          20,2016  0 0006 1            EXTEND
 1038   REF   1                20,2017  1 2034 0            BZF      FORCEONE
 1039   REF   4  LAST  305     20,2020  31'340 1            CAE      DAPDATR1         ENSURE THAT NO ILLEGAL BITS SET BY CREW.
 1040   REF   1                20,2021  7 2113 1  MSKDATR1  MASK     DSPLYMSK
 1041   REF   5  LAST  305     20,2022  55'340 0            TS       DAPDATR1
 1042   REF   1                20,2023  3 2112 1            CAF      V04N46           DISPLAY DAP CONFIG. / CHANBKUP
 1043   REF  55  LAST  303     20,2024  0 4607 1            TC       BANKCALL
 1044   REF   1                20,2025   20345 1            CADR     GOXDSPFR
 1045   REF  17  LAST  303     20,2026  1 5474 1            TCF      ENDEXT           V34E  TERMINATE
 1046   REF   1     .          20,2027  1 2037 0            TCF      DPDAT1           V33E  PROCEED
 1047   REF   1                20,2030  1 2014 1            TCF      CHKDATA1         E     NEW DATA     CHECK AND REDISPLAY
 1048   REF  18  LAST  289     20,2031  3 4742 1            CAF      BIT3             BLANK R3
 1049   REF   6  LAST  289     20,2032  0 5466 0            TC       BLANKET
 1050   REF  18  LAST  302     20,2033  1 5146 0            TCF      ENDOFJOB
 1051   REF  20  LAST  265     20,2034  3 4730 1  FORCEONE  CAF      BIT13
 1052   REF   6  LAST  305     20,2035  27'340 0            ADS      DAPDATR1
 1053   REF   1                20,2036  1 2021 1            TCF      MSKDATR1

 1054                          20,2037  0 0004 0  DPDAT1    INHINT                    INHINT FOR SETTING OF FLAG BITS AND MASS
 1055   REF   3  LAST  305     20,2040  4 4730 0            CS       APSFLBIT           ON BASIS OF DISPLAYED DAPDATR1.
 1056   REF  10  LAST  305     20,2041  7 0106 1            MASK     FLGWRD10
 1057   REF  22  LAST  287     20,2042  54 001 1            TS       L                SET APSFLAG TO BE COMPLEMENT OF BIT 14.
 1058   REF   7  LAST  305     20,2043  4 1340 0            CS       DAPDATR1
 1059   REF  33  LAST  305     20,2044  7 4727 0            MASK     BIT14
 1060   REF  79  LAST  305     20,2045  10 000 0            CCS      A
 1061   REF   4  LAST  305     20,2046  3 4730 1            CAF      APSFLBIT
 1062   REF  23  LAST  305     20,2047  6 0001 0            AD       L
 1063   REF  11  LAST  305     20,2050  54 106 1            TS       FLGWRD10
 1064   REF   8  LAST  305     20,2051  4 1340 0            CS       DAPDATR1         SET BITS OF DAPBOOLS ON BASIS OF DISPLAY
 1065   REF   4  LAST  305     20,2052  7 4346 0            MASK     BIT13-14           MASK OUT CSMDOCKD (BIT 13) UNLESS BOTH
 1066   REF  80  LAST  305     20,2053  10 000 0            CCS      A                  13 AND 14 ARE SET.
 1067   REF   1                20,2054  4 4730 0            CS       CSMDOCKD
 1068   REF   2  LAST  304     20,2055  6 2114 1            AD       BOOLSMSK
 1069   REF   9  LAST  305     20,2056  7 1340 0            MASK     DAPDATR1
 1070   REF  24  LAST  305     20,2057  54 001 1            TS       L
 1071   REF   3  LAST  305     20,2060  4 2114 0            CS       BOOLSMSK
 1072   REF   7  LAST  304     20,2061  7 0111 1            MASK     DAPBOOLS
 1073   REF  25  LAST  305     20,2062  6 0001 0            AD       L
 1074   REF   8  LAST  305     20,2063  54 111 1            TS       DAPBOOLS
 1075   REF   2  LAST  305     20,2064  7 4730 0            MASK     CSMDOCKD         LOAD MASS IN ACCORDANCE WITH CSMDOCKD.
 1076   REF  81  LAST  305     20,2065  10 000 0            CCS      A                  MASS IS USUALLY ALREADY OKAY, SO DO
 1077   REF   7  LAST  217     20,2066  31'327 0            CAE      CSMMASS            NOT TOUCH ITS LOW-ORDER PART.
 1078   REF   8  LAST  216   20,2067  6 1326 1            AD      LEMMASS
 1079   REF   3  LAST  108   20,2070  55'243 1            TS      MASS
 1080   REF   9  LAST  305   20,2071  30 111 0            CAE     DAPBOOLS
 1081   REF   1              20,2072  7 4732 1            MASK    ACC4OR2X         2 OR 4 JET X-TRANSLATION
 1082                        20,2073  0 0006 1            EXTEND                   (BIT ACC4OR2X = 1 FOR 4 JETS)
 1083                        20,2074  1 2101 1            BZF     +5
 1084   REF  22  LAST  231   20,2075  4 4726 1            CS      BIT15
 1085   REF  13  LAST  300   20,2076  7 0075 1            MASK    FLAGWRD1         CLEAR NJTSFLAG TO 0 FOR 4 JETS
 1086   REF  14  LAST  306   20,2077  54 075 1            TS      FLAGWRD1
 1087                        20,2100  1 2104 1            TCF     +4
 1088   REF  15  LAST  306   20,2101  4 0075 1            CS      FLAGWRD1         SET NJTSFLAG TO 1 FOR 2 JETS
 1089   REF  23  LAST  306  .20,2102  7 4726 1            MASK    BIT15
 1090   REF  16  LAST  306   20,2103  26 075 1            ADS     FLAGWRD1
 1091   REF  10  LAST  306   20,2104  3 0111 0            CA      DAPBOOLS         SELECT DESIRED KALCMANU AUTOMATIC
 1092   REF   2  LAST  244   20,2105  7 6266 1            MASK    THREE            MANEUVER RATE
 1093                        20,2106  6 0000 1            DOUBLE                   RATEINDX HAS TO BE 0,2,4,6 SINCE RATES
 1094   REF   2  LAST  223   20,2107  55'322 1            TS      RATEINDX         ARE DP
 1095   REF  14  LAST  304   20,2110  0 4626 1            TC      POSTJUMP
 1096   REF   1              20,2111   02214 1            CADR    STIKLOAD

 1097                        20,2112   01056 0  V04N46    VN      0446
 1098                        20,2113   33133 0  DSPLYMSK  OCT     33133
 1099                        20,2114   13133 1  BOOLSMSK  OCT     13133
 1100                        01,2214                      BANK    01
 1101   REF   2  LAST   45   01,2000                      SETLOC  LOADDAP1
 1102                        01,2214                      BANK

 1103   REF   2 LAST   45 TO   45:      2      2*         COUNT*  $$/R03

 1104   REF   3  LAST  230   01,2214  3 5006 1  STIKLOAD  CAF     EBANK6
 1105   REF   9  LAST  291   01,2215  54 003 0            TS      EBANK
 1106   REF   2  LAST  223   E6,1444                      EBANK=  STIKSENS
 1107   REF   1              01,2216  3 4736 1            CA      RHCSCALE         SET STICK SENSITIVITY TO CORRESPOND TO A
 1108   REF  11  LAST  306   01,2217  7 0111 1            MASK    DAPBOOLS         MAXIMUM COMMANDED RATE (AT 42 COUNTS) OF
 1109   REF  22  LAST  305   01,2220  10 000 0            CCS     A                20 D/S(NORMAL) OR 4 D/S(FINE), SCALED
 1110   REF   1              01,2221  3 2343 1            CA      NORMAL           AT 45 D/S.
 1111   REF   1              01,2222  6 2344 0            AD      FINE
 1112   REF   3  LAST  306  .01,2223  55'444 0            TS      STIKSENS
 1113   REF   1              01,2224  3 2346 1            CA      -0.6D/S
 1114   REF   3  LAST  223   01,2225  55'476 1            TS      -RATEDB          LM-ONLY BREAKOUT LEVEL IS .6 D/S.
 1115   REF   3  LAST  305   01,2226  3 4730 1            CA      CSMDOCKD         IF CSM-DOCKED, DIVIDE STICK SENSITIVITY
 1116   REF  12  LAST  306   01,2227  7 0111 1            MASK    DAPBOOLS         BY 10. NORMAL SCALING IS THEN 2 D/S AND
 1117                        01,2230  0 0006 1            EXTEND                   FINE SCALING IS 0.4 D/S
 1118                        01,2231  1 2240 1            BZF     +7               BRANCH IF CSM IS NOT DOCKED.
 1119   REF   4  LAST  306   01,2232  3 1444 1            CA      STIKSENS
 1120                        01,2233  0 0006 1            EXTEND
 1121   REF   1              01,2234  7 2345 0            MP      1/10
 1122   REF   5  LAST  306   01,2235  55'444 0 .          TS      STIKSENS
 1123   REF   1              01,2236  3 2347 0            CA      -0.3D/S          CSM-DOCKED BREAKOUT LEVEL IS .3 D/S.
 1124   REF   4  LAST  306   01,2237  55'476 1            TS      -RATEDB
```

```
1125                        01,2240   0 0003 1            RELINT            PROCEED TO NOUN 47, MASS LOAD,

1126  REF   1               01,2241   3 2341 0  DAPDATA2  CAF    V0647
1127  REF  56  LAST  305    01,2242   0 4607 1            TC     BANKCALL
1128  REF   2  LAST  305    01,2243    20345 1            CADR   GOXDSPFR
1129  REF   1               01,2244   1 2252 1            TCF    ENDR03     V34E  TERMINATE. FIRST SET DB, DO 1/ACCS
1130  REF   1               01,2245   1 2256 0            TCF    DAPDAT2    V33E  PROCEED
1131  REF   1               01,2246   1 2241 0            TCF    DAPDATA2         LOAD NEW DATA AND RECYCLE
1132  REF  19  LAST  305    01,2247   3 4742 1            CAF    BIT3       BLANKS R3
1133  REF   7  LAST  305    01,2250   0 5466 0            TC     BLANKET             LM
1134  REF  19  LAST  305    01,2251   1 5146 0            TCF    ENDOFJOB
1135                        01,2252   0 0004 0  ENDR03    INHINT
1136  REF  14  LAST  300    01,2253   0 4665 0            TC     IBNKCALL
1137  REF   2  LAST  300    01,2254    40115 0            CADR   RESTORDB
1138  REF  18  LAST  305    01,2255   1 5474 1            TCF    ENDEXT     DOES RELINT

1139  REF  12  LAST  305    01,2256   4 0106 1  DAPDAT2   CS     FLGWRD10   DETERMINE STAGE FROM APSFLAG
1140  REF   5  LAST  305    01,2257   7 4730 0            MASK   APSFLBIT
1141  REF  83  LAST  306    01,2260   10 000 0            CCS    A
1142  REF   1               01,2261   3 2000 0            CA     MINLMD
1143  REF   1               01,2262   6 2001 1            AD     MINMINLM
1144  REF   9  LAST  306    01,2263   6 1326 1            AD     LEMMASS    LEMMASS MUST BE GREATER THAN EMPTY LEM
1145                        01,2264   0 0006 1            EXTEND
1146  REF   2  LAST  307    01,2265   6 2241 1            BZMF   DAPDATA2   ASK FOR NEW MASSES
1147  REF  13  LAST  306    01,2266   30 111 0            CAE    DAPBOOLS
1148  REF   4  LAST  306    01,2267   7 4730 0            MASK   CSMDOCKD
1149                        01,2270   0 0006 1            EXTEND
1150  REF   1               01,2271   1 2277 0            BZF    LEMALONE   SKIP TEST ON CSMMASS IF NOT DOCKED.
1151  REF   1               01,2272   4 4732 1            CS     MINCSM     TEST CSM MASS
1152  REF   8  LAST  305    01,2273   6 1327 0            AD     CSMMASS    CSMMASS MUST BE GREATER THAN EMPTY CSM
1153                        01,2274   0 0006 1            EXTEND
1154  REF   3  LAST  307    01,2275   6 2241 1            BZMF   DAPDATA2   ASK FOR NEW MASSES
1155  REF   9  LAST  307    01,2276   31'327 0            CAE    CSMMASS    DOCKED:  MASS = CSMMASS + LEMMASS
1156  REF  10  LAST  307    01,2277   6 1326 1  LEMALONE  AD     LEMMASS    LEM ALONE:  MASS = LEMMASS
1157                        01,2300   22 007 0            ZL
1158  REF   4  LAST  306    01,2301   53'244 0            DXCH   MASS
1159                        01,2302   0 0004 0            INHINT
1160  REF  15  LAST  307    01,2303   0 4665 0            TC     IBNKCALL   SET DEADBANK AND COMPUTE MOMENTS OF
1161  REF   3  LAST  307    01,2304    40115 0            CADR   RESTORDB     INERTIA.
1162                        01,2305   0 0003 1            RELINT            PROCEED TO NOUN 48 (OR END).

1163  REF  13  LAST  307    01,2306   4 0106 1  DAPDATA3  CS     FLGWRD10
1164  REF   6  LAST  307    01,2307   7 4730 0            MASK   APSFLBIT
1165                        01,2310   0 0006 1            EXTEND            END ROUTINE IF LEM HAS STAGED,
1166  REF  19  LAST  307    01,2311   1 5474 1            BZF    ENDEXT
1167  REF   1               01,2312   3 2342 0            CAF    V06N48     DISPLAY TRIM ANGLES AND REQUEST RESPONSE
1168  REF  57  LAST  307    01,2313   0 4607 1            TC     BANKCALL
1169  REF   3  LAST  307    01,2314    20345 1            CADR   GOXDSPFR
1170  REF  20  LAST  307    01,2315   0 5474 0            TC     ENDEXT
1171  REF   1               01,2316   1 2323 0            TCF    DPDAT3     V33E GO DO TRIM (WAITLIST TO TRIMGIMB)
```

```
 1172                                01,2317  1 2312 1           TCF      -5                     LOAD NEW DATA AND RECYCLE
 1173    REF  20   LAST  307         01,2320  3 4742 1           CAF      BIT3
 1174    REF   8   LAST  307         01,2321  0 5466 0           TC       BLANKET          BLANK R3
 1175    REF  21   LAST  307         01,2322  1 5146 0           TCF      ENDOFJOB
 1176    REF  19   LAST  191         01,2323  3 4744 1  DPDAT3   CAF      BIT1
 1177    REF  11   LAST  295         01,2324  0 5205 0           TC       WAITLIST
 1178    REF   1                     E6,1401                     EBANK=   ROLLTIME
 1179    REF   1                     01,2325   03221 0           2CADR    TRIMGIM8
 1179    REF   1                     01,2326   56066 1
 1180    REF  21   LAST  308         01,2327  1 5146 0           TCF      ENDOFJOB         DOES A RELINT
 1181    REF   1                     01,2330  3 2342 0  TRIMDONE CAF      V50N48
 1182    REF  58   LAST  307         01,2331  0 4607 1           TC       BANKCALL         TRIM IS FINISHED; PLEASE TERMINATE R03
 1183    REF   1                     01,2332   20353 0           CADR     GOMARK3R -1
 1184    REF  21   LAST  307         01,2333  0 5474 0           TC       ENDEXT           V34E TERMINATE
 1185    REF  22   LAST  308         01,2334  0 5474 0           TC       ENDEXT
 1186    REF  23   LAST  308         01,2335  0 5474 0           TC       ENDEXT
 1187    REF   3   LAST  280         01,2336  3 6007 0           CAF      OCT24            BITS TO CHANGE TO PERFORM, 3 TO BLANK R3
 1188    REF   9   LAST  308         01,2337  0 5466 0           TC       BLANKET
 1189    REF  22   LAST  308         01,2340  1 5146 0           TCF      ENDOFJOB

 1190                                01,2341   01457 0  V0647    VN       0647
 1191                                01,2342   01460 1  V06N48   VN       0648

 1192    REF   2   LAST  307         01,2342            V50N48   =        V06N48

 1193                                01,2343   25101 0  NORMAL   DEC      .660214
A1194                                                                                      NORMAL SCALING IS 20 D/S
 1195                                01,2344   05220 1  FINE     DEC      .165054          FINE STICK SCALING (4 D/S).
 1196                                01,2345   03146 1  1/10     DEC      .1               FACTOR FOR CSM-DOCKED SCALING
 1197                                01,2346   77445 1  -0.6D/S  DEC      -218
 1198                                01,2347   77622 1  -0.3D/S  DEC      -109
```

```
P1199   VERB 66.  VEHICLES ARE ATTACHED.  MOVE THIS VEHICLE STATE VECTOR TO
R1200             OTHER VEHICLE STATE VECTOR.

R1201       USE SUBROUTINE GENTRAN.

 1202                              07,2607                            BANK    7
 1203   REF    6  LAST   300       43,2000                            SETLOC  EXTVERBS
 1204                              43,3141                            BANK

 1205   REF    6 LAST  300 TO  304:     65   438*                     COUNT*  $$/EXTVB

 1206   REF    1                   E3,1626                            EBANK=  RRECTHIS

 1207   REF    2  LAST   265       43,3141  4 0104 0  ATTACHED CS      FLAGWRD8
 1208   REF    1                   43,3142  7 4735 0           MASK    SURFFBIT
 1209                              43,3143  0 0006 1           EXTEND
 1210   REF   24  LAST   302       43,3144  1 2116 1           BZF     ALM/END        TURN ON OE AND EXIT IF SURFFLAG SET.
 1211   REF    3  LAST   298       43,3145  3 4730 1           CAF     PRIO10
 1212   REF   10  LAST   302       43,3146  0 5076 0           TC      FINDVAC
 1213   REF    2  LAST   309       E3,1626                     EBANK=  RRECTHIS

 1214   REF    1                   43,3147   03152 1           2CADR   ATTACHIT
 1214   REF    1                   43,3150   66103 0
 1215   REF   23  LAST   308       43,3151  0 5146 1           TC      ENDOFJOB

 1216   REF    9  LAST   299       43,3152  0 6060 1  ATTACHIT TC      INTPRET
 1217                              43,3153   77624 1           CALL
 1218   REF    4  LAST   300       43,3154   27447 0                   INTSTALL
 1219                              43,3155   43014 0           SET     BON
 1220   REF    1                   43,3156   04063 0                   MOONOTH
 1221   REF    1                   43,3157   04304 1                   MOONTHIS
 1222                              43,3160   67163 1                   +3
 1223                              43,3161   77614 1           CLEAR
 1224   REF    2  LAST   309       43,3162   04263 1                   MOONOTH
 1225                              43,3163   77776 1           EXIT
 1226   REF    1                   43,3164  3 3207 1           CAF     OCT51
 1227   REF    1                   43,3165  0 5546 0           TC      GENTRAN
 1228   REF    3  LAST   309       43,3166   01626 1           ADRES   RRECTHIS       OUR STATE VECTOR INTO OTHER VIA GENTRAN
 1229   REF    1                   43,3167   01554 1           ADRES   RRECTOTH

 1230                              43,3170  0 0003 1           RELINT
 1231   REF   10  LAST   309       43,3171  0 6060 1           TC      INTPRET
 1232                              43,3172   77624 1           CALL                   UPDATE R-OTHER, V-OTHER
 1233   REF    1                   43,3173   27016 0                   PTOALEM
 1234                              43,3174   45154 0           LXA,2   CALL
 1235   REF    2  LAST   118       43,3175   02030 0                   PBODY
 1236   REF    1                   43,3176   26114 1                   SVDWN1
 1237                              43,3177   77776 1           EXIT

 1238   REF    1                   43,3200  3 3210 1           CAF     TCPINAD
 1239   REF    8  LAST  266   43,3201   50 120 1             INDEX  EIXLOC
 1240   REF    1              43,3202   54 052 1             TS     QPRET
 1241   REF   15  LAST  306   43,3203  0 4626 1             TC     POSTJUMP
 1242   REF    1              43,3204   27460 0             CADR   INTWAKE          FREE INTEGRATION AND EXIT.

 1243                         43,3205   77634 0  TCPIN      RTB
 1244   REF    3  LAST  277   43,3206   21062 0                    PINBRNCH

 1245                         43,3207   00051 0  OCT51      OCT    51
 1246   REF    1              43,3210   67205 1  TCPINAD    CADR   TCPIN

R1247   VERB 96  SET QUITFLAG TO STOP INTEGRATION.

R1248            GO TO V37 WITH ZERO TO CAUSE P00.
R1249            STATEINT WILL CHECK QUITFLAG AND SKIP 1ST PASS,
R1250                     THUS ALLOWING A 10 MINUTE PERIOD WITHOUT INTEGRATION.

 1251   REF   13  LAST  301   43,3211  0 5506 1  VERB96     TC     UPFLAG           QUITFLAG WILL CAUSE INTEGRATION TO EXIT
 1252   REF    1              43,3212   00221 0             ADRES  QUITFLAG            AT NEXT TIMESTEP

 1253   REF   30  LAST  291   43,3213  3 4746 0             CAF    ZERO
 1254   REF   16  LAST  310   43,3214  0 4626 1             TC     POSTJUMP
 1255   REF    1              43,3215   10054 1             CADR   V37              GO TO P00

R1256
R1257   VERB 67 :   DISPLAY OF W MATRIX

 1258   REF   17  LAST  304   43,3216  0 2076 1  V67        TC     TESTXACT
 1259   REF    2  LAST  240   43,3217  3 5010 0             CAE    PRIO5
 1260   REF   11  LAST  309   43,3220  0 5076 0             TC     FINDVAC
 1261   REF    2  LAST  120   E4,1571                       EBANK= WWPOS
 1262   REF    1              43,3221   02007 1             2CADR  V67CALL
 1262   REF    1              43,3222   62064 1
 1263   REF   24  LAST  309   43,3223  0 5146 1             TC     ENDOFJOB

R1264   VERB 65           DISABLE U,V JETS DURING DPS BURNS

 1265   REF   14  LAST  310   43,3224  0 5506 1  SNUFFOUT TC       UPFLAG
 1266   REF    1              43,3225   00115 1             ADRES  SNUFFER
 1267   REF   21  LAST  302   43,3226  0 2117 1             TC     GOPIN

R1268   VERB 75           ENABLE U,V JETS DURING DPS BURNS

 1269   REF   24  LAST  301   43,3227  0 5520 0  OUTSNUFF TC       DOWNFLAG
 1270   REF    2  LAST  310   43,3230   00115 1             ADRES  SNUFFER
 1271   REF   22  LAST  310   43,3231  0 2117 1             TC     GOPIN
R1272   VERB 85           DISPLAY RR LOS AZIMUTH AND ELEVATION.

R1273            AZIMUTH IS THE ANGLE BETWEEN THE LOS AND THE X-Z NB PLANE, 0 - 90 DEG IN THE +Y HEMISPHERE,
R1275   360 - 270 DEG IN THE -Y HEMISPHERE.
```

```
R1276              ELEVATION IS THE ANGLE BETWEEN +ZNB AND THE PROJECTION OF THE LOS INTO THE X-Z PLANE, 0 - 360 ABOUT +Y.

 1278   REF   2  LAST  122   E4,1571                         EBANK= RR-AZ
 1279   REF  18  LAST  310   43,3232  0 2076 1  VERB85       TC     TESTXACT
 1280   REF  17  LAST  310   43,3233  0 4626 1               TC     POSTJUMP
 1281   REF   1              43,3234   62000 0               CADR   DSPRRLOS

 1282   REF   1              41,2000                         SETLOC PINBALL2
 1283                        41,2000                         BANK

 1284   REF   1                                              COUNT* $$/EXTVB

 1285   REF   3  LAST  310   41,2000  3 5010 0  DSPRRLOS     CAF    PRIO5
 1286   REF  12  LAST  310   41,2001  0 5076 0               TC     FINDVAC
 1287   REF   3  LAST  311   E4,1571                         EBANK= RR-AZ
 1288   REF   1              41,2002   02000 0               2CADR  RRLOSDSP
 1288   REF   1              41,2003   60104 1
 1289   REF   3  LAST  292   41,2004  3 4731 0               CAF    PRIO4
 1290   REF   5  LAST  304   41,2005  0 5137 1               TC     PRIOCHNG
 1291   REF   1              41,2006  3 2017 0               CAF    V16N56
 1292   REF  59  LAST  308   41,2007  0 4607 1               TC     BANKCALL
 1293   REF   5  LAST  289   41,2010   20345 1               CADR   GOMARKER
 1294   REF   1              41,2011  0 5565 1               TC     B5OFF
 1295   REF   2  LAST  311   41,2012  0 5565 1               TC     B5OFF
 1296   REF   3  LAST  311   41,2013  0 5565 1               TC     B5OFF

 1297   REF  21  LAST  308   41,2014  3 4742 1               CAF    BIT3
 1298   REF  10  LAST  308   41,2015  0 5466 0               TC     BLANKET
 1299   REF  25  LAST  310   41,2016  0 5146 1               TC     ENDOFJOB

 12992                       41,2017   04070 1  V16N56       VN     1656


 12995  REF   1              40,2000                         SETLOC PINBALL1
 12996                       40,2000                         BANK

 1300                        40,2000  0 0006 1  RRLOSDSP     EXTEND
 1301   REF   5  LAST  215   40,2001  3 0036 1               DCA    CDUT
 1302   REF  42  LAST  302   40,2002  52 155 1               DXCH   MPAC
 1303   REF  11  LAST  309   40,2003  0 6060 1               TC     INTPRET
 1304                        40,2004   77624 1               CALL
 1305   REF   1              40,2005   46065 0                      RRNBMPAC         GET RR LOS IN BODY AXIS.
 1306                        40,2006   00001 0               STORE  0D               UNIT LOS
 1307                        40,2007   14007 0               STODL  6D
 1308   REF   1              40,2010   06505 1                      HI6ZEROS
 1309                        40,2011   24011 1               STOVL  8D
 1310                        40,2012   00007 0                      6D
 1311                        40,2013   77656 1               UNIT
 1312                        40,2014   00007 0               STORE  6D               UNIT OF LOS PROJ IN X-Z PLANE
 1313                        40,2015   77641 1               DOT
 1314   REF    3  LAST    38   40,2016   06477 0                UNITZ
 1315   REF    1               40,2017   24021 1         STOVL  COSTH         16D
 1316   REF    3  LAST    38   40,2020   06503 1                UNITX
 1317                          40,2021   77641 1         DOT
 1318                          40,2022   00007 0                6D
 1319   REF    1               40,2023   34023 1         STCALL SINTH         18D
 1320   REF    1               40,2024   47303 1                ARCTRIG
 1321                          40,2025   43244 1         BPL    DAD           INSURE DISPLAY OF 0 - 360 DEG.
 1322                          40,2026   60030 1                +2
 1323   REF    1               40,2027   06513 0                DPPOSMAX      INTRODUCES AN ERROR OF B-28 REVS.
 1324   REF    1               40,2030   26174 1         STOVL  RR-ELEV
 1325                          40,2031   00001 0                0D
 1326                          40,2032   77641 1         DOT
 1327   REF    2  LAST    38   40,2033   06501 0                UNITY
 1328   REF    2  LAST   312   40,2034   24023 0         STOVL  SINTH
 1329                          40,2035   00001 0                0D
 1330                          40,2036   77641 1         DOT
 1331                          40,2037   00007 0                6D
 1332   REF    2  LAST   312   40,2040   34021 0         STCALL COSTH
 1333   REF    2  LAST   312   40,2041   47303 1                ARCTRIG
 1334                          40,2042   43244 1         BPL    DAD           INSURE DISPLAY OF 0 - 360 DEG.
 1335                          40,2043   60045 0                +2
 1336   REF    2  LAST   312   40,2044   06513 0                DPPOSMAX      INTRODUCES AN ERROR OF B-28 REVS.
 1337   REF    4  LAST   311   40,2045   02172 1         STORE  RR-AZ
 1338                          40,2046   77776 1         EXIT
 1339   REF    3  LAST   283   40,2047  3 4770 0         CA     1SEC
 1340   REF   60  LAST   311   40,2050  0 4607 1         TC     BANKCALL
 1341   REF    7  LAST   291   40,2051   01736 1         CADR   DELAYJOB

 1342   REF   17  LAST   269   40,2052  3 4740 0         CA     BIT5
 1343   REF    7  LAST   276   40,2053  7 1043 0         MASK   EXTVBACT
 1344   REF   84  LAST   307   40,2054  10 000 0         CCS    A
 1345   REF    2  LAST   311   40,2055  0 2000 0         TC     RRLOSDSP
 1346   REF   24  LAST   308   40,2056  0 5474 0         TC     ENDEXT
```

```
L       PINBALL NOUN TABLES                                                              USER'S PAGE NO.   1      EO S4

P1000   THE FOLLOWING REFERS TO THE NOUN TABLES


R1001   COMPONENT CODE NUMBER           INTERPRETATION

R1002   00000                           1 COMPONENT
R1003   00001                           2 COMPONENT
R1004   00010                           3 COMPONENT
R1005   X1XXX                           BIT4 = 1. DECIMAL ONLY
R1006   1XXXX                           BIT5 = 1. NO LOAD
R1007   END OF COMPONENT CODE NUMBERS


R1008   SF ROUTINE CODE NUMBER          INTERPRETATION

R1009   00000    OCTAL ONLY
R1010   00001    STRAIGHT FRACTIONAL
R1011   00010    CDU DEGREES (XXX.XX)
R1012   00011    ARITHMETIC SF
R1013   00100    ARITH DP1   OUT(MULT BY 2EXP14 AT END)    IN(STRAIGHT)
R1014   00101    ARITH DP2   OUT(STRAIGHT)                 IN(SL 7 AT END)
R1015   00110    LANDING RADAR POSITION (+0000X)
R1016   00111    ARITH DP3   OUT ( SL 7 AT END)       IN ( STRAIGHT)
R1017   01000    WHOLE HOURS IN R1, WHOLE MINUTES (MOD 60) IN R2,
R1018               SECONDS (MOD 60) 0XX.XX IN R3. *** ALARMS IF USED WITH OCTAL
R1019   01001    MINUTES (MOD 60) IN D1D2, D3 BLANK, SECONDS (MOD 60) IN D4D5
R1020                           LIMITS TO 59B59 IF MAG EXCEEDS THIS VALUE.
R1021                           ALARMS IF USED WITH OCTAL  ********  IN (ALARM)
R1022   01010    ARITH DP4   OUT (STRAIGHT)                  IN (SL 3 AT END)
R10221  01011    ARITH1 SF   OUT(MULT BY 2EXP14 AT END)    IN(STRAIGHT)
R10222  01100    2 INTEGERS IN D1D2, D4D5, D3 BLANK.
R10223                          ALARMS IF USED WITH OCTAL  ********  IN (ALARM)
R10224  01101    360-CDU DEGREES (XXX.XX)
R10225  01110    RR RANGE       15 BIT MAG TO DP, THEN SCALE *******  IN (ALARM)
R10226  01111    RR RANGE RATE  15 BIT MAG TO DP, THEN SCALE *******  IN (ALARM)
R1023   END OF SF ROUTINE CODE NUMBERS


R1024   SF CONSTANT CODE NUMBER.        INTERPRETATION

R1025   00000                           WHOLE                          USE ARITH
R1026   00000                           DP TIME SEC (XXX.XX SEC)     USE ARITHDP1
R10265  00000                           LR POSITION (+0000X)      USE LR POSITION
R1027   00001                           SPARE
R1028   00010                           CDU DEGREES               USE CDU DEGREES
R1029   00010                           360-CDU DEGREES      USE 360-CDU DEGREES
R1030   00011                           DP DEGREES (90) XX.XXX DEG  USE ARITHDP3
R1031   00100                           DP DEGREES (360) XXX.XX DEG USE ARITHDP4
R1032   00101                           DEGREES (180) XXX.XX DEG    USE ARITH
R10321  00101                           OPTICAL TRACKER AZIMUTH ANGLE(XXX.XXDEG)
```

```
R10322                                                              USE ARITHDP1
R1034   00110                           WEIGHT2 (XXXXX. LBS)        USE ARITH1
R1035   00111                           POSITION5 (XXX.XX NAUTICAL MILES)
R10351                                                              USE ARITHDP1
R1037   01000                           POSITION4 (XXXX.X NAUTICAL MILES)
R10371                                                              USE ARITHDP3
R1038   01001                           VELOCITY2 (XXXXX. FT/SEC)   USE ARITHDP4
R1039   01010                           VELOCITY3 (XXXX.X FT/SEC)   USE ARITHDP3
R1040   01011                           ELEVATION DEGREES(89.999MAX) USE ARITH
R1041   01100                           RENDEZVOUS RADAR RANGE (XXX.XX NAUT MI)
R1042                                                               USE RR RANGE
R1043   01101                           RENDEZVOUS RADAR RANGE RATE(XXXX.XFT/SEC
R1044                                                          USE RR RANGE RATE
R1045   01110                           LANDING RADAR ALTITUDE(XXXXX.FEET)
R1046                                                               USE ARITHDP1
R1047   01111                           INITIAL/FINAL ALTITUDE(XXXXX.FEET)
R1048                                                               USE ARITHDP1
R1049   10000                           ALTITUDE RATE(XXXXX.FT/SEC)    USE ARITH
R1050   10001                           FORWARD/LATERAL VELOCITY(XXXXX.FEET/SEC)
R1051                                                                  USE ARITH
R1052   10010                           ROTATIONAL HAND CONTROLLER ANGLE RATES
R1053                                         XXXXX.DEG/SEC            USE ARITH
R1054   10011                           LANDING RADAR VELX(XXXXX.FEET/SEC)
R1055                                                               USE ARITHDP1
R1056   10100                           LANDING RADAR VELY(XXXXX.FEET/SEC)
R1057                                                               USE ARITHDP1
R1058   10101                           LANDING RADAR VELZ(XXXXX.FEET/SEC)
R1059                                                               USE ARITHDP1
R1060   10110                           POSITION7 (XXXX.X NAUT MI)  USE ARITHDP4
R10601  10111                           TRIM DEGREES2 (XXX.XX DEG)  USE ARITH
R1061   11000                           COMPUTED ALTITUDE (XXXXX. FEET)
R106101                                                             USE ARITHDP1
R106102 11001                           DP DEGREES (XXXX.X DEG)     USE ARITHDP3
R106103 11010                           POSITION9 (XXXXX. FT)       USE ARITHDP3
R106104 11011                           VELOCITY4 (XXXX.X FT/SEC)   USE ARITHDP2
R106105 11100                           RADIANS (XX.XXX RADIANS)    USE ARITHDP4
R106106 11101                           VELOCITY5 (XXXX.X FT/SEC)   USE ARITHDP3
R1062   END OF SF CONSTANT CODE NUMBERS


R1063   FOR GREATER THAN SINGLE PRECISION SCALES, PUT ADDRESS OF MAJOR PART INTO
R1064   NOUN TABLES.
R1065   OCTAL LOADS PLACE +0 INTO MAJOR PART, DATA INTO MINOR PART.
R1066   OCTAL DISPLAYS SHOW MINOR PART ONLY.
R1067   TO GET AT BOTH MAJOR AND MINOR PARTS(IN OCTAL), USE NOUN 01.


R1068   A NOUN MAY BE DECLARED :DECIMAL ONLY: BY MAKING BIT4=1 OF ITS COMPONENT
R1069   CODE NUMBER. IF THIS NOUN IS USED WITH ANY OCTAL DISPLAY VERB, OR IF
R1070   DATA IS LOADED IN OCTAL, IT ALARMS.
```

```
R1071   IN LOADING AN :HOURS, MINUTES, SECONDS: NOUN, ALL 3 WORDS MUST BE
R1072   LOADED, OR ALARM.
R1073   ALARM IF AN ATTEMPT IS MADE TO LOAD :SPLIT MINUTES/SECONDS: (MMBSS).
R1074   THIS IS USED FOR DISPLAY ONLY.
```

```
R1075   THE FOLLOWING ROUTINES ARE FOR READING THE NOUN TABLES AND THE SF TABLES
R1076   (WHICH ARE IN A SEPARATE BANK FROM THE REST OF PINBALL). THESE READING
R1077   ROUTINES ARE IN THE SAME BANK AS THE TABLES. THEY ARE CALLED BY DXCH Z.


R1078   LODNNTAB LOADS NNADTEM WITH THE NNADTAB ENTRY, NNTYPTEM WITH THE
R1079   NNTYPTAB ENTRY. IF THE NOUN IS MIXED, IDAD1TEM IS LOADED WITH THE FIRST
R1080   IDADDTAB ENTRY, IDAD2TEM THE SECOND IDADDTAB ENTRY, IDAD3TEM THE THIRD
R1081   IDADDTAB ENTRY, RUTMXTEM WITH THE RUTMXTAB ENTRY. MIXBR IS SET FOR
R1082   MIXED OR NORMAL NOUN.

 1200                             06,3333                        BANK    6
 12002  REF    2  LAST  293       42,2000                        SETLOC  PINBALL3
 12003                            42,2110                        BANK
 12005  REF    1                                                 COUNT*  $$/NOUNS
 1201   REF    1                  42,2110   52 152 0  LODNNTAB   DXCH    IDAD2TEM         SAVE RETURN INFO IN IDAD2TEM, IDAD3TEM.
 1202   REF    3  LAST  280       42,2111   51'001 1             INDEX   NOUNREG
 1203   REF    1                  42,2112   3 2161 0             CAF     NNADTAB
 1204   REF    1                  42,2113   54 146 0             TS      NNADTEM
 1205   REF    4  LAST  316       42,2114   51'001 1             INDEX   NOUNREG
 1206   REF    1                  42,2115   3 2325 1             CAF     NNTYPTAB
 1207   REF    1                  42,2116   54 147 1             TS      NNTYPTEM
 1208   REF    5  LAST  316       42,2117   4 1001 0             CS      NOUNREG
 1209   REF    1                  42,2120   6 4762 0             AD      MIXCON
 1210                             42,2121   0 0006 1             EXTEND
 1211   REF    1                  42,2122   6 2126 0             BZMF    LODMIXNN         NOUN NUMBER G/E FIRST MIXED NOUN
 1212   REF   15  LAST  290       42,2123   3 4744 1             CAF     ONE              NOUN NUMBER L/ FIRST MIXED NOUN
 1213   REF    1                  42,2124   54 140 0             TS      MIXBR            NORMAL.  +1 INTO MIXBR.
 1214   REF    1                  42,2125   0 2144 1             TC      LODNLV
 1215   REF   12  LAST  294       42,2126   3 4743 0  LODMIXNN   CAF     TWO              MIXED.  +2 INTO MIXBR.
 1216   REF    2  LAST  316       42,2127   54 140 0             TS      MIXBR
 1217   REF    6  LAST  316       42,2130   51'001 1             INDEX   NOUNREG
 1218   REF    1                  42,2131   3 3075 0             CAF     RUTMXTAB -40D    FIRST MIXED NOUN = 40.
 1219   REF    1                  42,2132   54 153 1             TS      RUTMXTEM
 1220   REF    2  LAST  244       42,2133   3 5003 1             CAF     LOW10
 1221   REF    2  LAST  316       42,2134   7 0146 0             MASK    NNADTEM
 1222   REF   26  LAST  294       42,2135   54 002 1             TS      Q                TEMP
 1223   REF   85  LAST  312       42,2136   50 000 1             INDEX   A
 1224   REF    1                  42,2137   3 2661 1             CAF     IDADDTAB
 1225   REF    1                  42,2140   54 150 1             TS      IDAD1TEM         LOAD IDAD1TEM WITH FIRST IDADDTAB ENTRY
 1226                             42,2141   0 0006 1             EXTEND
 1227   REF   27  LAST  316       42,2142   5 0002 0             INDEX   Q                LOAD IDAD2TEM WITH 2ND IDADDTAB ENTRY
 1228   REF    2  LAST  316       42,2143   3 2663 0             DCA     IDADDTAB +1      LOAD IDAD3TEM WITH 3RD IDADDTAB ENTRY.
 1229   REF    2  LAST  316       42,2144   52 152 0  LODNLV     DXCH    IDAD2TEM         PUT RETURN INFO INTO A, L.
 1230   REF    1                  42,2145   52 006 0             DXCH    Z

 1231   REF    2  LAST  231          4762             MIXCON     =       OCT50            (DEC 40)
R1232   GTSFOUT LOADS SFTEMP1, SFTEMP2 WITH THE DP SFOUTAB ENTRIES.

 1233   REF    1                  42,2146   52 124 1  GTSFOUT    DXCH    SFTEMP1          2X(SFCONUM) ARRIVES IN SFTEMP1.
 1234                          42,2147  0 0006 1            EXTEND
 1235   REF  86  LAST  316     42,2150  5 0000 1            INDEX   A
 1236   REF   1                42,2151  3 2566 0            DCA     SFOUTAB
 1237   REF   2  LAST  316     42,2152  52 124 1  SFCOM     DXCH    SFTEMP1
 1238   REF   2  LAST  316     42,2153  52 006 0            DXCH    Z

R1239   GTSFIN LOADS SFTEMP1, SFTEMP2 WITH THE DP SFINTAB ENTRIES.

 1240   REF   3  LAST  317     42,2154  52 124 1  GTSFIN    DXCH    SFTEMP1          2X(SFCONUM) ARRIVES IN SFTEMP1.
 1241                          42,2155  0 0006 1            EXTEND
 1242   REF  87  LAST  317     42,2156  5 0000 1            INDEX   A
 1243   REF   1                42,2157  3 2472 1            DCA     SFINTAB
 1244   REF   1                42,2160  1 2152 1            TCF     SFCOM


A1400                                                                                NN  NORMAL NOUNS
 1401                          42,2161   00000 1  NNADTAB   OCT     00000            00 NOT IN USE
 1402                          42,2162   40000 0            OCT     40000            01 SPECIFY MACHINE ADDRESS (FRACTIONAL)
 1403                          42,2163   40000 0            OCT     40000            02 SPECIFY MACHINE ADDRESS (WHOLE)
 1404                          42,2164   40000 0            OCT     40000            03 SPECIFY MACHINE ADDRESS (DEGREES)
 1405   REF   5  LAST  289     42,2165   01044 0            ECADR   DSPTEM1          04 ANGULAR ERROR/DIFFERENCE
 1406   REF   6  LAST  317     42,2166   01044 0            ECADR   DSPTEM1          05 ANGULAR ERROR/DIFFERENCE
 1407   REF   1                42,2167   01143 0            ECADR   OPTION1          06 OPTION CODE
 1408   REF   1                42,2170   01002 1            ECADR   XREG             07 ECADR OF WORD TO BE MODIFIED
A14081                                                                                  ONES FOR BITS TO BE MODIFIED
A14082                                                                                  1 TO SET OR 0 TO RESET SELECTED BITS
 1409   REF   6  LAST  216     42,2171   01363 0            ECADR   ALMCADR          08 ALARM DATA
 1410   REF   5  LAST  222     42,2172   00375 0            ECADR   FAILREG          09 ALARM CODES
 1411                          42,2173   77776 1            OCT     77776            10 CHANNEL TO BE SPECIFIED
 1412   REF   3  LAST  210     42,2174   03633 1            ECADR   TCSI             11 TIG OF CSI (HRS,MIN,SEC)
 1413   REF   7  LAST  289     42,2175   01050 0            ECADR   OPTIONX          12 OPTION CODE
A14131                                                                                      (USED BY EXTENDED VERBS ONLY)
 1414   REF   3  LAST  210     42,2176   01774 1            ECADR   TCDH             13 TIG OF CDH (HRS,MIN,SEC)
 1415   REF   4  LAST  219     42,2177   01050 0            ECADR   DSPTEMX          14 CHECKLIST
A14151                                                                                      (USED BY EXTENDED VERBS ONLY)
 1416                          42,2200   77777 0            OCT     77777            15 INCREMENT MACHINE ADDRESS
 1417   REF   5  LAST  317     42,2201   01050 0            ECADR   DSPTEMX          16 TIME OF EVENT (HRS,MIN,SEC)
 1418                          42,2202   00000 1            OCT     00000            17 SPARE
 1419   REF   1                42,2203   02335 0            ECADR   FDAIX            18 AUTO MANEUVER BALL ANGLES
 1420                          42,2204   00000 1            OCT     00000            19 SPARE
 1421   REF   8  LAST  269     42,2205   00032 0            ECADR   CDUX             20 ICDU ANGLES
 1422   REF   4  LAST  211     42,2206   00037 0            ECADR   PIPAX            21 PIPAS
 1423   REF  10  LAST  294     42,2207   00321 1            ECADR   THETAD           22 NEW ICDU ANGLES
 1424                          42,2210   00000 1            OCT     00000            23 SPARE
 1425   REF   3  LAST  287     42,2211   01050 0            ECADR   DSPTEM2 +1       24 DELTA TIME FOR AGC CLOCK(HRS,MIN,SEC)
 1426   REF   7  LAST  317     42,2212   01044 0            ECADR   DSPTEM1          25 CHECKLIST
A14261                                                                                      (USED WITH PLEASE PERFORM ONLY)
 1427   REF   2  LAST  124     42,2213   02371 0            ECADR   N26/PRI          26 PRIO/DELAY, ADRES, BBCON
 1428   REF   4  LAST  302     42,2214   01362 1            ECADR   SMODE            27 SELF TEST ON/OFF SWITCH
 1429                         42,2215   00000 1         OCT     00000           28 SPARE
 1430                         42,2216   00000 1         OCT     00000           29 SPARE
 1431                         42,2217   00000 1         OCT     0               30 SPARE
 1432                         42,2220   00000 1         OCT     0               31 SPARE
 1433     REF   1             42,2221   02133 1         ECADR   -TPER           32 TIME TO PERIGEE (HRS,MIN,SEC)
 1434     REF   8  LAST  296  42,2222   03441 0         ECADR   TIG             33 TIME OF IGNITION (HRS,MIN(SEC)
 1435     REF   8  LAST  317  42,2223   01044 0         ECADR   DSPTEM1         34 TIME OF EVENT (HRS,MIN,SEC)
 1436     REF   8  LAST  252  42,2224   03453 0         ECADR   TTOGO           35 TIME TO GO TO EVENT (HRS,MIN,SEC)
 1437     REF  11  LAST  287  42,2225   00024 1         ECADR   TIME2           36 TIME OF AGC CLOCK (HRS,MIN,SEC)
 1438     REF   3  LAST  210  42,2226   03635 1         ECADR   TTPI            37 TIG OF TPI (HRS,MIN,SEC)
 1439     REF   5  LAST  214  42,2227   01516 1         ECADR   TET             38 TIME OF STATE BEING INTEGRATED
 1440                         42,2230   00000 1         OCT     00000           39 SPARE
R14401    END OF NNADTAB FOR NORMAL NOUNS


A14402                                                                          NN  MIXED NOUNS
 1441                         42,2231   64000 0         OCT     64000           40 TIME TO IGNITION/CUTOFF
A14411                                                                             VG
A14412                                                                             DELTA V (ACCUMULATED)
 1442                         42,2232   02003 0         OCT     02003           41 TARGET  AZIMUTH
A14421                                                                                    ELEVATION
 1443                         42,2233   24006 1         OCT     24006           42 APOGEE
A14431                                                                             PERIGEE
A14432                                                                             DELTA V (REQUIRED)
 1444                         42,2234   24011 1         OCT     24011           43 LATITUDE
A14441                                                                             LONGITUDE
A14442                                                                             ALTITUDE
 1445                         42,2235   64014 0         OCT     64014           44 APOGEE
A14451                                                                             PERIGEE
A14452                                                                             TFF
 1446                         42,2236   64017 0         OCT     64017           45 MARKS
A14461                                                                             TTI OF NEXT BURN
A14462                                                                             MGA
 1447                         42,2237   02022 0         OCT     02022           46 AUTOPILOT CONFIGURATION
A14471                                                                             CHANNEL BIT FAILURE PROTECTION WORD
 1448                         42,2240   22025 0         OCT     22025           47 LEM WEIGHT
A14481                                                                             CSM WEIGHT
 1449                         42,2241   22030 1         OCT     22030           48 GIMBAL PITCH TRIM
A14491                                                                             GIMBAL ROLL TRIM
 1450                         42,2242   24033 1         OCT     24033           49 DELTA R
A14501                                                                             DELTA V
A14502                                                                             RADAR DATA SOURCE CODE
 1451                         42,2243   00000 1         OCT     0               50 SPARE
 1452                         42,2244   22041 1         OCT     22041           51 S-BAND ANTENNA PITCH
A14521                                                                                           YAW
 1453                         42,2245   00044 1         OCT     00044           52 CENTRAL ANGLE OF ACTIVE VEHICLE
 1454                         42,2246   00000 1         OCT     00000           53 SPARE
 1455                         42,2247   24052 0         OCT     24052           54 RANGE
A14551                                                                             RANGE RATE
A14552                                                                             THETA
```

```
 1458                     42,2250   24055 1         OCT     24055         55 NO. OF APSIDAL CROSSINGS
A14581                                                                       ELEVATION ANGLE
A14582                                                                       CENTRAL ANGLE
 1459                     42,2251   02060 0         OCT     02060         56 RR LOS AZIMUTH
A14591                                                                              ELEVATION
 1460                     42,2252   00000 1         OCT     00000         57 SPARE
 1461                     42,2253   24066 1         OCT     24066         58 PERIGEE ALT
A14611                                                                       DELTA V TPI
A14612                                                                       DELTA V TPF
 1462                     42,2254   24071 1         OCT     24071         59 DELTA VELOCITY LOS
 1463                     42,2255   24074 1         OCT     24074         60 FORWARD VELOCITY
A14631                                                                       ALTITUDE RATE
A14632                                                                       COMPUTED ALTITUDE
 1464                     42,2256   64077 0         OCT     64077         61 TIME TO GO IN BRAKING PHASE
A14641                                                                       TIME TO IGNITION
A14642                                                                       CROSS RANGE DISTANCE
 1465                     42,2257   64102 0         OCT     64102         62 ABSOLUTE VALUE OF VELOCITY
A14651                                                                       TIME TO IGNITION
A14652                                                                       DELTA V (ACCUMULATED)
 1466                     42,2260   24105 0         OCT     24105         63 LR ALTITUDE MINUS COMPUTED ALTITUDE
A14661                                                                       ALTITUDE RATE
A14662                                                                       COMPUTED ALTITUDE
 1467                     42,2261   64110 0         OCT     64110         64 TIME LEFT FOR REDESIGNATION-LPD ANGLE
A14671                                                                       ALTITUDE RATE
A14672                                                                       COMPUTED ALTITUDE
 1468                     42,2262   24113 1         OCT     24113         65 SAMPLED AGC TIME (HRS,MIN,SEC)
A14681                                                                       (FETCHED IN INTERRUPT)
 1470                     42,2263   62116 0         OCT     62116         66 LR RANGE
A14701                                                                          POSITION
 1471                     42,2264   04121 1         OCT     04121         67 LRVX
A14711                                                                       LRVY
A14712                                                                       LRVZ
 1472                     42,2265   64124 1         OCT     64124         68 SM Z-AXIS RANGE TO LANDING SITE
A14721                                                                       TIME TO GO IN BRAKING PHASE
A14722                                                                       ABSOLUTE VALUE OF VELOCITY
 1473                     42,2266   24127 0         OCT     24127         69 LANDING SITE CORRECTION, Z-COMPONENT
A14731                                                                       LANDING SITE CORRECTION, Y-COMPONENT
A14732                                                                       LANDING SITE CORRECTION, X-COMPONENT
 1474                     42,2267   04132 0         OCT     04132         70 AOT DETENT CODE/STAR CODE
 1475                     42,2270   04135 1         OCT     04135         71 AOT DETENT CODE/STAR CODE
 1476                     42,2271   02140 0         OCT     02140         72 RR  360 - TRUNNION ANGLE
A14761                                                                           SHAFT ANGLE
 1477                     42,2272   02143 0         OCT     02143         73 NEW RR  360 - TRUNNION ANGLE
A14771                                                                               SHAFT ANGLE
 1478                     42,2273   64146 0         OCT     64146         74 TIME TO IGNITION
A14781                                                                       YAWAFTER VEHICLE RISE
A14782                                                                       PITCH AFTER VEHICLE RISE
 1479                     42,2274   64151 0         OCT     64151         75 DELTA ALTITUDE CDH
A14791                                                                       DELTA TIME (CDH-CSI OR TPI-CDH)
A14792                                                                       DELTA TIME (TPI-CDH OR TPI-NOMTPI)
```

```
 1480                    42,2275   24154 1          OCT     24154          76 DESIRED HORIZONTAL VELOCITY
A14801                                                                        DESIRED RADIAL VELOCITY
A14802                                                                        CROSS-RANGE DISTANCE
 1481                    42,2276   64157 0          OCT     64157          77 TIME TO ENGINE CUTOFF
A14811                                                                        VGY (BODY)
A14812                                                                        ABSOLUTE VALUE OF VELOCITY
 1482                    42,2277   64162 0          OCT     64162          78 RR RANGE
A14821                                                                           RANGE RATE
A14822                                                                        TIME FROM IGNITION
 1483                    42,2300   24165 0          OCT     24165          79 CURSOR ANGLE
A14831                                                                        SPIRAL ANGLE
A14832                                                                        POSITION CODE
 1484                    42,2301   02170 0          OCT     02170          80 DATA INDICATOR
A14841                                                                        OMEGA
 1485                    42,2302   24173 1          OCT     24173          81 DELTA V (LV)
 1486                    42,2303   24176 1          OCT     24176          82 DELTA V (LV)
 1487                    42,2304   24201 1          OCT     24201          83 DELTA V (BODY)
 1488                    42,2305   24204 1          OCT     24204          84 DELTA V (OTHER VEHICLE)
 1489                    42,2306   24207 1          OCT     24207          85 VG (BODY)
 1490                    42,2307   24212 0          OCT     24212          86 VG (LV)
 1491                    42,2310   02215 0          OCT     02215          87 BACKUP OPTICS LOS AZIMUTH
A14911                                                                                          ELEVATION
 1492                    42,2311   24220 1          OCT     24220          88 HALF UNIT SUN OR PLANET VECTOR
 1493                    42,2312   24223 1          OCT     24223          89 LANDMARK LATITUDE
A14931                                                                                 LONGITUDE/2
A14932                                                                                 ALTITUDE
 1494                    42,2313   24226 1          OCT     24226          90 Y
A14941                                                                        Y DOT
A14942                                                                        PSI
 1495                    42,2314   04231 0          OCT     04231          91 ALTITUDE
A14951                                                                        VELOCITY
A14952                                                                        FLIGHT PATH ANGLE
 1496                    42,2315   04234 0          OCT     04234          92 PCT FTP(10.5KLB) AT PRESENT THRUST
A14961                                                                        ALTITUDE RATE
A14962                                                                        COMPUTED ALTITUDE
 1497                    42,2316   04237 0          OCT     04237          93 DELTA GYRO ANGLES
 1498                    42,2317   64242 1          OCT     64242          94 VGX (BODY)
A14981                                                                        ALTITUDE RATE
A14962                                                                        COMPUTED ALTITUDE
 1499                    42,2320   00000 1          OCT     0              95 SPARE
 1500                    42,2321   00000 1          OCT     0              96 SPARE
 1501                    42,2322   04253 1          OCT     04253          97 SYSTEM TEST INPUTS
 1502                    42,2323   04256 1          OCT     04256          98 SYSTEM TEST RESULTS
 1503                    42,2324   24261 1          OCT     24261          99 RMS IN POSITION
A15031                                                                        RMS IN VELOCITY
A15032                                                                        RMS IN BIAS
R1504    END OF NNAOTAB FOR MIXED NOUNS


A1800                                                                  NN          NORMAL NOUNS
```

```
 1801                   42,2325   00000 1  NNTYPTAB OCT     00000          00 NOT IN USE
 1802                   42,2326   04040 1           OCT     04040          01 3COMP  FRACTIONAL
 1803                   42,2327   04140 0           OCT     04140          02 3COMP  WHOLE
 1804                   42,2330   04102 0           OCT     04102          03 3COMP  CDU DEGREES
 1805                   42,2331   00504 0           OCT     00504          04 1COMP  DPDEG(360)
 1806                   42,2332   00504 0           OCT     00504          05 1COMP  DPDEG(360)
 1807                   42,2333   04000 0           OCT     04000          06 3COMP  OCTAL ONLY
 1808                   42,2334   04000 0           OCT     04000          07 3COMP  OCTAL ONLY
 1809                   42,2335   04000 0           OCT     04000          08 3COMP  OCTAL ONLY
 1810                   42,2336   04000 0           OCT     04000          09 3COMP  OCTAL ONLY
 1811                   42,2337   00000 1           OCT     00000          10 1COMP  OCTAL ONLY
 1812                   42,2340   24400 0           OCT     24400          11 3COMP  HMS (DEC ONLY)
 1813                   42,2341   02000 0           OCT     02000          12 2COMP  OCTAL ONLY
 1814                   42,2342   24400 0           OCT     24400          13 3COMP  HMS (DEC ONLY)
 1815                   42,2343   04140 0           OCT     04140          14 3COMP  WHOLE
 1816                   42,2344   00000 1           OCT     00000          15 1COMP  OCTAL ONLY
 1817                   42,2345   24400 0           OCT     24400          16 3COMP  HMS (DEC ONLY)
 1818                   42,2346   00000 1           OCT     0              17       SPARE
 1819                   42,2347   04102 0           OCT     04102          18 3COMP  CDU DEG
 1820                   42,2350   00000 1           OCT     00000          19        SPARE
 1821                   42,2351   04102 0           OCT     04102          20 3COMP  CDU DEGREES
 1822                   42,2352   04140 0           OCT     04140          21 3COMP  WHOLE
 1823                   42,2353   04102 0           OCT     04102          22 3COMP  CDU DEGREES
 1824                   42,2354   00000 1           OCT     00000          23        SPARE
 1825                   42,2355   24400 0           OCT     24400          24 3COMP  HMS (DEC ONLY)
 1826                   42,2356   04140 0           OCT     04140          25 3COMP  WHOLE
 1827                   42,2357   04000 0           OCT     04000          26 3COMP  OCTAL ONLY
 1828                   42,2360   00140 1           OCT     00140          27 1COMP  WHOLE
 1829                   42,2361   00000 1           OCT     00000          28        SPARE
 1830                   42,2362   00000 1           OCT     00000          29        SPARE
 1831                   42,2363   00000 1           OCT     0              30 SPARE
 1832                   42,2364   00000 1           OCT     0              31 SPARE
 1833                   42,2365   24400 0           OCT     24400          32 3COMP  HMS (DEC ONLY)
 1834                   42,2366   24400 0           OCT     24400          33 3COMP  HMS (DEC ONLY)
 1835                   42,2367   24400 0           OCT     24400          34 3COMP  HMS (DEC ONLY)
 1836                   42,2370   24400 0           OCT     24400          35 3COMP  HMS (DEC ONLY)
 1837                   42,2371   24400 0           OCT     24400          36 3COMP  HMS (DEC ONLY)
 1838                   42,2372   24400 0           OCT     24400          37 3COMP  HMS (DEC ONLY)
 1839                   42,2373   24400 0           OCT     24400          38 3COMP  HMS (DEC ONLY)
 1840                   42,2374   00000 1           OCT     00000          39        SPARE
R18401  END OF NNTYPTAB FOR NORMAL NOUNS


A18402                                                                     NN   MIXED NOUNS
 1841                   42,2375   24500 1           OCT     24500          40 3COMP  MIN/SEC, VEL3, VEL3
A18411                                                                               (NO LOAD, DEC ONLY)
 1842                   42,2376   00542 1           OCT     00542          41 2COMP  CDU DEG, ELEV DEG
 1843                   42,2377   24410 1           OCT     24410          42 3COMP  POS4, POS4, VEL3
A18431                                                                               (DEC ONLY)
 1844                   42,2400   20204 0           OCT     20204          43 3COMP  DPDEG(360), DPDEG(360), POS4
```

```
A18441                                                                       (DEC ONLY)
 1845                   42,2401   00410 1        OCT     00410          44 3COMP  POS4, POS4, MIN/SEC
A18451                                                                       (NO LOAD, DEC ONLY)
 1846                   42,2402   10000 0        OCT     10000          45 3COMP  WHOLE, MIN/SEC, DPDEG(360)
A18461                                                                       (NO LOAD, DEC ONLY)
 1847                   42,2403   00000 1        OCT     00000          46 2COMP  OCTAL ONLY
 1848                   42,2404   00306 1        OCT     00306          47 2COMP WEIGHT2 FOR EACH
A18481                                                                       (DEC ONLY)
 1849                   42,2405   01367 1        OCT     01367          48 2COMP  TRIM DEG2 FOR EACH
A18491                                                                       (DEC ONLY)
 1850                   42,2406   00507 0        OCT     00507          49 3COMP  POS5, VEL3, WHOLE
A18501                                                                       (DEC ONLY)
 1851                   42,2407   00000 1        OCT     0              50        SPARE
 1852                   42,2410   00204 1        OCT     00204          51 2COMP  DPDEG(360), DPDEG(360)
A18521                                                                       (DEC ONLY)
 1853                   42,2411   00004 0        OCT     00004          52 1COMP  DPDEG(360)
 1854                   42,2412   00000 1        OCT     00000          53        SPARE
 1855                   42,2413   10507 1        OCT     10507          54 3COMP  POS5, VEL3, DPDEG(360)
A18551                                                                       (DEC ONLY)
 1858                   42,2414   10200 1        OCT     10200          55 3COMP  WHOLE, DPDEG(360), DPDEG(360)
A18581                                                                       (DEC ONLY)
 1859                   42,2415   00204 1        OCT     00204          56 2COMP  DPDEG(360), DPDEG(360)
 1860                   42,2416   00000 1        OCT     00000          57        SPARE
A18601                                                                       (DEC ONLY)
 1861                   42,2417   24510 0        OCT     24510          58 3COMP  POS4, VEL3, VEL3
A18611                                                                       (DEC ONLY)
 1862                   42,2420   24512 1        OCT     24512          59 3COMP  VEL3 FOR EACH
A18621                                                                       (DEC ONLY)
 1863                   42,2421   60535 1        OCT     60535          60 3COMP  VEL5, VEL3, COMP ALT
A18631                                                                       (DEC ONLY)
 1864                   42,2422   54000 0        OCT     54000          61 3COMP  MIN/SEC, MIN/SEC, POS7
A18641                                                                       (NO LOAD, DEC ONLY)
 1865                   42,2423   24012 1        OCT     24012          62 3COMP  VEL3, MIN/SEC, VEL3
A18651                                                                       (NO LOAD, DEC ONLY)
 1866                   42,2424   60530 1        OCT     60530          63 3COMP  COMP ALT, VEL3, COMP ALT
A18661                                                                       (DEC ONLY)
 1867                   42,2425   60500 1        OCT     60500          64 3COMP  2INT, VEL3, COMP ALT
A18671                                                                       (NO LOAD, DEC ONLY)
 1868                   42,2426   00000 1        OCT     00000          65 3COMP  HMS (DEC ONLY)
 1869                   42,2427   00016 0        OCT     00016          66 2COMP  LANDING RADAR ALT, POSITION
A18691                                                                       (NO LOAD, DEC ONLY)
 1870                   42,2430   53223 1        OCT     53223          67 3COMP LANDING RADAR VELX, Y, Z
 1871                   42,2431   24026 0        OCT     24026          68 3COMP  POS7, MIN/SEC, VEL3
A18711                                                                       (NO LOAD, DEC ONLY)
 1872                   42,2432   61430 1        OCT     61430          69 3COMP  COMP ALT, COMP ALT, COMP ALT
A18721                                                                       (DEC ONLY)
 1873                   42,2433   00000 1        OCT     0              70 3COMP  OCTAL ONLY FOR EACH
 1874                   42,2434   00000 1        OCT     0              71 3COMP  OCTAL ONLY FOR EACH
 1875                   42,2435   00102 1        OCT     00102          72 2COMP  360-CDU DEG, CDU DEG
 1876                   42,2436   00102 1        OCT     00102          73 2COMP  360-CDU DEG, CDU DEG
```

```
  1877                    42,2437   10200 1            OCT     10200          74 3COMP   MIN/SEC, DPDEG(360),DPDEG(360)
 A18771                                                                                  (NO LOAD, DEC ONLY)
  1878                    42,2440   00010 0            OCT     00010          75 3COMP   POS4, MIN/SEC, MIN/SEC
 A18781                                                                                  (NO LOAD, DEC ONLY)
  1879                    42,2441   20512 0            OCT     20512          76 3COMP   VEL3, VEL3, POS4
 A18791                                                                                  (DEC ONLY)
  1880                    42,2442   24500 1            OCT     24500          77 3COMP   MIN/SEC, VEL3, VEL3
 A18801                                                                                  (NO LOAD, DEC ONLY)
  1881                    42,2443   00654 0            OCT     00654          78 3COMP   RR RANGE, RR RANGE RATE, M/S
 A18811                                                                                  (NO LOAD, DEC ONLY)
  1882                    42,2444   00102 1            OCT     00102          79 3COMP   CDU DEG, CDU DEG, WHOLE
 A18821                                                                                  (DEC ONLY)
  1883                    42,2445   00200 0            OCT     00200          80 2COMP   WHOLE, DPDEG(360)
  1884                    42,2446   24512 1            OCT     24512          81 3COMP   VEL3 FOR EACH
 A18841                                                                                  (DEC ONLY)
  1885                    42,2447   24512 1            OCT     24512          82 3COMP   VEL3 FOR EACH
 A18851                                                                                  (DEC ONLY)
  1886                    42,2450   24512 1            OCT     24512          83 3COMP   VEL3 FOR EACH
 A18861                                                                                  (DEC ONLY)
  1887                    42,2451   24512 1            OCT     24512          84 3COMP   VEL3 FOR EACH
 A18871                                                                                  (DEC ONLY)
  1888                    42,2452   24512 1            OCT     24512          85 3COMP   VEL3 FOR EACH
 A18881                                                                                  (DEC ONLY)
  1889                    42,2453   24512 1            OCT     24512          86 3COMP   VEL3 FOR EACH
 A18891                                                                                  (DEC ONLY)
  1890                    42,2454   00102 1            OCT     00102          87 2COMP   CDU DEG FOR EACH
  1891                    42,2455   00000 1            OCT     0              88 3COMP   FRAC FOR EACH
 A18912                                                                                   (DEC ONLY)
  1892                    42,2456   16143 0            OCT     16143          89 3COMP   DPDEG(90), DPDEG(90), POS5
 A18921                                                                                  (DEC ONLY)
  1893                    42,2457   10507 1            OCT     10507          90 3COMP   POS5, VEL3, DPDEG(360)
 A18931                                                                                  (DEC ONLY)
  1894                    42,2460   10450 1            OCT     10450          91 3COMP   POS4, VEL2, DPDEG(360)
  1895                    42,2461   60500 1            OCT     60500          92 3COMP   WHOLE, VEL3, COMP ALT
  1896                    42,2462   06143 1            OCT     06143          93 3COMP   DPDEG(90) FOR EACH
  1897                    42,2463   60512 1            OCT     60512          94 3COMP   VEL3, VEL3, COMP ALT
 A18971                                                                                   (NO LOAD, DEC ONLY)
  1898                    42,2464   00000 1            OCT     0              95         SPARE
  1899                    42,2465   00000 1            OCT     0              96         SPARE
  1900                    42,2466   00000 1            OCT     00000          97 3COMP   WHOLE FOR EACH
  1901                    42,2467   00000 1            OCT     00000          98 3COMP   WHOLE, FRAC, WHOLE
  1902                    42,2470   71572 1            OCT     71572          99 3COMP   POS9, VEL4, RADIANS
 A19021                                                                                  (DEC ONLY)
 R1903    END OF NNTYPTAB FOR MIXED NOUNS


  2200                    42,2471   00006 1  SFINTAB   OCT     00006          WHOLE, DP TIME (SEC)
  2201                    42,2472   03240 1            OCT     03240
  2202                    42,2473   00000 1            OCT     00000          SPARE
  2203                    42,2474   00000 1            OCT     00000
 2204                 42,2475   00000 1          OCT      00000           CDU DEGREES, 360-CDU DEGREES
 2205                 42,2476   00000 1          OCT      00000              (SFCONS IN DEGINSF)
 2206                 42,2477   10707 0          OCT      10707           DP DEGREES (90)
 2207                 42,2500   03435 0          OCT      03435                 UPPED BY 1
 2208                 42,2501   13070 1          OCT      13070           DP DEGREES (360)(POINT BETWN BITS 11-12)
 2209                 42,2502   34345 1          OCT      34345                 UPPED BY 1
 2210                 42,2503   00005 1          OCT      00005           DEGREES (180)
 2211                 42,2504   21616 0          OCT      21616
 2212                 42,2505   26113 0          OCT      26113           WEIGHT2
 2213                 42,2506   31713 0          OCT      31713
 2214                 42,2507   00070 0          OCT      00070           POSITION5
 2215                 42,2510   20460 1          OCT      20460
 2216                 42,2511   01065 0          OCT      01065           POSITION4
 2217                 42,2512   05740 1          OCT      05740
 2218                 42,2513   11414 0          OCT      11414           VELOCITY2        (POINT BETWN BITS 11-12)
 2219                 42,2514   31463 1          OCT      31463
 2220                 42,2515   07475 0          OCT      07475           VELOCITY3
 2221                 42,2516   16051 1          OCT      16051
 2222                 42,2517   00001 0          OCT      00001           ELEVATION DEGREES
 2223                 42,2520   03434 1          OCT      03434
 2224                 42,2521   00047 1          OCT      00047           RENDEZVOUS RADAR RANGE
 2225                 42,2522   21135 0          OCT      21135
 2226                 42,2523   77766 0          OCT      77766           RENDEZVOUS RADAR RANGE RATE
 2227                 42,2524   50711 0          OCT      50711
 2228                 42,2525   00005 1          2DEC*    .9267840599 E5 B-28 * LANDING RADAR ALTITUDE
 2228                 42,2526   25006 0
 2230                 42,2527   00002 0          OCT      00002           INITIAL/FINAL ALTITUDE
 2231                 42,2530   23224 1          OCT      23224
 2232                 42,2531   00014 1          OCT      00014           ALTITUDE RATE
 2233                 42,2532   06500 1          OCT      06500
 2235                 42,2533   00001 0          2DEC*    1.79500987 E4 B-28 * FORWARD/LATERAL VELOCITY
 2235                 42,2534   03036 1
 2236                 42,2535   04256 1          OCT      04256           ROT HAND CONT ANGLE RATE
 2237                 42,2536   07071 0          OCT      07071
 2238                 42,2537   77766 0          2DEC*    -1.552795030 E5 B-28 * LANDING RADAR VELX
 2238                 42,2540   60557 0
 2240                 42,2541   00005 1          2DEC*     .8250825087 E5 B-28 *  LANDING RADAR VELY
 2240                 42,2542   01114 1
 2242                 42,2543   00007 0          2DEC*     1.153668673 E5 B-28 *  LANDING RADAR VELZ
 2242                 42,2544   01247 1
 2244                 42,2545   04324 0          OCT      04324           POSITION7
 2245                 42,2546   27600 1          OCT      27600
 2246                 42,2547   00036 1          OCT      00036           TRIM DEGREES2
 2247                 42,2550   20440 0          OCT      20440
 2248                 42,2551   00035 1          OCT      00035           COMPUTED ALTITUDE
 2249                 42,2552   30400 0          OCT      30400
 2250                 42,2553   23420 0          OCT      23420           DP DEGREES
 2251                 42,2554   00000 1          OCT      00000
 2252                 42,2555   01670 1          2DEC     30480 B-19      POSITION 9
 2252                 42,2556   20000 0
 2253                       42,2557   07475 0           2DEC    30.48 B-7          VELOCITY4
 2253                       42,2560   16051 1
 2254                       42,2561   14400 0           2DEC    100 B-8            RADIANS
 2254                       42,2562   00000 1
 2255                       42,2563   36365 1           2DEC    .3048 E2 B-5       VELOCITY5
 2255                       42,2564   30244 0
A2290                                                                              END OF SFINTAB


 2300                       42,2565   05174 0  SFOUTAB  OCT     05174              WHOLE, DP TIME (SEC)
 2301                       42,2566   13261 0           OCT     13261
 2302                       42,2567   00000 1           OCT     00000              SPARE
 2303                       42,2570   00000 1           OCT     00000
 2304                       42,2571   00000 1           OCT     00000              CDU DEGREES, 360-CDU DEGREES
 2305                       42,2572   00000 1           OCT     00000                 (SECONS IN DEGOUTSF, 360-CDUO)
 2306                       42,2573   00714 0           OCT     00714              DP DEGREES (90) (POINT BETWN BITS 7-8)
 2307                       42,2574   31463 1           OCT     31463
 2308                       42,2575   13412 1           OCT     13412              DP DEGREES (360)
 2309                       42,2576   07534 1           OCT     07534
 2310                       42,2577   05605 1           OCT     05605              DEGREES (180)
 2311                       42,2600   03656 1           OCT     03656
 2312                       42,2601   00001 0           OCT     00001              WEIGHT2
 2313                       42,2602   16170 0           OCT     16170
 2314                       42,2603   00441 0           OCT     00441              POSITION5
 2315                       42,2604   34306 0           OCT     34306
 2316                       42,2605   07176 0           OCT     07176              POSITION4         (POINT BETWN BITS 7-8)
 2317                       42,2606   21603 1           OCT     21603
 2318                       42,2607   15340 1           OCT     15340              VELOCITY2
 2319                       42,2610   15340 1           OCT     15340
 2320                       42,2611   01031 1           OCT     01031              VELOCITY3         (POINT BETWN BITS 7-8)
 2321                       42,2612   21032 0           OCT     21032
 2322                       42,2613   34631 1           OCT     34631              ELEVATION DEGREES
 2323                       42,2614   23146 0           OCT     23146
 2324                       42,2615   00636 1           OCT     00636              RENDEZVOUS RADAR RANGE
 2325                       42,2616   14552 0           OCT     14552
 2326                       42,2617   74552 0           OCT     74552              RENDEZVOUS RADAR RANGE RATE
 2327                       42,2620   70307 1           OCT     70307
 2328                       42,2621   05520 0           2DEC    1.079 E-5 B14      LANDING RADAR ALTITUDE
 2328                       42,2622   15312 0
 2330                       42,2623   14226 1           OCT     14226              INITIAL/FINAL ALTITUDE
 2331                       42,2624   31757 0           OCT     31757
 2332                       42,2625   02476 0           OCT     02476              ALTITUDE RATE
 2333                       42,2626   05531 0           OCT     05531
 2334                       42,2627   35152 1           2DEC    5.571 E-5 B14      FORWARD/LATERAL VELOCITY
 2334                       42,2630   21203 0
 2336                       42,2631   00007 0           OCT     00007              ROT HAND CONT ANGLE RATE
 2337                       42,2632   13734 0           OCT     13734
 2338                       42,2633   74477 0           2DEC    -.6440 E-5 B14     LANDING RADAR VELX
 2338                       42,2634   50643 0
 2340                       42,2635   06265 0           2DEC     1.212 E-5 B14     LANDING RADAR VELY
 2340                       42,2636   16004 1
 2342                        42,2637   04426 0           2DEC     .8668 E-5 B14  LANDING RADAR VELZ
 2342                        42,2640   31433 1
 2344                        42,2641   34772 1           OCT      34772          POSITION7
 2345                        42,2642   07016 1           OCT      07016
 2346                        42,2643   01030 0           OCT      01030          TRIM DEGREES2
 2347                        42,2644   33675 0           OCT      33675
 2348                        42,2645   01046 1           OCT      01046          COMPUTED ALTITUDE
 2349                        42,2646   15700 1           OCT      15700
 2350                        42,2647   00321 1           OCT      00321          DP DEGREES
 2351                        42,2650   26706 1           OCT      26706
 2352                        42,2651   04231 0           2DEC     17.2010499 B-7  POSITION 9
 2352                        42,2652   27400 0
 2353                        42,2653   01031 1           2DEC     .032808399     VELOCITY4
 2353                        42,2654   21032 0
 2354                        42,2655   12172 0           2DEC     .32            RADIANS
 2354                        42,2656   34122 1
 2355                        42,2657   00206 0           2DEC*    3.280839896 E-2 B-2 * VELOCITY5
 2355                        42,2660   14206 0
A2390                                                                            END OF SEDUTAB


A2400                                                                            NN  SF CONSTANT                SF ROUTINE

 2401   REF   9  LAST  318   42,2661   03453 0  IDADDTAB ECADR    TTOGO          40 MIN/SEC                      M/S
 2402   REF   1              42,2662   03663 1           ECADR    VGDISP         40 VEL3                         DP3
 2403   REF   3  LAST  212   42,2663   03507 0           ECADR    DVTOTAL        40 VEL3                         DP3
 2404   REF   9  LAST  318   42,2664   01044 0           ECADR    DSPTEM1        41 CDU DEG                      CDU
 2405   REF  10  LAST  326   42,2665   01045 1           ECADR    DSPTEM1 +1     41 ELEV DEG                     ARTH
 2406                        42,2666   00000 1           OCT      0              41 SPARE COMPONENT
 2407   REF   3  LAST  295   42,2667   02307 1           ECADR    HAPO           42 POS4                         DP3
 2408   REF   1              42,2670   02311 0           ECADR    HPER           42 POS4                         DP3
 2409   REF   2  LAST  326   42,2671   03663 1           ECADR    VGDISP         42 VEL3                         DP3
 2410   REF   2  LAST  107   42,2672   01117 1           ECADR    LAT            43 DPDEG(360)                   DP4
 2411   REF   2  LAST  107   42,2673   01121 1           ECADR    LONG           43 DPDEG(360)                   DP4
 2412   REF   2  LAST  107   42,2674   01123 0           ECADR    ALT            43 POS4                         DP3
 2413   REF   2  LAST  119   42,2675   02112 1           ECADR    HAPOX          44 POS4                         DP3
 2414   REF   1              42,2676   02114 1           ECADR    HPERX          44 POS4                         DP3
 2415   REF   2  LAST  120   42,2677   02131 0           ECADR    TFF            44 MIN/SEC                      M/S
 2416   REF   7  LAST  252   42,2700   03462 1           ECADR    TRKMKCNT       45 WHOLE                        ARTH
 2417   REF  10  LAST  326   42,2701   03453 0           ECADR    TTOGO          45 MIN/SEC                      M/S
 2418   REF   1              42,2702   02243 0           ECADR    +MGA           45 DPDEG(360)                   DP4
 2419   REF  10  LAST  305   42,2703   01340 1           ECADR    DAPDATR1       46 OCTAL ONLY                   OCT
 2420   REF   3  LAST  206   42,2704   00374 1           ECADR    CHANBKUP       46 OCTAL ONLY
 2421                        42,2705   00000 1           OCT      0              46 SPARE COMPONENT
 2422   REF  11  LAST  307   42,2706   01326 1           ECADR    LEMMASS        47 WEIGHT2                     ARTH1
 2423   REF  10  LAST  307   42,2707   01327 0           ECADR    CSMMASS        47 WEIGHT2                     ARTH1
 2424                        42,2710   00000 1           OCT      0              47 SPARE COMPONENT
 2425   REF   1              42,2711   03002 0           ECADR    PITTIME        48 TRIM DEG2                    ARTH
 2426   REF   2  LAST  308   42,2712   03001 0           ECADR    ROLLTIME       48 TRIM DEG2                    ARTH
 2427                        42,2713   00000 1           OCT      0              48 SPARE COMPONENT
 2428   REF   1              42,2714   00314 1        ECADR  R22DISP       49 POS5                           DP1
 2429   REF   2  LAST  327   42,2715   00316 0        ECADR  R22DISP +2    49 VEL3                           DP3
 2430   REF   2  LAST  112   42,2716   01353 0        ECADR  WHCHREAD      49 WHOLE                          ARTH
 2431                        42,2717   00000 1        OCT    0             50 SPARE
 2432                        42,2720   00000 1        OCT    0             50 SPARE
 2433                        42,2721   00000 1        OCT    0             50 SPARE
 2434   REF   4  LAST  292   42,2722   02171 1        ECADR  ALPHASB       51 DPDEG(360)                     DP4
 2435   REF   3  LAST  122   42,2723   02173 0        ECADR  BETASB        51 DPDEG(360)                     DP4
 2436                        42,2724   00000 1        OCT    0             51 SPARE COMPONENT
 2437   REF   1              42,2725   01753 1        ECADR  ACTCENT       52 DPDEG(360)                     DP4
 2438                        42,2726   00000 1        OCT    00000         52 SPARE COMPONENT
 2439                        42,2727   00000 1        OCT    00000         52 SPARE COMPONENT
 2440                        42,2730   00000 1        OCT    00000         53 SPARE
 2441                        42,2731   00000 1        OCT    00000         53
 2442                        42,2732   00000 1        OCT    00000         53
 2443   REF   2  LAST  120   42,2733   02213 0        ECADR  RANGE         54 POS5                           DP1
 2444   REF   2  LAST  120   42,2734   02215 0        ECADR  RRATE         54 VEL3                           DP3
 2445   REF   1              42,2735   02217 1        ECADR  RTHETA        54 DPDEG(360)                     DP4
 2446   REF   2  LAST  210   42,2736   03466 0        ECADR  NN            55 WHOLE                          ARTH
 2447   REF   3  LAST  210   42,2737   02247 1        ECADR  ELEV          55 DPDEG(360)                     DP4
 2448   REF   2  LAST  210   42,2740   03620 0        ECADR  CENTANG       55 DPDEG(360)                     DP4
 2449   REF   5  LAST  312   42,2741   02171 1        ECADR  RR-AZ         56 DPDEG(360)                     DP4
 2450   REF   2  LAST  312   42,2742   02173 0        ECADR  RR-ELEV       56 DPDEG(360)                     DP4
 2451                        42,2743   00000 1        OCT    0             56 SPARE COMPONENT
 2452                        42,2744   00000 1        OCT    0             57 SPARE
 2453                        42,2745   00000 1        OCT    0             57 SPARE
 2454                        42,2746   00000 1        OCT    0             57 SPARE
 2455   REF   3  LAST  147   42,2747   03605 1        ECADR  POSTTPI       58 POS4                           DP3
 2456   REF   4  LAST  147   42,2750   03575 0        ECADR  DELVTPI       58 VEL3                           DP3
 2457   REF   2  LAST  210   42,2751   02340 1        ECADR  DELVTPF       58 VEL3                           DP3
 2458   REF   1              42,2752   02273 0        ECADR  DVLOS         59 VEL3                           DP3
 2459   REF   2  LAST  327   42,2753   02275 0        ECADR  DVLOS +2      59 VEL3                           DP3
 2460   REF   3  LAST  327   42,2754   02277 1        ECADR  DVLOS +4      59 VEL3                           DP3
 2461   REF   2  LAST  158   42,2755   03734 1        ECADR  FORVEL        60 VEL5                           DP3
 2462   REF   3  LAST  154   42,2756   03473 1        ECADR  HDOTDISP      60 VEL3                           DP3
 2463   REF   2  LAST  159   42,2757   03774 0        ECADR  HCALC1        60 COMP ALT                       DP1
 2464   REF   2  LAST  154   42,2760   03475 1        ECADR  TTFDISP       61 MIN/SEC                        M/S
 2465   REF  11  LAST  326   42,2761   03453 0        ECADR  TTOGO         61 MIN/SEC                        M/S
 2466   REF   2  LAST  127   42,2762   02613 1        ECADR  OUTOFPLN      61 POS7                           DP4
 2467   REF   2  LAST  154   42,2763   03471 0        ECADR  ABVEL         62 VEL3                           DP3
 2468   REF  12  LAST  327   42,2764   03453 0        ECADR  TTOGO         62 MIN/SEC                        M/S
 2469   REF   4  LAST  326   42,2765   03507 0        ECADR  DVTOTAL       62 VEL3                           DP3
 2470   REF   3  LAST  213   42,2766   03664 0        ECADR  DELTAH        63 COMP ALT                       DP1
 2471   REF   4  LAST  327   42,2767   03473 1        ECADR  HDOTDISP      63 VEL3                           DP3
 2472   REF   3  LAST  327   42,2770   03774 0        ECADR  HCALC1        63 COMP ALT                       DP1
 2473   REF   4  LAST  157   42,2771   03666 1        ECADR  FUNNYDSP      64 2INT                           2INT
 2474   REF   5  LAST  327   42,2772   03473 1        ECADR  HDOTDISP      64 VEL3                           DP3
 2475   REF   2  LAST  154   42,2773   03534 0        ECADR  HCALC         64 COMP ALT                       DP1
 2476   REF   2  LAST  219   42,2774   00013 0        ECADR  SAMPTIME      65 HMS (MIXED ONLY TO KEEP CODE 65) HMS
 2477   REF   3  LAST  327   42,2775   00013 0        ECADR  SAMPTIME      65 HMS                            HMS
```

```
L       PINBALL NOUN TABLES                                                       USER'S PAGE NO.  16       EO S4

 2478   REF   4  LAST  327   42,2776   00013 0          ECADR  SAMPTIME          65 HMS                                    HMS
 2479   REF   3  LAST  289   42,2777   02177 1          ECADR  RSTACK +6         66 LANDING RADAR ALT                      DP1
 2480                        42,3000   00000 1          OCT    0                 66 LR POSITION                          LRPOS
 2481                        42,3001   00000 1          OCT    0                 66 SPARE COMPONENT
 2482   REF   4  LAST  328   42,3002   02171 1          ECADR  RSTACK            67 LANDING RADAR VELX                     DP1
 2483   REF   5  LAST  328   42,3003   02173 0          ECADR  RSTACK +2         67 LANDING RADAR VELY                     DP1
 2484   REF   6  LAST  328   42,3004   02175 0          ECADR  RSTACK +4         67 LANDING RADAR VELZ                     DP1
 2485   REF   2  LAST  127   42,3005   02613 1          ECADR  RANGEDSP          68 POS7                                   DP4
 2486   REF   3  LAST  327   42,3006   03475 1          ECADR  TTFDISP           68 MIN/SEC                                M/S
 2487   REF   3  LAST  327   42,3007   03471 0          ECADR  ABVEL             68 VEL3                                   DP3
 2488   REF   1              42,3010   02635 0          ECADR  DLANDZ            69 COMP ALT                               DP1
 2489   REF   1              42,3011   02633 0          ECADR  DLANDY            69 COMP ALT                               DP1
 2490   REF   1              42,3012   02631 1          ECADR  DLANDX            69 COMP ALT                               DP1
 2491   REF   9  LAST  257   42,3013   01235 1          ECADR  AOTCODE           70 OCTAL ONLY                             OCT
 2492   REF  10  LAST  328   42,3014   01236 1          ECADR  AOTCODE +1        70 OCTAL ONLY                             OCT
 2493   REF  11  LAST  328   42,3015   01237 0          ECADR  AOTCODE +2        70 OCTAL ONLY                             OCT
 2494   REF  12  LAST  328   42,3016   01235 1          ECADR  AOTCODE           71 OCTAL ONLY                             OCT
 2495   REF  13  LAST  328   42,3017   01236 1          ECADR  AOTCODE +1        71 OCTAL ONLY                             OCT
 2496   REF  14  LAST  328   42,3020   01237 0          ECADR  AOTCODE +2        71 OCTAL ONLY                             OCT
 2497   REF   6  LAST  311   42,3021   00035 1          ECADR  CDUT              72 360-CDU DEG                        360-CDU
 2498   REF   4  LAST  210   42,3022   00036 1          ECADR  CDUS              72 CDU DEG                                CDU
 2499                        42,3023   00000 1          OCT    0                 72 SPARE COMPONENT
 2500   REF   2  LAST  106   42,3024   01106 1          ECADR  TANG              73 360-CDU DEG                        360-CDU
 2501   REF   3  LAST  328   42,3025   01107 0          ECADR  TANG +1           73 CDU DEG                                CDU
 2502                        42,3026   00000 1          OCT    0                 73 SPARE COMPONENT
 2503   REF  13  LAST  327   42,3027   03453 0          ECADR  TTOGO             74 MIN/SEC                                M/S
 2504   REF   2  LAST  124   42,3030   02353 0          ECADR  YAW               74 DPDEG(360)                             DP4
 2505   REF   1              42,3031   02355 0          ECADR  PITCH             74 DPDEG(360)                             DP4
 2506   REF   3  LAST  210   42,3032   03577 1          ECADR  DIFEALT           75 POS4                                   DP3
 2507   REF   2  LAST  121   42,3033   02243 0          ECADR  T1TOT2            75 MIN/SEC
 2508   REF   1              42,3034   02245 0          ECADR  T2TOT3            75 MIN/SEC                                M/S
 2509   REF   3  LAST  212   42,3035   02267 0          ECADR  ZDOTD             76 VEL3                                   DP3
 2510   REF   2  LAST  123   42,3036   02263 1          ECADR  RDOTD             76 VEL3                                   DP3
 2511   REF   2  LAST  160   42,3037   03642 1          ECADR  XRANGE            76 POS4                                   DP3
 2512   REF  14  LAST  328   42,3040   03453 0          ECADR  TTOGO             77 MIN/SEC                                M/S
 2513   REF   4  LAST  155   42,3041   03503 1          ECADR  VGBODY    +2      77 VEL3                                   DP3
 2514   REF   4  LAST  328   42,3042   03471 0          ECADR  ABVEL             77 VEL3                                   DP3
 2515   REF   5  LAST  208   42,3043   01330 0          ECADR  DNRRANGE          78 RR RANGE                          RR RANGE
 2516   REF   6  LAST  215   42,3044   01331 1          ECADR  DNRRDOT           78 RR RANGE RATE                RR RANGE RATE
 2517   REF   1              42,3045   01271 1          ECADR  TTOTIG            78 MIN/SEC                                 M/S
 2518   REF   5  LAST  272   42,3046   01240 0          ECADR  CURSOR            79 CDU DEG                                CDU
 2519   REF   3  LAST  215   42,3047   01241 1          ECADR  SPIRAL            79 CDU DEG                                CDU
 2520   REF   1              42,3050   00734 1          ECADR  POSCODE           79 WHOLE                                 ARTH
 2521   REF   2  LAST  150   42,3051   03733 0          ECADR  DATAGOOD          80 WHOLE                                 ARTH
 2522   REF   1              42,3052   03734 1          ECADR  OMEGAD            80 DPDEG(360)                             DP4
 2523                        42,3053   00000 1          OCT    0                 80 SPARE COMPONENT
 2524   REF   3  LAST  158   42,3054   03433 0          ECADR  DELVLVC           81 VEL3                                   DP3
 2525   REF   4  LAST  328   42,3055   03435 0          ECADR  DELVLVC +2        81 VEL3                                   DP3
 2526   REF   5  LAST  328   42,3056   03437 1          ECADR  DELVLVC +4        81 VEL3                                   DP3
 2527   REF   6  LAST  328   42,3057   03433 0          ECADR  DELVLVC           82 VEL3                                   DP3
 2528   REF   7  LAST  328   42,3060   03435 0          ECADR  DELVLVC +2        82 VEL3                           DP3
 2529   REF   8  LAST  329   42,3061   03437 1          ECADR  DELVLVC +4        82 VEL3                           DP3
 2530   REF   1              42,3062   03622 1          ECADR  DELVIMU           83 VEL3                           DP3
 2531   REF   2  LAST  329   42,3063   03624 1          ECADR  DELVIMU +2        83 VEL3                           DP3
 2532   REF   3  LAST  329   42,3064   03626 0          ECADR  DELVIMU +4        83 VEL3                           DP3
 2533   REF   1              42,3065   01250 1          ECADR  DELVOV            84 VEL3                           DP3
 2534   REF   2  LAST  329   42,3066   01252 0          ECADR  DELVOV  +2        84 VEL3                           DP3
 2535   REF   3  LAST  329   42,3067   01254 0          ECADR  DELVOV  +4        84 VEL3                           DP3
 2536   REF   5  LAST  328   42,3070   03501 0          ECADR  VGBODY            85 VEL3                           DP3
 2537   REF   6  LAST  329   42,3071   03503 1          ECADR  VGBODY +2         85 VEL3                           DP3
 2538   REF   7  LAST  329   42,3072   03505 1          ECADR  VGBODY +4         85 VEL3                           DP3
 2539   REF   9  LAST  329   42,3073   03433 0          ECADR  DELVLVC           86 VEL3                           DP3
 2540   REF  10  LAST  329   42,3074   03435 0          ECADR  DELVLVC +2        86 VEL3                           DP3
 2541   REF  11  LAST  329   42,3075   03437 1          ECADR  DELVLVC +4        86 VEL3                           DP3
 2542   REF   3  LAST  257   42,3076   01344 0          ECADR  AZ                87 CDU DEG                        CDU
 2543   REF   1              42,3077   01345 1          ECADR  EL                87 CDU DEG                        CDU
 2544                        42,3100   00000 1          OCT    0                 87 SPARE COMPONENT
 2545   REF   9  LAST  262   42,3101   02706 1          ECADR  STARAD            88 FRAC                           FRAC
 2546   REF  10  LAST  329   42,3102   02710 0          ECADR  STARAD +2         88 FRAC                           FRAC
 2547   REF  11  LAST  329   42,3103   02712 1          ECADR  STARAD +4         88 FRAC                           FRAC
 2548   REF   2  LAST  128   42,3104   02706 1          ECADR  LANDLAT           89 DPDEG(90)                      DP3
 2549   REF   2  LAST  128   42,3105   02710 0          ECADR  LANDLONG          89 DPDEG(90)                      DP3
 2550   REF   1              42,3106   02712 1          ECADR  LANDALT           89 POS5                           DP1
 2551   REF   8  LAST  122   42,3107   02171 1          ECADR  YLEM              90 POS5                            DP1
 2552   REF   2  LAST  120   42,3110   02173 0          ECADR  YDOTLEM           90  VEL3                           DP3
 2553   REF   1              42,3111   02175 0          ECADR  PHILEM            90 DPDEG(360)                      DP4
 2554   REF   1              42,3112   03715 1          ECADR  P21ALT            91 POS4                           DP3
 2555   REF   2  LAST  155   42,3113   03711 0          ECADR  P21VEL            91 VEL2                           DP4
 2556   REF   2  LAST  155   42,3114   03713 1          ECADR  P21GAM            91 DPDEG(360)                     DP4
 2557   REF   1              42,3115   03750 0          ECADR  THRDISP           92 WHOLE                          ARTH
 2558   REF   6  LAST  327   42,3116   03473 1          ECADR  HDOTDISP          92 VEL3                           DP3
 2559   REF   4  LAST  327   42,3117   03774 0          ECADR  HCALC1            92 COMP ALT                       DP1
 2560   REF   7  LAST  235   42,3120   02737 0          ECADR  OGC               93 DPDEG(90)                      DP3
 2561   REF   8  LAST  329   42,3121   02741 1          ECADR  OGC      +2       93 DPDEG(90)                      DP3
 2562   REF   9  LAST  329   42,3122   02743 0          ECADR  OGC      +4       93 DPDEG(90)                      DP3
 2563   REF   8  LAST  329   42,3123   03501 0          ECADR  VGBODY            94 VEL3                           DP3
 2564   REF   7  LAST  329   42,3124   03473 1          ECADR  HDOTDISP          94 VEL3                           DP3
 2565   REF   3  LAST  327   42,3125   03534 0          ECADR  HCALC             94 COMP ALT                       DP1
 2566                        42,3126   00000 1          OCT    0                 95 SPARE
 2567                        42,3127   00000 1          OCT    0                 95 SPARE
 2568                        42,3130   00000 1          OCT    0                 95 SPARE
 2569                        42,3131   00000 1          OCT    0                 96 SPARE
 2570                        42,3132   00000 1          OCT    0                 96 SPARE
 2571                        42,3133   00000 1          OCT    0                 96 SPARE
 2572   REF  11  LAST  326   42,3134   01044 0          ECADR  DSPTEM1           97 WHOLE                          ARTH
 2573   REF  12  LAST  329   42,3135   01045 1          ECADR  DSPTEM1 +1        97 WHOLE                          ARTH
 2574   REF  13  LAST  329   42,3136   01046 1          ECADR  DSPTEM1 +2        97 WHOLE                          ARTH
 2575   REF   4  LAST  317   42,3137   01047 0          ECADR  DSPTEM2           98 WHOLE                          ARTH
 2576   REF   5  LAST  329   42,3140   01050 0          ECADR  DSPTEM2 +1        98 FRAC                           FRAC
 2577   REF   6  LAST  329   42,3141   01051 1          ECADR  DSPTEM2 +2        98 WHOLE                          ARTH
 2578   REF   3  LAST  310   42,3142   02171 1            ECADR  WWPOS            99 POS9                                   DP3
 2579   REF   2  LAST  120   42,3143   02173 0            ECADR  WWVEL            99 VEL4                                   DP2
 2580   REF   1              42,3144   02175 0            ECADR  WWBIAS           99 RADIANS                                DP4
R2600   END OF IDADDTA8


A2800                                                                             NN  SF ROUTINES

 2801                        42,3145   16351 1  RUTMXTA8 OCT    16351            40 M/S, DP3, DP3
 2802                        42,3146   00142 0           OCT    00142            41 CDU, ARTH
 2803                        42,3147   16347 0           OCT    16347            42 DP3, DP3, DP3
 2804                        42,3150   16512 0           OCT    16512            43 DP4, DP4, DP3
 2805                        42,3151   22347 1           OCT    22347            44 DP3, DP3, M/S
 2806                        42,3152   24443 1           OCT    24443            45 ARTH, M/S, DP4
 2807                        42,3153   00000 1           OCT    00000            46 OCT, OCT
 2808                        42,3154   00553 1           OCT    00553            47 ARITH1, ARITH1
 2809                        42,3155   00143 1           OCT    00143            48 ARTH, ARTH
 2810                        42,3156   06344 1           OCT    06344            49 DP1, DP3, ARTH
 2811                        42,3157   00000 1           OCT    0                50 SPARE
 2812                        42,3160   00512 1           OCT    00512            51 DP4, DP4
 2813                        42,3161   00012 1           OCT    00012            52 DP4
 2814                        42,3162   00000 1           OCT    00000            53 SPARE
 2815                        42,3163   24344 1           OCT    24344            54 DP1, DP3, DP4
 2816                        42,3164   24503 1           OCT    24503            55 ARTH, DP4 , DP4
 2817                        42,3165   00512 1           OCT    00512            56 DP4, DP4
 2818                        42,3166   00000 1           OCT    0                57 SPARE
 2819                        42,3167   16347 0           OCT    16347            58 DP3, DP3, DP3
 2820                        42,3170   16347 0           OCT    16347            59 DP3, DP3, DP3
 2821                        42,3171   10347 0           OCT    10347            60 DP3, DP3, DP1
 2822                        42,3172   24451 1           OCT    24451            61 M/S, M/S, DP4
 2823                        42,3173   16447 1           OCT    16447            62 DP3, M/S, DP3
 2824                        42,3174   10344 0           OCT    10344            63 DP1, DP3, DP1
 2825                        42,3175   10354 1           OCT    10354            64 2INT, DP3, DP1
 2826                        42,3176   20410 0           OCT    20410            65 HMS, HMS, HMS
 2827                        42,3177   00304 0           OCT    00304            66 DP1, LRPOS
 2828                        42,3200   10204 0           OCT    10204            67 DP1, DP1, DP1
 2829                        42,3201   16452 0           OCT    16452            68 DP4, M/S, DP3
 2830                        42,3202   10204 0           OCT    10204            69 DP1, DP1, DP1
 2831                        42,3203   00000 1           OCT    0                70 OCT, OCT, OCT
 2832                        42,3204   00000 1           OCT    0                71 OCT, OCT, OCT
 2833                        42,3205   00115 1           OCT    00115            72 360-CDU, CDU
 2834                        42,3206   00115 1           OCT    00115            73 360-CDU, CDU
 2835                        42,3207   24511 1           OCT    24511            74M/S, DP4,DP4
 2836                        42,3210   22447 0           OCT    22447            75 DP3, M/S, M/S
 2837                        42,3211   16347 0           OCT    16347            76 DP3, DP3, DP3
 2838                        42,3212   16351 1           OCT    16351            77 M/S, DP3, DP3
 2839                        42,3213   22756 0           OCT    22756            78 RR RANGE, RR RANGE RATE, M/S
 2840                        42,3214   06102 1           OCT    06102            79 CDU, CDU, ARTH
 2841                        42,3215   00503 1           OCT    00503            80 ARTH, DP4
 2842                        42,3216   16347 0           OCT    16347            81 DP3, DP3, DP3
 2843                       42,3217   16347 0          OCT     16347             82 DP3, DP3, DP3
 2844                       42,3220   16347 0          OCT     16347             83 DP3, DP3, DP3
 2845                       42,3221   16347 0          OCT     16347             84 DP3, DP3, DP3
 2846                       42,3222   16347 0          OCT     16347             85 DP3, DP3, DP3
 2847                       42,3223   16347 0          OCT     16347             86 DP3, DP3, DP3
 2848                       42,3224   00102 1          OCT     00102             87 CDU, CDU
 2849                       42,3225   02041 0          OCT     02041             88 ERAC FOR EACH
 2850                       42,3226   10347 0          OCT     10347             89 DP3, DP3, DP1
 2851                       42,3227   24344 1          OCT     24344             90 DP1, DP3, DP4
 2852                       42,3230   24507 0          OCT     24507             91 DP3, DP4, DP4
 2853                       42,3231   10343 1          OCT     10343             92 ARTH, DP3, DP1
 2854                       42,3232   16347 0          OCT     16347             93 DP3, DP3, DP3
 2855                       42,3233   10347 0          OCT     10347             94 DP3, DP3, DP1
 2856                       42,3234   00000 1          OCT     0                 95 SPARE
 2857                       42,3235   00000 1          OCT     0                 96 SPARE
 2858                       42,3236   06143 1          OCT     06143             97 ARTH, ARTH, ARTH
 2859                       42,3237   06043 0          OCT     06043             98 ARTH, ERAC, ARTH
 2860                       42,3240   24247 0          OCT     24247             99 DP3, DP2, DP4
R2870    END OF RUTMXTAB

 2871    REF    3  LAST  304    30,2000                SBANK= LOWSUPER
 0001                          23,2041                             BANK    23
 0001C1  REF    1              13,2000                             SETLOC  LEMGEOM
 0001C2                        13,2070                             BANK

 00015   REF    4  LAST  331   30,2000                             SBANK=  LOWSUPER
 0002    REF    3  LAST  259   E5,1642                             EBANK=  XSM


R0500    THESE TWO ROUTINES COMPUTE THE ACTUAL STATE VECTOR FOR LM,CSM BY ADDING
R0501    THE CONIC R,V AND THE DEVIATIONSR,V. THE STATE VECTORS ARE CONVERTED TO
R0502    METERS B-29 AND METERS/CSEC B-7 AND STORED APPROPRIATELY IN RN,VN OR
R0503    R-OTHER , V-OTHER FOR DOWNLINK. THE ROUTINES NAMES ARE SWITCHED IN THE
R0504    OTHER VEHICLES COMPUTER.

R0505    INPUT
R0506      STATE VECTOR IN TEMPORARY STORAGE AREA
R05061     IF STATE VECTOR IS SCALED POS B27 AND VEL B5
R05062        SET X2 TO +2
R05063     IF STATE VECTOR IS SCALED POS B29 AND VEL B7
R05064        SET X2 TO 0

R0507    OUTPUT
R0508      R(T) IN RN, V(T) IN VN, T IN PIPTIME
R0509    OR
R0510      R(T) IN R-OTHER, V(T) IN V-OTHER   (T IS DEFINED BY T-OTHER)


 05106   REF    1                                                  COUNT*  $$/GEOM
 0511                          13,2070   43414 1  SVDWN2           BOF     RVQ               SW=1=AVETOMID DOING W-MATRIX INTEG.
 05112   REF    1              13,2071   04756 1                           AVEMIDSW
 05113                         13,2072   26073 1                           +1
 05114                         13,2073   53775 1                   VLOAD   VSL*
 0512    REF    2  LAST  115   13,2074   01521 0                           TDELTAV
 0513                          13,2075   57605 0                           0 -7,2
 0514                          13,2076   53655 1                   VAD     VSL*
 0515    REF    2  LAST  115   13,2077   01535 0                           RCV
 0516                          13,2100   57576 1                           0,2
 0517    REF    4  LAST  206   13,2101   25220 0                   STOVL   RN
 0518    REF    2  LAST  115   13,2102   01527 0                           TNUV
 0519                          13,2103   53257 1                   VSL*    VAD
 0520                          13,2104   57602 1                           0 -4,2
 0521    REF    2  LAST  115   13,2105   01543 1                           VCV
 0522                          13,2106   77657 0                   VSL*
 0523                          13,2107   57576 1                           0,2
 0524    REF    4  LAST  206   13,2110   15226 0                   STODL   VN
 0525    REF    6  LAST  318   13,2111   01517 0                           TET
 0526    REF    2  LAST  206   13,2112   01234 0                   STORE   PIPTIME
 0527                          13,2113   77616 0                   RVQ
 0528                           13,2114    53775 1  SVDWN1    VLOAD  VSL*
 0529   REF    3  LAST  332     13,2115    01521 0                   TDELTAV
 0530                           13,2116    57605 0                   0 -7,2
 0531                           13,2117    53655 1            VAD    VSL*
 0532   REF    3  LAST  332     13,2120    01535 0                   RCV
 0533                           13,2121    57576 1                   0,2
 0534   REF    6  LAST  205     13,2122    25716 0            STOVL  R-OTHER
 0535   REF    3  LAST  332     13,2123    01527 0                   TNUV
 0536                           13,2124    53257 1            VSL*   VAD
 0537                           13,2125    57602 1                   0 -4,2
 0538   REF    3  LAST  332     13,2126    01543 1                   VCV
 0539                           13,2127    77657 0            VSL*
 0540                           13,2130    57576 1                   0,2
 0541   REF    6  LAST  205     13,2131    01724 1            STORE  V-OTHER
 0542                           13,2132    77616 0            RVQ
```

```
L        LEM GEOMETRY                                                                       USER'S PAGE NO.   3      E5 S3

R0649             THE FOLLOWING ROUTINE TAKES A HALF UNIT TARGET VECTOR REFERRED TO NAV BASE COORDINATES AND FINDS BOTH
R0651    GIMBAL ORIENTATIONS AT WHICH THE RR MIGHT SIGHT THE TARGET. THE GIMBAL ANGLES CORRESPONDING TO THE PRESENT MODE
R0653    ARE LEFT IN MODEA AND THOSE WHICH WOULD BE USED AFTER A REMODE IN MODEB. THIS ROUTINE ASSUMES MODE 1 IS TRUNNION
R0655    ANGLE LESS THAN 90 DEGS IN ABS VALUE WITH ARBITRARY SHAFT, WITH A CORRESPONDING DEFINITION FOR MODE 2. MODE
R0657    SELECTION AND LIMIT CHECKING ARE DONE ELSEWHERE.

R0658             THE MODE 1 CONFIGURATION IS CALCULATED FROM THE VECTOR AND THEN MODE 2 IS FOUND USING THE RELATIONS

R0660             S(2) = 180 + S(1)
R0661             T(2) = 180 - T(1)

R066101      THE VECTOR ARRIVES IN MPAC WHERE TRG*SMNB OR *SMNB* WILL HAVE LEFT IT.

 0662                          13,2133   00041 1  RRANGLES STORE  32D
 06625                         13,2134   57545 1           DLOAD  DCOMP           SINCE WE WILL FIND THE MODE 1 SHAFT
 0663                          13,2135   00043 0                  34D             ANGLE LATER, WE CAN FIND THE MODE 1
 0664                          13,2136   67401 0           SETPD  ASIN            TRUNNION BY SIMPLY TAKING THE ARCSIN OF
 0665                          13,2137   00001 0                  0               THE Y COMPONENT, THE ASIN GIVING AN
 0666                          13,2140   44206 0           PUSH   BDSU            ANSWER WHOSE ABS VAL IS LESS THAN 90 DEG
 0667    REF   1               13,2141   24005 1                  LODPHALF
 0668                          13,2142   14005 1           STODL  4               MODE 2 TRUNNION TO 4.

 0669    REF   3  LAST  260    13,2143   24007 0                  LO6ZEROS
 0670                          13,2144   24043 0           STOVL  34D             UNIT THE PROJECTION OF THE VECTOR
 0671                          13,2145   00041 1                  32D               IN THE X-Z PLANE
 0672                          13,2146   41056 1           UNIT   BOVB            IF OVERFLOW,TARGET VECTOR IS ALONG Y
 0673    REF   1               13,2147   52412 1                  LUNDESCH        CALL FOR MANEUVER UNLESS ON LUNAR SURF
 0674                          13,2150   14041 1           STODL  32D             PROJECTION VECTOR.
 0675                          13,2151   00041 1                  32D
 0676                          13,2152   44142 0           SR1    STQ
 0677    REF   2  LAST  261    13,2153   00051 0                  S2
 0678    REF   3  LAST  312    13,2154   14023 0           STODL  SINTH           USE ARCTRIG SINCE SHAFT COULD BE ARB.
 0679                          13,2155   00045 0                  36D
 0680                          13,2156   77742 0           SR1
 0681    REF   3  LAST  312    13,2157   34021 0           STCALL COSTH
 0682    REF   3  LAST  312    13,2160   47303 1                  ARCTRIG
```

```
0683                          13,2161   43206 1          PUSH    DAD              MODE 1 SHAFT TO 2.
0684  REF   2  LAST  334      13,2162   24005 1                  LODPHALF
0685                          13,2163   24007 0          STOVL   6
0686                          13,2164   00005 1                  4
0687                          13,2165   77634 0          RTB                      FIND MODE 2 CDU ANGLES.
0688  REF   1                 13,2166   21645 0                  2V1STO2S
0689  REF   2  LAST  106      13,2167   25111 1          STOVL   MODEB
0690                          13,2170   00001 0                  0
0691                          13,2171   77634 0          RTB                      MODE 1 ANGLES TO MODE A.
0692  REF   2  LAST  335      13,2172   21645 0                  2V1STO2S
0693  REF   1                 13,2173   01107 0          STORE   MODEA
0694                          13,2174   77776 1          EXIT

0695  REF  26  LAST  288      13,2175  4 0110 0          CS      RADMODES         SWAP MODEA AND MODEB IF RR IN MODE 2.
0696  REF   1                 13,2176  7 4731 1          MASK    ANTENBIT
0697  REF  88  LAST  317      13,2177 10 000 0           CCS     A
0698                          13,2200  1 2204 1          TCF     +4

0699  REF   2  LAST  335      13,2201  53'107 1          DXCH    MODEA
0700  REF   3  LAST  335      13,2202  53'111 0          DXCH    MODEB
0701  REF   3  LAST  335      13,2203  53'107 1          DXCH    MODEA

0702  REF  12  LAST  311      13,2204  0 6060 1          TC      INTPRET
0703                          13,2205   77650 1          GOTO
0704  REF   3  LAST  334      13,2206   00051 0                  S2
```

```
R0705   GIVEN RR TRUNNION AND SHAFT (T,S) IN TANGNB,+1,FIND THE ASSOCIATED
R0706   LINE OF SIGHT IN NAV BASE AXES.  THE HALF UNIT VECTOR, .5(SIN(S)COS(T),
R0707   -SIN(T),COS(S)COS(T)) IS LEFT IN MPAC AND 32D.

 07072  REF   1               23,2000                       SETLOC INFLIGHT
 07074                        23,2041                       BANK

 07076  REF   1                                             COUNT* $$/GEOM

 0708                         23,2041   47135 0  RRNB       SLOAD  RTB
 0709   REF   6  LAST  214    23,2042   03753 0                    TANGNB
 07091  REF   5  LAST  261    23,2043   21606 1                    CDULOGIC
 0710                         23,2044   41401 1             SETPD  PUSH             TRUNNION ANGLE TO 0
 0711                         23,2045   00001 0                    0
 0712                         23,2046   57556 0             SIN    DCOMP
 0713                         23,2047   14043 0             STODL  34D              Y COMPONENT

 0714                         23,2050   41546 0             COS    PUSH             .5 COS(T) TO 0
 0715                         23,2051   47135 0             SLOAD  RTB
 0716   REF   7  LAST  336    23,2052   03754 1                    TANGNB +1
 0717   REF   6  LAST  336    23,2053   21606 1                    CDULOGIC
 0718                         23,2054   71406 0  RRNB1      PUSH   COS              SHAFT ANGLE TO 2
 0719                         23,2055   72405 0             DMP    SL1
 0720                         23,2056   00001 0                    0
 0721                         23,2057   14045 0             STODL  36D              Z COMPONENT

 0722                         23,2060   41356 1             SIN    DMP
 0723                         23,2061   77752 1             SL1
 0724                         23,2062   24041 1             STOVL  32D
 0725                         23,2063   00041 1                    32D
 0726                         23,2064   77616 0             RVQ

R0727   THIS ENTRY TO RRNB REQUIRES THE TRUNNION AND SHAFT ANGLES IN MPAC AND MPAC +1 RESPECTIVELY

 0729                         23,2065   14025 0  RRNBMPAC STODL  20D              SAVE SHAFT CDU IN 21.
 07291  REF  43  LAST  311    23,2066   00155 0                    MPAC             SET MODE TO DP.  (THE PRECEEDING STORE
A07292                                                                              MAY BE DP, TP OR VECTOR.)
 0730                         23,2067   40234 0             RTB    SETPD
 0731   REF   7  LAST  336    23,2070   21606 1                    CDULOGIC
 0732                         23,2071   00001 0                    0
 0733                         23,2072   73406 1             PUSH   SIN              TRUNNION ANGLE TO 0
 0734                         23,2073   77676 0             DCOMP
 0735                         23,2074   14043 0             STODL  34D              Y COMPONENT
 0736                         23,2075   41546 0             COS    PUSH             .5COS(T) TO 0
 0737                         23,2076   47135 0             SLOAD  RTB              PICK UP CDU'S.
 0738                         23,2077   00026 0                    21D
 0739   REF   8  LAST  336    23,2100   21606 1                    CDULOGIC
 0740                         23,2101   77650 1             GOTO
 0741   REF   1               23,2102   46054 1                    RRNB1
```

```
 0001                              C7,2607                     BANK    7
 0001C1 REF    1                   06,2000                     SETLOC IMUCOMP
 0001C2                            06,3333                     BANK

 0002   REF    1                   E3,1460                     EBANK= N8DX

 0100   REF    1                                               COUNT* $$/ICOMP
 0112   REF    1                   06,3333  3 3601 0  1/PIPA   CAF     LGCOMP          SAVE EBANK OF CALLING PROGRAM
 0113   REF   10  LAST  306        06,3334  56 003 1           XCH     EBANK
 0114   REF    1                   06,3335  54 163 1           TS      MODE

 0115   REF    1                   06,3336  11'477 0           CCS     GCOMPSW         BYPASS IF GCOMPSW NEGATIVE
 0116                              06,3337  1 3342 0           TCF     +3
 0117                              06,3340  1 3342 0           TCF     +2
 0118   REF    1                   06,3341  1 3423 0           TCF     IRIG1           RETURN

 0119   REF    2  LAST  223        06,3342  3 4742 1  1/PIPA1  CAF     FOUR            PIPAZ, PIPAY, PIPAX
 0120   REF    9  LAST  127        06,3343  54 132 0           TS      BUF +2

 0121   REF   10  LAST  338        06,3344  50 132 1           INDEX   BUF +2
 0122   REF    1                   06,3345  3 1453 1           CA      PIPASCF         (P.P.M.) X 2(-9)
 0123                              06,3346  0 0006 1           EXTEND
 0124   REF   11  LAST  338        06,3347  5 C132 1           INDEX   BUF +2
 0125   REF    1                   06,3350  7 0324 0           MP      DELVX           (PP) X 2(+14) NOW (PIPA PULSES) X 2(+5)
 0126   REF   28  LAST  316        06,3351  54 C02 1           TS      Q               SAVE MAJOR PART

 0127   REF   26  LAST  305        06,3352  3 0001 0           CA      L               MINOR PART
 0128                              06,3353  C 0C06 1           EXTEND
 0129   REF   30  LAST  293        06,3354  7 4737 1           MP      BIT6            SCALE 2(+9)   SHIFT RIGHT 9
 0130   REF   12  LAST  338        06,3355  50 132 1           INDEX   BUF +2
 0131   REF    2  LAST  338        06,3356  54 325 1           TS      DELVX +1        FRACTIONAL PIPA PULSES SCALED 2(+14)

 0132   REF   29  LAST  338        06,3357  3 0002 0           CA      Q               MAJOR PART
 0133                              06,3360  0 0006 1           EXTEND
 0134   REF   31  LAST  338        06,3361  7 4737 1           MP      BIT6            SCALE 2(+9)   SHIFT RIGHT 9
 0135   REF   13  LAST  338        06,3362  50 132 1           INDEX   BUF +2
 0136   REF    3  LAST  338        06,3363  20 325 1           DAS     DELVX           (PIPAI) + (PIPAI)(SFE)

 0137   REF   14  LAST  338        06,3364  50 132 1           INDEX   BUF +2
 0138   REF    1                   06,3365  4 1452 1           CS      PIPABIAS        (PIPA PULSES)/(CS) X 2(-3)                *
 0139                              06,3366  0 CC06 1           EXTEND
 0140   REF    2  LAST  175        06,3367  7 1074 1           MP      1/PIPADT        (CS) X 2(+8) NOW (PIPA PULSES) X 2(+5)*
 0141                              06,3370  C 0C06 1           EXTEND
 0142   REF   32  LAST  338        06,3371  7 4737 1           MP      BIT6            SCALE 2(+9) SHIFT RIGHT 9                 *
 0143   REF   15  LAST  338        06,3372  50 132 1           INDEX   BUF +2
 0144   REF    4  LAST  338        06,3373  20 325 1           DAS     DELVX           (PIPAI) + (PIPAI)(SFE) - (BIAS)(DELTAT)

 0145   REF   16  LAST  338        06,3374  10 132 0           CCS     BUF +2          PIPAZ, PIPAY, PIPAX
 0146   REF    1                   06,3375  6 7770 0           AD      NEG1
 0147   REF    1                   06,3376  1 3343 1           TCF     1/PIPA1 +1
```

```
0148                        06,3377  13 400 1          NOOP                      LESS THAN ZERO IMPOSSIBLE
```

```
 01481  REF   2  LAST  338    06,3400  55'477 0  IRIGCOMP TS      GCOMPSW          INDICATE COMMANDS 2 PULSES OR LESS.
 01482  REF  17  LAST  338    06,3401  54 130 1           TS      BUF              INDEX COUNTER . IRIGX, IRIGY, IRIGZ.

 01483  REF   1               06,3402  0 3426 1           TC      IRIGX            COMPENSATE ACCELERATION TERMS

 01484  REF   2  LAST  338    06,3403  4 1460 0           CS      NBDX             (GYRO PULSES)/(CS) X 2(-5)
 01485  REF   1               06,3404  0 3524 1           TC      DRIFTSUB         -(NBDX)(DELTAT)   (GYRO PULSES) X 2(+14)

 01486  REF   1               06,3405  0 3443 1           TC      IRIGY            COMPENSATE ACCELERATION TERMS

 01487  REF   1               06,3406  4 1461 1           CS      NBDY             (GYRO PULSES)/(CS) X 2(-5)
 01488  REF   2  LAST  340    06,3407  0 3524 1           TC      DRIFTSUB         -(NBDY)(DELTAT)   (GYRO PULSES) X 2(+14)

 01489  REF   1               06,3410  0 3460 0           TC      IRIGZ            COMPENSATE ACCELERATION TERMS

 0149   REF   1               06,3411  3 1462 0           CA      NBDZ             (GYRO PULSES)/(CS) X 2(-5)
 01491  REF   3  LAST  340    06,3412  0 3524 1           TC      DRIFTSUB         +(NBDZ)(DELTAT)   (GYRO PULSES) X 2(+14)


 01492  REF   3  LAST  340    06,3413  11'477 0           CCS     GCOMPSW          ARE GYRO COMMANDS GREATER THAN 2 PULSES
 01493                        06,3414  1 3416 0           TCF     +2               YES  SEND OUT GYRO TORQUING COMMANDS.
 01494  REF   2  LAST  338    06,3415  1 3423 0           TCF     IRIG1            NO   RETURN

 01495  REF   1               06,3416  3 5022 1           CA      PRIO21           PRIO GREATER THAN SERVICER
 01496  REF   7  LAST  274    06,3417  0 5063 1           TC      NOVAC            SEND OUT GYRO TORQUING COMMANDS.
 01497  REF   3  LAST  340    F3,1460                     EBANK=  NBDX
 01498  REF   1               06,3420   03557 0           2CADR   1/GYRO
 01498  REF   1               06,3421   14063 1

 01499                        06,3422  0 0003 1           RELINT
 0150   REF   2  LAST  338    06,3423  3 0163 0  IRIG1    CA      MODE             RESTORE CALLERS EBANK
 01501  REF  11  LAST  338    06,3424  54 003 0           TS      EBANK
 01502  REF   2  LAST  255    06,3425  1 4622 1           TCF     SWRETURN
```

```
L       IMU COMPENSATION PACKAGE                                                                 USER'S PAGE NO.   4      E3 S3

 0151                              06,3426  0 0006 1  IRIGX     EXTEND
 01511  REF  44  LAST  336         06,3427  22 156 0            QXCH    MPAC +2              SAVE Q
 01512                             06,3430  0 0006 1            EXTEND
 0152   REF   5  LAST  338         06,3431  4 0325 1            DCS     DELVX                (PIPA PULSES) X 2(+14)
 0153   REF  45  LAST  341         06,3432  52 155 1            DXCH    MPAC
 0154   REF   1                    06,3433  3 1463 1            CA      ADIAX                (GYRO PULSES)/(PIPA PULSE) X 2(-6)      *
 0155   REF   1                    06,3434  0 3475 1            TC      GCOMPSUB             -(ADIAX)(PIPAX)   (GYRO PULSES) X 2(+14)

 0156                              06,3435  0 0006 1            EXTEND
 0157   REF   1                    06,3436  4 0327 0            DCS     DELVY                (PIPA PULSES) X 2(+14)
 0158   REF  46  LAST  341         06,3437  52 155 1            DXCH    MPAC
 0159   REF   1                    06,3440  4 1466 0            CS      ADSRAX               (GYRO PULSES)/(PIPA PULSE) X 2(-6)      *
 0160   REF   2  LAST  341         06,3441  0 3475 1            TC      GCOMPSUB             +(ADSRAX)(PIPAY)  (GYRO PULSES) X 2(+14)

A01603                                                          EXTEND          ***
A01604                                                          DCS     DELVZ   ***          (PIPA PULSES) X 2(+14)
A01605                                                          DXCH    MPAC    ***
A01606                                                          CA      ADOAX   ***          (GYRO PULSES)/(PIPA PULSE) X 2(-6)      *
A01607                                                          TC      GCOMPSUB ***         -(ADOAX)(PIPAZ)   (GYRO PULSES) X 2(+14)

 0161   REF  47  LAST  341         06,3442  0 0156 0            TC      MPAC +2

 0163                              06,3443  0 0006 1  IRIGY     EXTEND
 01631  REF  48  LAST  341         06,3444  22 156 0            QXCH    MPAC +2              SAVE Q
 01632                             06,3445  0 0006 1            EXTEND
 0164   REF   2  LAST  341         06,3446  4 0327 0            DCS     DELVY                (PIPA PULSES) X 2(+14)
 0165   REF  49  LAST  341         06,3447  52 155 1            DXCH    MPAC
 0166   REF   1                    06,3450  3 1464 0            CA      ADIAY                (GYRO PULSES)/(PIPA PULSE) X 2(-6)      *
 0167   REF   3  LAST  341         06,3451  0 3475 1            TC      GCOMPSUB             -(ADIAY)(PIPAY)   (GYRO PULSES) X 2(+14)

 0168                              06,3452  0 0006 1            EXTEND
 0169   REF   1                    06,3453  4 0331 1            DCS     DELVZ                (PIPA PULSES) X 2(+14)
 0170   REF  50  LAST  341         06,3454  52 155 1            DXCH    MPAC
 0171   REF   1                    06,3455  4 1467 1            CS      ADSRAY               (GYRO PULSES)/(PIPA PULSE) X 2(-6)      *
 0172   REF   4  LAST  341         06,3456  0 3475 1            TC      GCOMPSUB             +(ADSRAY)(PIPAZ)  (GYRO PULSES) X 2(+14)

A01723                                                          EXTEND          ***
A01724                                                          DCS     DELVX   ***          (PIPA PULSES) X 2(+14)
A01725                                                          DXCH    MPAC    ***
A01726                                                          CA      ADOAY   ***          (GYRO PULSES)/(PIPA PULSE) X 2(-6)      *
A01727                                                          TC      GCOMPSUB ***         -(ADOAY)(PIPAX)   (GYRO PULSES) X 2(+14)

 0173   REF  51  LAST  341         06,3457  0 0156 0            TC      MPAC +2

 0175                              06,3460  0 0006 1  IRIGZ     EXTEND
 01751  REF  52  LAST  341         06,3461  22 156 0            QXCH    MPAC +2              SAVE Q
 01752                             06,3462  0 0006 1            EXTEND
 0176   REF   3  LAST  341         06,3463  4 0327 0            DCS     DELVY                (PIPA PULSES) X 2(+14)
 0177   REF  53  LAST  341         06,3464  52 155 1            DXCH    MPAC
 0178   REF   1                    06,3465  3 1470 0            CA      ADSRAZ               (GYRO PULSES)/(PIPA PULSE) X 2(-6)      *
 0179   REF   5  LAST  341   06,3466  0 3475 1          TC      GCOMPSUB           -(ADSRAZ)(PIPAY)  (GYRO PULSES) X 2(+14)

 0180                        06,3467  0 0006 1          EXTEND
 0181   REF   2  LAST  341   06,3470  4 0331 1          DCS     DELVZ              (PIPA PULSES) X 2(+14)
 0182   REF  54  LAST  341   06,3471  52 155 1          DXCH    MPAC
 0183   REF   1              06,3472  3 1465 1          CA      ADIAZ              (GYRO PULSES)/(PIPA PULSE) X 2(-6)      *
 0184   REF   6  LAST  342   06,3473  0 3475 1          TC      GCOMPSUB           -(ADIAZ)(PIPAZ)   (GYRO PULSES) X 2(+14)

A01843                                                  EXTEND           ***
A01844                                                  DCS     DELVX    ***       (PIPA PULSE) X 2(+14)
A01845                                                  DXCH    MPAC     ***
A01846                                                  CS      ADOAZ    ***       (GYRO PULSES)/(PIPA PULSE) X 2(-6)      *
A01847                                                  TC      GCOMPSUB ***       +(ADOAZ)(PIPAX)   (GYRO PULSES) X 2(+14)

 0185   REF  55  LAST  342   06,3474  0 0156 0          TC      MPAC +2
 0199   REF  56  LAST  342   06,3475  56 154 1  GCOMPSUB XCH     MPAC              ADIA OR ADSRA COEFFICIENT ARRIVES IN A
 0200                        06,3476   0 0006 1           EXTEND                   C(MPAC) = (PIPA PULSES) X 2(+14)
 0201   REF  57  LAST  343   06,3477   7 0154 0           MP      MPAC              (GYRO PULSES)/(PIPA PULSE) X 2(-6)      *
 0202   REF  17  LAST  100   06,3500  52 123 0           DXCH    VBUF              NOW = (GYRO PULSES) X 2(+8)             *

 0203   REF  58  LAST  343   06,3501   3 0155 0           CA      MPAC +1           MINOR PART PIPA PULSES
 0204                        06,3502   0 0006 1           EXTEND
 0205   REF  59  LAST  343   06,3503   7 0154 0           MP      MPAC              ADIA OR ADSRA
 0206   REF  27  LAST  338   06,3504  54 001 1           TS      L
 0207   REF  31  LAST  310   06,3505   3 4746 0           CAF     ZERO
 0208   REF  18  LAST  343   06,3506  20 123 0           DAS     VBUF              NOW = (GYRO PULSES) X 2(+8)             *

 0209   REF  19  LAST  343   06,3507   3 0122 0           CA      VBUF              PARTIAL RESULT - MAJOR
 0210                        06,3510   0 0006 1           EXTEND
 0211   REF  15  LAST  257   06,3511   7 4734 1           MP      BIT9              SCALF 2(+6)       SHIFT RIGHT 6         *
 0212   REF  18  LAST  340   06,3512  50 130 0           INDEX   BUF               RESULT = (GYRO PULSES) X 2(+14)
 0213   REF   3  LAST  115   06,3513  21'472 0           DAS     GCOMP             HI(ADIA)(PIPAI)  OR  HI(ADSRA)(PIPAI)

 0214   REF  20  LAST  343   06,3514   3 0123 1           CA      VBUF +1           PARTIAL RESULT - MINOR
 0215                        06,3515   0 0006 1           EXTEND
 0216   REF  16  LAST  343   06,3516   7 4734 1           MP      BIT9              SCALF 2(+6)       SHIFT RIGHT 6         *
 0217   REF  28  LAST  343   06,3517  54 001 1           TS      L
 0218   REF  32  LAST  343   06,3520   3 4746 0           CAF     ZERO
 0219   REF  19  LAST  343   06,3521  50 130 0           INDEX   BUF               RESULT = (GYRO PULSES) X 2(+14)
 0220   REF   4  LAST  343   06,3522  21'472 0           DAS     GCOMP             (ADIA)(PIPAI)  OR  (ADSRA)(PIPAI)

 0221   REF  30  LAST  338   06,3523   0 0002 0           TC      Q
```

```
0222                         06,3524  0 0006 1  DRIFTSUB EXTEND
0223   REF  20  LAST  343    06,3525  22 131 1           QXCH    BUF +1

0224                         06,3526  0 0006 1           EXTEND                     C(A) = NBD     (GYRO PULSES)/(CS) X 2(-5)
0225   REF   3  LAST  338    06,3527  7 1074 1           MP      1/PIPADT           (CS) X 2(+8)    NOW (GYRO PULSES) X 2(+3)
0226   REF  60  LAST  343    06,3530  22 155 0           LXCH    MPAC +1            SAVE FOR FRACTIONAL COMPENSATION
0227                         06,3531  0 0006 1           EXTEND
0228   REF  22  LAST  269    06,3532  7 4741 0           MP      BIT4               SCALE 2(+11)      SHIFT RIGHT 11
0229   REF  21  LAST  344    06,3533  50 130 0           INDEX   BUF
0230   REF   5  LAST  343    06,3534  21'472 0           DAS     GCOMP              HI(NBD)(DELTAT)    (GYRO PULSES) X 2(+14)

0231   REF  61  LAST  344    06,3535  3 0155 0           CA      MPAC +1            NOW MINOR PART
0232                         06,3536  0 0006 1           EXTEND
0233   REF  23  LAST  344    06,3537  7 4741 0           MP      BIT4               SCALE 2(+11)      SHIFT RIGHT 11
0234   REF  29  LAST  343    06,3540  54 001 1           TS      L
0235   REF  33  LAST  343    06,3541  3 4746 0           CAF     ZERO
0236   REF  22  LAST  344    06,3542  50 130 0           INDEX   BUF                ADD IN FRACTIONAL COMPENSATION
0237   REF   6  LAST  344    06,3543  21'472 0           DAS     GCOMP              (NBD)(DELTAT)      (GYRO PULSES) X 2(+14)

0238   REF  13  LAST  316    06,3544  3 4743 0  DRFTSUB2 CAF     TWO                PIPAX, PIPAY, PIPAZ
0239   REF  23  LAST  344    06,3545  6 0130 0           AD      BUF
0240   REF  24  LAST  344    06,3546  56 130 0           XCH     BUF
0241   REF  89  LAST  335    06,3547  50 000 1           INDEX   A
0242   REF   7  LAST  344    06,3550  11'471 0           CCS     GCOMP              ARE GYRO COMMANDS 1 PULSE OR GREATER
0243                         06,3551  1 3553 0           TCF     +2                 YES
0244   REF  25  LAST  344    06,3552  0 0131 1           TC      BUF +1             NO

0245   REF   1               06,3553  7 3623 1           MASK    COMPCHK            DEC -1
0246   REF  90  LAST  344    06,3554  10 000 0           CCS     A                  ARE GYRO COMMANDS GREATER THAN 2 PULSES
0247   REF   4  LAST  340    06,3555  55'477 0           TS      GCOMPSW            YES - SET GCOMPSW POSITIVE
0248   REF  26  LAST  344    06,3556  0 0131 1           TC      BUF +1             NO
```

```
 0249   REF   3  LAST  338   06,3557  3 4742 1  1/GYRO    CAF    FOUR            PIPAZ, PIPAY, PIPAX
 0250   REF  27  LAST  344   06,3560  54 130 1            TS     BUF

 0251   REF  28  LAST  345   06,3561  50 130 0            INDEX  BUF             SCALE GYRO COMMANDS FOR IMUPULSE
 0252   REF   8  LAST  344   06,3562  3 1472 1            CA     GCOMP +1        FRACTIONAL PULSES
 0253                        06,3563  0 0006 1            EXTEND
 0254   REF  21  LAST  291   06,3564  7 4735 0            MP     BIT8            SHIFT RIGHT 7
 0255   REF  29  LAST  345   06,3565  50 130 0            INDEX  BUF
 0256   REF   9  LAST  345   06,3566  55'472 0            TS     GCOMP +1        FRACTIONAL PULSES SCALED

 0257   REF  34  LAST  344   06,3567  3 4746 0            CAF    ZERO            SET GCOMP = 0 FOR DAS INSTRUCTION
 0258   REF  30  LAST  345   06,3570  50 130 0            INDEX  BUF
 0259   REF  10  LAST  345   06,3571  57'471 1            XCH    GCOMP           GYRO PULSES
 0260                        06,3572  0 0006 1            EXTEND
 0261   REF  22  LAST  345   06,3573  7 4735 0            MP     BIT8            SHIFT RIGHT 7
 0262   REF  31  LAST  345   06,3574  50 130 0            INDEX  BUF
 0263   REF  11  LAST  345   06,3575  21'472 0            DAS    GCOMP           ADD THESE TO FRACTIONAL PULSES ABOVE

 0264   REF  32  LAST  345   06,3576  10 130 1            CCS    BUF             PIPAZ, PIPAY, PIPAX
 0265   REF   2  LAST  338   06,3577  6 7770 0            AD     NEG1
 0266   REF   2  LAST  340   06,3600  1 3560 0            TCF    1/GYRO +1
 0267   REF  12  LAST  345   06,3601   01471 1  LGCOMP    ECADR  GCOMP           LESS THAN ZERO IMPOSSIBLE

 0268   REF   2  LAST  338   06,3602  3 3601 0            CAF    LGCOMP
 0269   REF  61  LAST  312   06,3603  0 4607 1            TC     BANKCALL
 0270   REF   2  LAST  285   06,3604   17310 0            CADR   IMUPULSE        CALL GYRO TORQUING ROUTINE
 0271   REF  62  LAST  345   06,3605  0 4607 1            TC     BANKCALL
 0272   REF   6  LAST  285   06,3606   17735 0            CADR   IMUSTALL        WAIT FOR PULSES TO GET OUT
 0273                        06,3607  1 3610 1            TCF    +1

 0274   REF   4  LAST  345   06,3610  3 4742 1  GCOMP1    CAF    FOUR            PIPAZ, PIPAY, PIPAX
 0275   REF  33  LAST  345   06,3611  54 130 1            TS     BUF

 0276   REF  34  LAST  345   06,3612  50 130 0            INDEX  BUF             RESCALE
 0277   REF  13  LAST  345   06,3613  3 1472 1            CA     GCOMP +1
 0278                        06,3614  0 0006 1            EXTEND
 0279   REF  23  LAST  345   06,3615  7 4735 0            MP     BIT8            SHIFT MINOR PART LEFT 7 - MAJOR PART = 0
 0280   REF  35  LAST  345   06,3616  50 130 0            INDEX  BUF
 0281   REF  14  LAST  345   06,3617  23'472 1            LXCH   GCOMP +1        BITS 8-14 OF MINOR PART WERE = 0

 0282   REF  36  LAST  345   06,3620  10 130 1            CCS    BUF             PIPAZ, PIPAY, PIPAX
 0283   REF   3  LAST  345   06,3621  6 7770 0            AD     NEG1
 0284   REF   1              06,3622  1 3611 0            TCF    GCOMP1 +1
 0285                        06,3623   77776 1  COMPCHK   DEC    -1              LESS THAN ZERO IMPOSSIBLE
 0286   REF  26  LAST  311   06,3624  1 5146 0            TCF    ENDOFJOB
 0287   REF   5  LAST  344    06,3625  11'477 0  NBDONLY  CCS    GCOMPSW          BYPASS IF GCOMPSW NEGATIVE
 0288                         06,3626   1 3631 1           TCF    +3
 0289                         06,3627   1 3631 1           TCF    +2
 0290   REF  27  LAST  345    06,3630   1 5146 0           TCF    ENDOFJOB

 029005                       06,3631   0 0004 0           INHINT
 02901  REF   6  LAST  241    06,3632  10 076  1           CCS    FLAGWRD2         PREREAD T3RUPT MAY COINCIDE
 02902  REF  28  LAST  346    06,3633   1 5146 0           TCF    ENDOFJOB
 02903  REF  29  LAST  346    06,3634   1 5146 0           TCF    ENDOFJOB
 02904                        06,3635   1 3636 0           TCF    +1

 02905  REF   3  LAST  309    06,3636   3 0104 1           CA     FLAGWRD8         IF SURFACE FLAG IS SET, SET TEM1
 02906  REF  24  LAST  345    06,3637   7 4735 0           MASK   BIT8             POSITIVE SO THAT THE ACCELERATION TERMS
 02907  REF   4  LAST  100    06,3640  54 141  1           TS     TEM1             WILL BE COMPENSATED.
 02908                        06,3641   0 0006 1           EXTEND
 0291                         06,3642   1 3645 1           BZF    +3               ARE WE ON THE SURFACE

 0292   REF  16  LAST  307    06,3643   0 4665 0           TC     IBNKCALL         ON THE SURFACE
 02925  REF   1               06,3644    77543 0           CADR   PIPASR +3        READ PIPAS, BUT DO NOT SCALE THEM

 0293   REF   8  LAST  217    06,3645   3 0025 0           CA     TIME1            (CS) X 2(+14)
 0294   REF   4  LAST  344    06,3646  57'074 0           XCH    1/PIPADT         PREVIOUS TIME
 0295                         06,3647   0 0003 1           RELINT
 0296                         06,3650   4 0000 0           COM
 0297   REF   5  LAST  346    06,3651   6 1074 0           AD     1/PIPADT         PRESENT TIME - PREVIOUS TIME
 0298   REF   1               06,3652   6 4727 1  NBD2     AD     HALF             CORRECT FOR POSSIBLE TIME1 TICK
 0299   REF   2  LAST  346    06,3653   6 4727 1           AD     HALF
 0300   REF  30  LAST  344    06,3654  56 001  0           XCH    L                IF TIME1 DID NOT TICK, REMOVE RESULTING
 0301   REF  31  LAST  346    06,3655  56 001  0           XCH    L                OVERFLOW.

 0302                         06,3656   0 0006 1  NBD3     EXTEND                  C(A) = DELTAT     (CS) X 2(+14)
 0303   REF  16  LAST  189    06,3657   7 4733 0           MP     BIT10            SHIFT RIGHT 5
 0304   REF  21  LAST  343    06,3660  52 125  0           DXCH   VBUF +2

 03041  REF  35  LAST  345    06,3661   3 4746 0           CA     ZERO
 03042  REF   6  LAST  346    06,3662  55'477 0           TS     GCOMPSW          INDICATE COMMANDS 2 PULSES OR LESS.
 03043  REF  37  LAST  345    06,3663  54 130  1           TS     BUF              INDEX  X, Y, Z.

 03044  REF   5  LAST  346    06,3664  10 141  1           CCS    TEM1             IF SURFACE FLAG IS SET,
 03045  REF   2  LAST  340    06,3665   0 3426 1           TC     IRIGX            COMPENSATE ACCELERATION TERMS.

 0305                         06,3666   0 0006 1           EXTEND
 0306   REF  22  LAST  346    06,3667   3 0125 1           DCA    VBUF +2
 0307   REF  62  LAST  344    06,3670  52 155  1           DXCH   MPAC             DELTAT NOW SCALED (CS) X 2(+19)

 0311   REF   4  LAST  340    06,3671   4 1460 0           CS     NBDX             (GYRO PULSES)/(CS) X 2(-5)
 0312   REF   1               06,3672   0 3714 0           TC     FBIASSUB         -(NBDX)(DELTAT)   (GYRO PULSES) X 2(+14)

 03121  REF   6  LAST  346    06,3673  10 141  1           CCS    TEM1             IF SURFACE FLAG IS SET,
 03122  REF   2  LAST  340    06,3674   0 3443 1           TC     IRIGY            COMPENSATE ACCELERATION TERMS.
```

```
0313                            06,3675  0 0006 1          EXTEND
0314   REF  23  LAST  346       06,3676  4 0125 0          DCS     VBUF +2
0315   REF  63  LAST  346       06,3677  52 155 1          DXCH    MPAC                   DELTAT SCALED (CS) X 2(+19)
0316   REF   2  LAST  340       06,3700  3 1461 0          CA      NBDY                   (GYRO PULSES)/(CS) X 2(-5)
0317   REF   2  LAST  346       06,3701  0 3714 0          TC      FBIASSUB               -(NBDY)(DELTAT)   (GYRO PULSES) X 2(+14)

03171  REF   7  LAST  346       06,3702  10 141 1          CCS     TEM1                   IF SURFACE FLAG IS SET,
03172  REF   2  LAST  340       06,3703  0 3460 0          TC      IRIGZ                  COMPENSATE ACCELERATION TERMS

0318                            06,3704  0 0006 1          EXTEND
0319   REF  24  LAST  347       06,3705  4 0125 0          DCS     VBUF +2
0320   REF  64  LAST  347       06,3706  52 155 1          DXCH    MPAC                   DELTAT SCALED (CS) X 2(+19)
0321   REF   2  LAST  340       06,3707  4 1462 1          CS      NBDZ                   (GYRO PULSES)/(CS) X 2(-5)
0322   REF   3  LAST  347       06,3710  0 3714 0          TC      FBIASSUB               +(NBDZ)(DELTAT)   (GYRO PULSES) X 2(+14)

0323   REF   7  LAST  346       06,3711  11'477 0          CCS     GCOMPSW                ARE GYRO COMMANDS GREATER THAN 2 PULSES
0324   REF   3  LAST  345       06,3712  1 3557 1          TCF     1/GYRO                 YES
0325   REF  30  LAST  346       06,3713  1 5146 0          TCF     ENDOFJOB               NO
```

```
0326   REF  31  LAST  343   06,3714  56 002 0  FBIASSUB XCH     Q
0327   REF  38  LAST  346   06,3715  54 131 0           TS      BUF +1

0328   REF  32  LAST  348   06,3716  3 0002 0           CA      Q                   NBD SCALED (GYRO PULSES)/(CS) X 2(-5)
0329                        06,3717  0 0006 1           EXTEND
0330   REF  65  LAST  347   06,3720  7 0154 0           MP      MPAC                DELTAT SCALED (CS) X 2(+19)
0331   REF  39  LAST  348   06,3721  50 130 0           INDEX   BUF
0332   REF  15  LAST  345   06,3722  21'472 0           DAS     GCOMP               HI(NBD)(DELTAT)   (GYRO PULSES) X 2(+14)

0333   REF  33  LAST  348   06,3723  3 0002 0           CA      Q                   NOW FRACTIONAL PART
0334                        06,3724  0 0006 1           EXTEND
0335   REF  66  LAST  348   06,3725  7 0155 1           MP      MPAC +1
0336   REF  32  LAST  346   06,3726  54 001 1           TS      L
0337   REF  36  LAST  346   06,3727  3 4746 0           CAF     ZERO
0338   REF  40  LAST  348   06,3730  50 130 0           INDEX   BUF
0339   REF  16  LAST  348   06,3731  21'472 0           DAS     GCOMP               (NBD)(DELTAT)     (GYRO PULSES) X 2(+14)

0340   REF   1              06,3732  1 3544 0           TCF     DRFTSUB2            CHECK MAGNITUDE OF COMPENSATION


0341   REF  63  LAST  345   06,3733  0 4607 1  LASTBIAS TC      BANKCALL
03411  REF   1              06,3734   17264 1           CADR    PIPUSE1

03412  REF   8  LAST  347   06,3735  11'477 0           CCS     GCOMPSW
0342                        06,3736  1 3741 1           TCF     +3
0343                        06,3737  1 3741 1           TCF     +2
0344   REF  31  LAST  347   06,3740  1 5146 0           TCF     ENDOFJOB

03441  REF   4  LAST  346   06,3741  3 0104 1           CA      FLAGWRD8            IF SURFACE FLAG IS SET, SET TEM1
03442  REF   2  LAST  309   06,3742  7 4735 0           MASK    SURFFBIT            POSITIVE SO THAT THE ACCELERATION TERMS
03443  REF   8  LAST  347   06,3743  54 141 1           TS      TEM1                WILL BE COMPENSATED.

0345   REF   1              06,3744  3 7737 0           CAF     PRIO31              2 SECONDS SCALED (CS) X 2(+8)
0346   REF   6  LAST  346   06,3745  57'074 0           XCH     1/PIPADT
0347                        06,3746  4 0000 0           COM
0348   REF   3  LAST  332   06,3747  6 1234 0           AD      PIPTIME +1
0349   REF   1              06,3750  1 3652 1           TCF     NBD2


0350   REF   3  LAST  345   06,3751  3 3601 0  GCOMPZER CAF     LGCOMP               ROUTINE TO ZERO GCOMP BEFORE FIRST
0351   REF  12  LAST  340   06,3752  56 003 1           XCH     FBANK                CALL TO 1/PIPA
0352   REF   3  LAST  340   06,3753  54 163 1           TS      MODE

0353   REF  37  LAST  348   06,3754  3 4746 0           CAF     ZERO
0354   REF   9  LAST  348   06,3755  55'477 0           TS      GCOMPSW
0355   REF  17  LAST  348   06,3756  55'471 0           TS      GCOMP
0356   REF  18  LAST  348   06,3757  55'472 0           TS      GCOMP +1
0357   REF  19  LAST  348   06,3760  55'473 1           TS      GCOMP +2
0358   REF  20  LAST  348   06,3761  55'474 0           TS      GCOMP +3
0359   REF  21  LAST  348   06,3762  55'475 1           TS      GCOMP +4
```

```
 0360   REF  22  LAST  348   06,3763  55'476 1           TS      GCOMP +5
 0361   REF   3  LAST  340   06,3764  1 3423 0           TCF     IRIG1            RESTORE EBANK AND RETURN
```

```
R0010   SUBROUTINE NAME:     V89CALL
R0011   MOD NO:  0                          DATE: 9 JAN 1968
R0012   MOD BY:  DIGITAL DEVEL GROUP        LOG SECTION: R63

R0013   FUNCTIONAL DESCRIPTION:

R0014   CALLED BY VERB 89 ENTER DURING P00. PRIO 10 USED.  CALCULATES AND
R0015   DISPLAYS FINAL FDAI BALL ANGLES TO POINT LM +X OR +Z AXIS AT CSM.

R0016   1. KEY IN V 89 E ONLY IF IN PROG 00. IF NOT IN P00, OPERATOR ERROR AND
R0017   EXIT R63, OTHERWISE CONTINUE.

R0018   2. IF IN P00, DO IMU STATUS CHECK ROUTINE (R02BOTH). IF IMU ON AND ITS
R0019   ORIENTATION KNOWN TO LGC, CONTINUE.

R0020   3. FLASH DISPLAY V 04 N 06.  R2 INDICATES WHICH SPACECRAFT AXIS IS TO
R0021   BE POINTED AT CSM.  INITIAL CHOICE IS PREFERRED (+Z) AXIS (R2=1).
R0022   ASTRONAUT CAN CHANGE TO (+X) AXIS (R2 NOT = 1) BY V 22 E 2 E.  CONTINUE
R0023   AFTER KEYING IN PROCEED.

R0024   4. BOTH VEHICLE STATE VECTORS UPDATED BY CONIC EQS.

R0025   5. HALF MAGNITUDE UNIT LOS VECTOR (IN STABLE MEMBER COORDINATES) AND
R0026   HALF MAGNITUDE UNIT SPACECRAFT AXIS VECTOR (IN BODY COORDINATES)
R0027   PREPARED FOR VECPOINT.

R0028   6. GIMBAL ANGLES FROM VECPOINT TRANSFORMED INTO FDAI BALL ANGLES BY
R0029   BALLANGS. FLASH DISPLAY V 06 N 13 AND AWAIT RESPONSE.

R0030   7. RECYCLE - RETURN TO STEP 4.
R0031      TERMINATE - EXIT R63.
R0032      PROCEED - RESET 3AXISFLG AND CALL R60LEM FOR ATTITUDE MANEUVER.


R0033   CALLING SEQUENCE:  V 89 E.

R0034   SUBROUTINES CALLED:  CHKPOOH, R02BOTH, GOXDSPE, CSMCONIC, LEMCONIC,
R0035                        VECPOINT, BALLANGS, R60LEM.

R0036   NORMAL EXIT MODES:  TC ENDEXT

R0037   ALARMS:  1. OPERATOR ERROR IF NOT IN P00.
R0038            2. PROGRAM ALARM IF IMU IS OFF.
R0039            3. PROGRAM ALARM IF IMU ORIENTATION IS UNKNOWN.

R0040   OUTPUT:  NONE

R0041   ERASABLE INITIALIZATION REQUIRED:  NONE

R0042   DEBRIS:  OPTION1, +1, TDEC1, POINTVSM, SCAXIS, CPHI, CTHETA, CPSI,
R0043            3AXISFLG.


 0044   REF   4  LAST  296    E4,1577                       EBANK= RONE
 0045                         32,2213                       BANK    32
 0046   REF   1               26,2000                       SETLOC 8AWLANGS
 0047                         26,2024                       BANK


 0048   REF   1                                             COUNT* $$/R63
 0049   REF  64  LAST  348    26,2024  0 4607 1  V89CALL    TC      BANKCALL      IMU STATUS CHECK. RETURNS IF ORIENTATION
 0050   REF   1               26,2025   33757 1             CADR    R02BOTH       KNOWN. ALARMS IF NOT.
 0051   REF   3  LAST  306    26,2026  3 6266 0             CAF     THREE         ALLOW ASTRONAUT TO SELECT DESIRED
 0052   REF   8  LAST  317    26,2027  55'050 1             TS      OPTIONX       TRACKING ATTITUDE AXIS.
 0053   REF  16  LAST  316    26,2030  3 4744 1             CAF     ONE
 0054   REF   9  LAST  351    26,2031  55'051 0             TS      OPTIONX +1
 0055   REF   1               26,2032  3 2121 1             CAF     VB04N12       V 04 N 12
 0056   RFF  65  LAST  351    26,2033  0 4607 1             TC      BANKCALL
 0057   REF   2  LAST  236    26,2034   20471 1             CADR    GOFLASH
 0058   REF  25  LAST  312    26,2035  0 5474 0             TC      ENDEXT        TERMINATE
 0059                         26,2036  0 2040 1             TC      +2            PROCEED
 0060                         26,2037  Q 2032 1             TC      -5            DATA IN. OPTION1+1 = 1 FOR Z AXIS
 0061   PEF  13  LAST  335    26,2040  0 6060 1  V89RECL    TC      INTPRET                           = 2 FOR X AXIS
 0062                         26,2041   43234 0             RTB     DAD
 0063   REF   3  LAST  259    26,2042   21603 1                     LOADTIME      READ PRESENT TIMF
 00635  REF   1               26,2043   14124 0                     DP1MIN
 0064   REF   1               26,2044   02176 0             STORE   TSTART82      SAVE TIME FOR LEMCONIC CALL
 0065   RFF   4  LAST  247    26,2045   34041 0             STCALL  TDEC1         STORE TIME FOR CSMCONIC CALL
 0066   REF   1               26,2046   27124 0                     CSMCONIC      CSM STATF VECTOR UPDATE
 0067                         26,2047   77775 1             VLOAD                 CSMCONIC LEFT R VECTOR IN RATT
 0068   REF   1               26,2050   00001 0                     RATT
 0069   REF   5  LAST  351    26,2051   16200 1             STODL   RONE          SAVE FOR LINE OF SIGHT (LOS) COMPUTATION
 0070   REF   2  LAST  351    26,2052   02176 0                     TSTART82
 0071   REF   5  LAST  351    26,2053   34041 0             STCALL  TDEC1         STORE TIME FOR LEMCONIC CALL
 0072   REF   1               26,2054   27136 0                     LEMCONIC      LEM STATE VECTOR UPDATE
 0073                         26,2055   52375 1             VLOAD   VSU           CSM POSITION - LEM POSITION = LOS
 0074   REF   6  LAST  351    26,2056.  02200 1                     RONE          LOS VECTOR LEFT IN MPAC
 0075   REF   2  LAST  351    26,2057   00001 0                     RATT
 0076                         26,2060   47121 0             MXV     RTB           (REFSMMAT X LOS). TRANSFORMS LOS FROM
 0077   REF   8  LAST  263    26,2061   01732 0                     REFSMMAT      REFERENCE COORD TO STAB MEMB COORD.
 00771  RFF   1               26,2062   21724 0                     NORMUNIT
 0078   REF   4  LAST  264    26,2063   03773 1             STORE   POINTVSM      STORE LOS FOR VECPOINT CALL
 0079                         26,2064   77776 1             EXIT
 0080   REF  10  LAST  351    26,2065  4 1051 0             CS      OPTIONX +1    1 FOR Z AXIS. 2 FOR X AXIS.
 0081   REF  17  LAST  351    26,2066  6 4744 1             AD      ONF
 0082                         26,2067  0 CC06 1             EXTEND
 0083   RFF   1               26,2070  1 2115 1             BZF     ALINEZ
 0084   RFF  14  LAST  351    26,2071  0 6060 1  ALINEX     TC      INTPRFT       X AXIS ALIGNMFNT
 0085                         26,2072   77775 1             VLOAD
 0086   REF   4  LAST  312    26,2073   06503 1                     UNITX         READ (.5, 0, 0)
```

```
0087   REF  11  LAST  264   26,2074   37765 1  V89CALL1 STCALL SCAXIS         STORE SELECTED ALIGNMENT AXIS
0088   REF   1              26,2075   56040 0                  VECPOINT       PUTS DESIRED GIM ANG (OG,IG,MG) IN TMPAC
0089   REF   1              26,2076   00322 1           STORE  CPHI           STORE GIMBAL ANGLES FOR BALLANGS CALL.
0090                        26,2077   77776 1           EXIT
00905  REF  66  LAST  351   26,2100  0 4607 1           TC     BANKCALL
0091   REF   1              26,2101   54300 0           CADR   BALLANGS       PUTS DESIRED BALL ANGLES IN FDAIX,Y,Z
0092   REF   1              26,2102  3 2122 1           CAF    VB06N18        V 06 N 18
0093   REF  67  LAST  352   26,2103  0 4607 1           TC     BANKCALL       NOUN 18 REFERS TO FDAIX,Y,Z
0094   REF   3  LAST  351   26,2104   20471 1           CADR   GOFLASH
0095   REF  26  LAST  351   26,2105  0 5474 0           TC     ENDEXT         TERMINATE
0096                        26,2106  0 2110 0           TC     +2             PROCEED
0097   REF   1              26,2107  0 2040 1           TC     V89RECL        RECYCLE
0098   REF  25  LAST  310   26,2110  0 5520 0           TC     DOWNFLAG       RESET 3 AXIS FLAG
0099   REF   2  LAST  240   26,2111   00124 0           ADRES  3AXISFLG       RESET BIT6 FLAG WORD 5
0100   REF  68  LAST  352   26,2112  0 4607 1           TC     BANKCALL       PERFORMS LEM MANEUVER TO ALIGN SELECTED
0101   REF   1              26,2113   54125 0           CADR   R60LEM         SPACECRAFT AXIS TO CSM.
0102   REF  27  LAST  352   26,2114  1 5474 1           TCF    ENDEXT         TERMINATE R63


0103   REF  15  LAST  351   26,2115  0 6060 1  ALINEZ   TC     INTPRET        Z AXIS ALIGNMENT
0104                        26,2116   52175 0           VLOAD  GOTO
0105   REF   4  LAST  312   26,2117   06477 0                  UNITZ          READ (0, 0, .5)
0106   REF   1              26,2120   54074 0                  V89CALL1


0107                        26,2121   01014 0  VB04N12  VN     412
0108                        26,2122   01422 1  VB06N18  VN     0618
```

```
 01085                          26,2123    00000 1  DP1MIN   2DEC    6000
 01085                          26,2124    13560 0
```

```
P0001   BLOCK 2 LGC ATTITUDE MANEUVER ROUTINE-KALCMANU


R0002   MOD 2            DATE   5/1/67     BY DON KEENE
R0003   PROGRAM DESCRIPTION

R0004        KALCMANU IS A ROUTINE WHICH GENERATES COMMANDS FOR THE LM DAP TO CHANGE THE ATTITUDE OF THE SPACECRAFT
R0006   DURING FREE FALL.  IT IS DESIGNED TO MANEUVER THE SPACECRAFT FROM ITS INITIAL ORIENTATION TO SOME DESIRED
R0008   ORIENTATION SPECIFIED BY THE PROGRAM WHICH CALLS KALCMANU, AVOIDING GIMBAL LOCK IN THE PROCESS.  IN THE
R0010   MOD 2 VERSION, THIS DESIRED ATTITUDE IS SPECIFIED BY A SET OF THREE COMMANDED CDU ANGLES STORED AS 2S COMPLEMENT
R0012   SINGLE PRECISION ANGLES IN THE THREE CONSECUTIVE LOCATIONS, CPHI, CTHETA, CPSI, WHERE

R0014        CPHI = COMMANDED OUTER GIMBAL ANGLE
R0015        CTHETA = COMMANDED INNER GIMBAL ANGLE
R0016        CPSI = COMMANDED MIDDLE GIMBAL ANGLE

R0017       WHEN POINTING A SPACECRAFT AXIS (E.I. X, Y, Z, THE AOT, THRUST AXIS, ETC) THE SUBROUTINE VECPOINT MAY BE
R0019   USED TO GENERATE THIS SET OF DESIRED CDU ANGLES (SEE DESCRIPTION IN R60)    -
R0021    WITH THIS INFORMATION KALCMANU DETERMINES THE DIRECTION OF THE SINGLE EQUIVALENT ROTATION (COF ALSO U) AND THE
R0023   MAGNITUDE OF THE ROTATION (AM) TO BRING THE S/C FROM ITS INITIAL ORIENTATION TO ITS FINAL ORIENTATION.
R0025   THIS DIRECTION REMAINS FIXED BOTH IN INERTIAL COORDINATES AND IN COMMANDED S/C AXES THROUGHOUT THE
R0027                                   -
R0028   MANEUVER.  ONCE COF AND AM HAVE BEEN DETERMINED, KALCMANU THEN EXAMINES THE MANEUVER TO SEE IF IT WILL BRING
R0030                                                                -
R0031   THE S/C THROUGH GIMBAL LOCK.  IF SO, COF AND AM ARE READJUSTED SO THAT THE S/C WILL JUST SKIM THE GIMBAL
R0033   LOCK ZONE AND ALIGN THE X-AXIS.  IN GENERAL A FINAL YAW  ABOUT X WILL BE NECESSARY TO COMPLETE THE MANEUVER.
R0035   NEEDLESS TO SAY, NEITHER THE INITIAL NOR THE FINAL ORIENTATION CAN BE IN GIMBAL LOCK.
R0037
R0038        FOR PROPER ATTITUDE CONTROL THE DIGITAL AUTOPILOT MUST BE GIVEN AN ATTITUDE REFERENCE WHICH IT CAN TRACK.
R0040   KALCMANU DOES THIS BY GENERATING A REFERENCE OF DESIRED GIMBAL ANGLES (CDUXD, CDUYD, CDUZD) WHICH ARE UPDATED
R0042   EVERY ONE SECOND DURING THE MANEUVER.  TO ACHIEVE A SMOOTHER SEQUENCE OF COMMANDS BETWEEN SUCCESSIVE UPDATES,
R0044   THE PROGRAM ALSO GENERATES A SET OF INCREMENTAL CDU ANGLES (DELDCDU) TO BE ADDED TO CDU DESIRED BY THE DIGITAL
R0046   AUTOPILOT.  KALCMANU ALSO CALCULATES THE COMPONENT MANEUVER RATES (OMEGAPD, OMEGAQD, OMEGARD), WHICH CAN
R0048                                                            -
R0049   BE DETERMINED SIMPLY BY MULTIPLYING COF BY SOME SCALAR (ARATE) CORRESPONDING TO THE DESIRED ROTATIONAL RATE.
R0051
R0052        AUTOMATIC MANEUVERS ARE TIMED WITH THE HELP OF WAITLIST SO THAT AFTER A SPECIFIED INTERVAL THE Y AND Z
R0054   DESIRED RATES ARE SET TO ZERO AND THE DESIRED CDU ANGLES (CDUYD, CDUZD) ARE SET EQUAL TO THE FINAL DESIRED CDU
R0056   ANGLES (CTHETA, CPSI).  IF ANY YAW  REMAINS DUE TO GIMBAL LOCK AVOIDANCE, THE FINAL YAW  MANEUVER IS
R0058   CALCULATED AND THE DESIRED YAW  RATE SET TO SOME FIXED VALUE (ROLLRATE = + OR - 2 DEGREES PER SEC).
R0060   IN THIS CASE ONLY AN INCREMENTAL CDUX ANGLE (DELEROLL) IS SUPPLIED TO THE DAP.  AT THE END OF THE YAW
R0062   MANEUVER OR IN THE EVENT THAT THERE WAS NO FINAL YAW,  CDUXD IS SET EQUAL TO CPHI AND THE X-AXIS DESIRED
R0064   RATE SET TO ZERO.  THUS, UPON COMPLETION OF THE MANEUVER THE S/C WILL FINISH UP IN A LIMIT CYCLE ABOUT THE
R0066   DESIRED FINAL GIMBAL ANGLES.


R0067   PROGRAM LOGIC FLOW

R0068        KALCMANU IS CALLED AS A HIGH PRIORITY JOB WITH ENTRY POINTS AT KALCMAN3 AND VECPOINT.  IT FIRST PICKS
R0070   UP THE CURRENT CDU ANGLES TO BE USED AS THE BASIS FOR ALL COMPUTATIONS INVOLVING THE INITIAL S/C ORIENTATION.
```

```
R0072   IT THEN DETERMINES THE DIRECTION COSINE MATRICES RELATING BOTH THE INITIAL AND FINAL S/C ORIENTATION TO STABLE
R0074                 *    *                                                                                *
R0076   MEMBER AXES (MIS, MFS).  IT ALSO COMPUTES THE MATRIX RELATING FINAL S/C AXES TO INITIAL S/C AXES (MFI).  THE
R0078   ANGLE OF ROTATION (AM) IS THEN EXTRACTED FROM THIS MATRIX, AND TESTS ARE MADE TO DETERMINE IF
R0080
R0081        A)  AM LESS THAN .25 DEGREES (MINANG)
R0082        B)  AM GREATER THAN 170 DEGREES (MAXANG)

R0083        IF AM LESS THAN .25 DEGREES, NO COMPLICATED AUTOMATIC MANEUVERING IS NECESSARY.  THEREFORE WE CAN SIMPLY
R0085   SET CDU DESIRED EQUAL TO THE FINAL CDU DESIRED ANGLES AND TERMINATE THE JOB.
R0087
R0088        IF AM IS GREATER THAN .25 DEGREES BUT LESS THAN 170 DEGREES, THE AXES OF THE SINGLE EQUIVALENT ROTATION
R0090     -                                                       *
R0091   (COF) IS EXTRACTED FROM THE SKEW SYMMETRIC COMPONENTS OF MFI.                               *     *
R0093        IF AM GREATER THAN 170 DEGREES AN ALTERNATE METHOD EMPLOYING THE SYMMETRIC PART OF MFI (MFISYM) IS USED
R0095                 -
R0096   TO DETERMINE COF.

R0097        THE PROGRAM THEN CHECKS TO SEE IF THE MANEUVER AS COMPUTED WILL BRING THE S/C THROUGH GIMBAL LOCK.  IF
R0099   SO, A NEW MANEUVER IS CALCULATED WHICH WILL JUST SKIM THE GIMBAL LOCK ZONE AND ALIGN THE S/C X-AXIS.  THIS
R0101   METHOD ASSURES THAT THE ADDITIONAL MANEUVERING TO AVOID GIMBAL LOCK WILL BE KEPT TO A MINIMUM.  SINCE A FINAL
R0103   P AXIS YAW WILL BE NECESSARY, A SWITCH IS RESET (STATE SWITCH 31) TO ALLOW FOR THE COMPUTATION OF THIS FINAL
R0105   YAW.

R0106        AS STATED PREVIOUSLY KALCMANU GENERATES A SEQUENCE OF DESIRED GIMBAL ANGLES WHICH ARE UPDATED EVERY
R0108                                                                                                    -
R0110   SECOND.  THIS IS ACCOMPLISHED BY A SMALL ROTATION OF THE DESIRED S/C FRAME ABOUT THE VECTOR COF.  THE NEW
R0112   DESIRED REFERENCE MATRIX IS THEN,

R0113                    *              *         *
R0114                   MIS        =   MIS       DEL
R0115                      N+1            N

R0116          *
R0117   WHERE DEL IS THE MATRIX CORRESPONDING TO THIS SMALL ROTATION.  THE NEW CDU ANGLES CAN THEN BE EXTRACTED
R0119         *
R0120   FREM MIS.

R0121        AT THE BEGINNING OF THE MANEUVER THE AUTOPILOT DESIRED RATES (OMEGAPD, OMEGAQD, OMEGARD) AND THE
R0123   MANEUVER TIMINGS ARE ESTABLISHED.  ON THE FIRST PASS AND ON ALL SUBSEQUENT UPDATES THE CDU DESIRED
R0125   ANGLES ARE LOADED WITH THE APPROPRIATE VALUES AND THE INCREMENTAL CDU ANGLES ARE COMPUTED.  THE AGC CLOCKS
R0127   (TIME1 AND TIME2) ARE THAN CHECKED TO SEE IF THE MANEUVER WILL TERMINATE BEFORE THE NEXT UPDATE.  IF
R0129   NOT, KALCMANU CALLS FOR ANOTHER UPDATE (RUN AS A JOB WITH PRIORITY TBD) IN ONE SECOND.  ANY DELAYS IN THIS
R0131   CALLING SEQUENCE ARE AUTOMATICALLY COMPENSATED IN CALLING FOR THE NEXT UPDATE.
R0133
R0134        IF IT IS FOUND THAT THE MANEUVER IS TO TERMINATE BEFORE THE NEXT UPDATE A ROUTINE IS CALLED (AS A WAIT-
R0136   LIST TASK) TO STOP THE MANEUVER AT THE APPROPRIATE TIME AS EXPLAINED ABOVE.
R0138
```

```
R0139   CALLING SEQUENCE

R0140        IN ORDER TO PERFORM A KALCMANU SUPERVISED MANEUVER, THE COMMANDED GIMBAL ANGLES MUST BE PRECOMPUTED AND
R0142   STORED IN LOCATIONS CPHI, CTHETA, CPSI.  THE USER:S PROGRAM MUST THEN CLEAR STATE SWITCH NO 33 TO ALLOW THE
R0144   ATTITUDE MANEUVER ROUTINE TO PERFORM ANY FINAL P-AXIS YAW INCURRED BY AVOIDING GIMBAL LOCK.  THE MANEUVER IS
R0146   THEN INITIATED BY ESTABLISHING THE FOLLOWING EXECUTIVE JOB

R0147                          *
R0148        CAF      PRIO     XX
R0149                          --
R0150        INHINT
R0151        TC           FINDVAC
R0152        2CADR        KALCMAN3
R0153        RELINT

R0154   THE USER:S PROGRAM MAY EITHER CONTINUE OR WAIT FOR THE TERMINATION OF THE MANEUVER.  IF THE USER WISHES TO
R0156   WAIT, HE MAY PUT HIS JOB TO SLEEP WITH THE FOLLOWING INSTRUCTIONS

R0157        L            TC          BANKCALL
R0158        L+1          CADR        ATTSTALL
R0159        L+2          (BAD        RETURN)
R0160        L+3          (GOOD       RETURN)

R0161        UPON COMPLETION OF THE MANEUVER, THE PROGRAM WILL BE AWAKENED AT L+3 IF THE MANEUVER WAS COMPLETED
R0163   SUCCESSFULLY, OR AT L+2 IF THE MANEUVER WAS ABORTED.  THIS ABORT WOULD OCCUR IF THE INITIAL OR FINAL ATTITUDE
R0165   WAS IN GIMBAL LOCK.

R0166   ***NOTA BENE***  IT IS ASSUMED THAT THE DESIRED MANEUVERING RATE (0.5, 2, 5, 10, DEG/SEC) HAS BEEN SELECTED BY
R0168   KEYBOARD ENTRY PRIOR TO THE EXECUTION OF KALCMANU.
R0169       IT IS ALSO ASSUMED THAT THE AUTOPILOT IS IN THE AUTO MODE.  IF THE MODE SWITCH IS CHANGED DURING THE
R0171   MANEUVER, KALCMANU WILL TERMINATE VIA GOODEND WITHIN 1 SECOND SO THAT R60 MAY REQUEST A TRIM OF THE S/C ATTITUDE
R0173   THIS IS THE ONLY MEANS FOR MANUALLY TERMINATING A KALCMANU SUPERVISED MANEUVER.
R0175   SUBROUTINES

R0176        KALCMANU USES A NUMBER OF INTERPRETIVE SUBROUTINES WHICH MAY BE OF GENERAL INTEREST.  SINCE THESE ROUTINES
R0178   WERE PROGRAMMED EXCLUSIVELY FOR KALCMANU, THEY ARE NOT, AS YET, GENERALLY AVAILABLE FOR USE BY OTHER PROGRAMS.
R0180
R0181        MXM3
R0182        ----

R0183        THIS SUBROUTINE MULTIPLIES TWO 3X3 MATRICES AND LEAVES THE RESULT IN THE FIRST 18 LOCATIONS OF THE PUSH
R0185   DOWN LIST, I.E.,

R0186                  (M     M     M )
R0187                  ( 0     1     2)
R0188     *            (              )       *         *
R0189     M     =      (M     M     M )  =    M1    X    M2
R0190                  ( 3     4     5)
R0191                  (              )
R0192                  (M     M     M )
```

```
               ( 6    7    8)

                                                                                      *
     INDEX REGISTER XI MUST BE LOADED WITH THE COMPLEMENT OF THE STARTING ADDRESS FOR M1, AND X2 MUST BE
                                                       *
LOADED WITH THE COMPLEMENT OF THE STARTING ADDRESS FOR M2.  THE ROUTINE USES THE FIRST 20 LOCATIONS OF THE PUSH
DOWN LIST.  THE FIRST ELEMENT OF THE MATRIX APPEARS IN PDO.  PUSH UP FOR M .
                                                                         8

     TRANSPOS
     --------

     THIS ROUTINE TRANSPOSES A 3X3 MATRIX AND LEAVES THE RESULT IN THE PUSH DOWN LIST, I.E.,

      *         * T
      M    =    M1

INDEX REGISTER X1 MUST CONTAIN THE COMPLEMENT OF THE STARTING ADDRESS FOR M1.  PUSH UP FOR THE FIRST AND SUB-
                      *
SEQUENT COMPONENTS OF M.   THIS SUBROUTINE ALSO USES THE FIRST 20 LOCATIONS OF THE PUSH DOWN LIST.

     CDU TO DCM
     ----------

     THIS SUBROUTINE CONVERTS THREE CDU ANGLES IN T(MPAC) TO A DIRECTION COSINE MATRIX (SCALED BY 2) RELATING
THE CORRESPONDING S/C ORIENTATIONS TO THE STABLE MEMBER FRAME.  THE FORMULAS FOR THIS CONVERSION ARE

      M    =    COSY  COSZ
       0

      M    =    -COSY  SINZ  COSX  +  SINY  SINX
       1

      M    =    COSY  SINZ  SINX  +  SINY  COSX
       2

      M    =    SINZ
       3

      M    =    COSZ  COSX
       4

      M    =    -COSZ  SINX
       5

      M    =    -SINY  COSZ
       6

      M    =    SINY  SINZ  COSX  +  COSY  SINX
       7
```

```
R0242         M    =    -SINY  SINZ  SINX  +  COSY  COSX
R0243          8

R0244   WHERE      X    =    OUTER GIMBAL ANGLE
R0245              Y    =    INNER GIMBAL ANGLE
R0246              Z    =    MIDDLE GIMBAL ANGLE

R0247        THE INTERPRETATION OF THIS MATRIX IS AS FOLLOWS

R0248        IF A , A , A  REPRESENT THE COMPONENTS OF A VECTOR IN S/C AXES THEN THE COMPONENTS OF THE SAME VECTOR IN
R0250            X   Y   Z
R0251   STABLE MEMBER AXES (B , B , B ) ARE
R0252                        X   Y   Z

R0253              (B )                (A )
R0254              ( X)                ( X)
R0255              (  )                (  )
R0256              (  )           *    (  )
R0257              (B )      =    M    (A )
R0258              ( Y)                ( Y)
R0259              (  )                (  )
R0260              (B )                (A )
R0261              ( Z)                ( Z)

R0262       THE SUBROUTINE WILL STORE THIS MATRIX IN SEQUENTIAL LOCATIONS OF ERASABLE MEMORY AS SPECIFIED BY THE CALLING
R0264                                                                                                                *
R0266   PROGRAM.  TO DO THIS THE CALLING PROGRAM MUST FIRST LOAD X2 WITH THE COMPLEMENT OF THE STARTING ADDRESS FOR M.
R0268
R0269        INTERNALLY, THE ROUTINE USES THE FIRST 16 LOCATIONS OF THE PUSH DOWN LIST, ALSO STEP REGISTER S1 AND INDEX
R0271   REGISTER X2.


R0272        DCM TO CDU
R0273        ----------
R0274                                                                                   *
R0276        THIS ROUTINE EXTRACTS THE CDU ANGLES FROM A DIRECTION COSINE MATRIX (M SCALED BY 2) RELATING S/C AXIS TO
R0278                                                                                         *
R0280   STABLE MEMBER AXES.  X1 MUST CONTAIN THE COMPLEMENT OF THE STARTING ADDRESS FOR M.  THE SUBROUTINE LEAVES THE
R0282   CORRESPONDING GIMBAL ANGLES IN V(MPAC) AS DOUBLE PRECISION 1:S COMPLEMENT ANGLES SCALED BY 2PI.  THE FORMULAS
R0284   FOR THIS CONVERSION ARE

R0285         Z    =    ARCSIN (M )
R0286                            3

R0287         Y    =    ARCSIN (-M /COSZ)
R0288                             6

R0289   IF M  IS NEGATIVE, Y IS REPLACED BY PI SGN Y - Y
R0290       0
```

```
R0291         X    =   ARCSIN (-M /CCSZ)
R0292                            5

R0293   IF M  IS NEGATIVE X IS REPLACED BY PI SGN X - X
R0294       4

R0295        THIS ROUTINE DOES NOT SET THE PUSH DOWN POINTER, BUT USES THE NEXT 8 LOCATIONS OF THE PUSH DOWN LIST AND
R0297   RETURNS THE POINTER TO ITS ORIGINAL SETTING.  THIS PROCEDURE ALLOWS THE CALLER TO STORE THE MATRIX AT THE TOP OF
R0299   THE PUSH DOWN LIST.


R0300        DELCOMP
R0301        -------

R0302                                                           *
R0303        THIS ROUTINE COMPUTES THE DIRECTION COSINE MATRIX (DEL) RELATING ON
R0304                                                                           -
R0306   IS ROTATED WITH RESPECT TO THE FIRST BY AN ANGLE, A, ABOUT A UNIT VECTOR, U.  THE FORMULA FOR THIS MATRIX IS
R0308
R0309         *         *          --T           *
R0310         DEL  =    I  COSA  + UU (1-COSA) + V SINA
R0311                                             X

R0312   WHERE      *        (1   0    0)
R0313              I   =    (0   1    0)
R0314                       (0   0    1)


R0315                          2
R0316                       (U        U U       U U )
R0317                       ( X        X Y       X Z)
R0318                       (                       )
R0319             --T       (           2           )
R0320             UU   =    (U U      U         U U )
R0321                       ( Y X      Y         Y Z)
R0322                       (                       )
R0323                       (                     2 )
R0324                       (U U      U U       U  )
R0325                       ( Z X      Z Y       Z  )


R0326                       (0        -U        U  )
R0327                       (           Z        Y )
R0328              *        (                      )
R0329              V   =    (U        0         -U )
R0330               X       ( Z                   X)
R0331                       (                      )
R0332                       (-U       U         0  )
R0333                       (  Y       X           )
```

```
R0334             -
R0335             U     =     UNIT ROTATION VECTOR RESOLVED INTO S/C AXES
R0336             A     =     ROTATION ANGLE

R0337                                  *
R0338        THE INTERPRETATION OF DEL IS AS FOLLOWS

R0339        IF A , A , A  REPRESENT THE COMPONENT OF A VECTOR IN THE ROTATED FRAME, THEN THE COMPONENTS OF THE SAME
R0341            X   Y   Z
R0342    VECTOR IN THE ORIGINAL S/C AXES (B , B , B ) ARE
R0343                                      X   Y   Z

R0344             (B )                    (A )
R0345             ( X)                    ( X)
R0346             (  )           *        (  )
R0347             (B )      =    DEL      (A )
R0348             ( Y)                    ( Y)
R0349             (  )                    (  )
R0350             (B )                    (A )
R0351             ( Z)                    ( Z)

R0352        THE ROUTINE WILL STORE THIS MATRIX (SCALED UNITY) IN SEQUENTIAL LOCATIONS OF ERASABLE MEMORY BEGINNING WITH
R0354                                                                                 -
R0356    THE LOCATION CALLED DEL.  IN ORDER TO USE THE ROUTINE, THE CALLING PROGRAM MUST FIRST STORE U (A HALF UNIT
R0358    DOUBLE PRECISION VECTOR) IN THE SET OF ERASABLE LOCATIONS BEGINNING WITH THE ADDRESS CALLED COF.  THE ANGLE, A,
R0360    MUST THEN BE LOADED INTO D(MPAC).

R0361        INTERNALLY, THE PROGRAM ALSO USES THE FIRST 10 LOCATIONS OF THE PUSH DOWN LIST.
R0363


R0364        READCDUK
R0365        --------

R0366        THIS BASIC LANGUAGE SUBROUTINE LOADS T(MPAC) WITH THE THREE CDU ANGLES.
R0368


R0369       SIGNMPAC
R0370        --------

R0371        THIS IS A BASIC LANGUAGE SUBROUTINE WHICH LIMITS THE MAGNITUDE OF D(MPAC) TO + OR - DPOSMAX ON OVERFLOW.
R0373


R0374        PROGRAM STORAGE ALLOCATION

R0375             1)    FIXED MEMORY                  1059 WORDS
R0376             2)    ERASABLE MEMORY                 98
R0377             3)    STATE SWITCHES                   3
```

```
R0378             4)   FLAGS                                 1

R0379         JOB PRIORITIES

R0380             1)   KALCMANU                             TBD
R0381             2)   ONE SECOND UPDATE                    TBD

R0382         SUMMARY OF STATE SWITCHES AND FLAGWORDS USED BY KALCMANU.

R0383   STATE                 FLAGWRD 2      SETTING              MEANING
R0384   SWITCH NO.             BIT NO.

R0385     *
R0386   31                       14             0         MANEUVER WENT THROUGH GIMBAL LOCK
R0388                                           1         MANEUVER DID NOT GO THROUGH GIMBAL LOCK
R0390
R0391     *
R0392   32                       13             0         CONTINUE UPDATE PROCESS
R0393                                           1         START UPDATE PROCESS

R0394   33                       12             0         PERFORM FINAL P-AXIS YAW IF REQUIRED
R0396                                           1         IGNORE ANY FINAL P-AXIS YAW
R0398
R0399   34                       11             0         SIGNAL END OF KALCMANU
R0400                                           1         KALCMANU IN PROCESS       USER MUST SET SWITCH BEFORE INITIATING

R0402             *  INTERNAL TO KALCMANU

R0403         SUGGESTIONS FOR PROGRAM INTEGRATION

R0404         THE FOLLOWING VARIABLES SHOULD BE ASSIGNED TO UNSWITCH ERASABLE

R0405                         CPHI
R0406                         CTHETA
R0407                         CPSI
R0408                         POINTVSM   +5
R0409                         SCAXIS     +5
R0410                         DELDCDU
R0411                         DELDCDU1
R0412                         DELDCDU2
R0413                         RATEINDX

R0414         THE FOLLOWING SUBROUTINES MAY BE PUT IN A DIFFERENT BANK

R0415                         MXM3
```

```
R0416                          TRANSPOS
R0417                          SIGNMPAC
R0418                          READCDUK
R0419                          CDUTODCM
```

```
 0420                            15,2162                    BANK    15
 0421   REF   1                  22,2000                    SETLOC  KALCMON1
 0422                            22,2004                    BANK

 0423   REF   3  LAST  298       E6,1675                    EBANK=  BCDU

R0424   THE THREE DESIRED CDU ANGLES MUST BE STORED AS SINGLE PRECISION TWOS COMPLEMENT ANGLES IN THE THREE SUCCESSIVE
R0426   LOCATIONS, CPHI, CTHETA, CPSI.

 0427   REF   1                                             COUNT*  $$/KALC
 0428   REF  16  LAST  352       22,2004  0 6060 1 KALCMAN3 TC      INTPRET          PICK UP THE CURRENT CDU ANGLES AND
 0429                            22,2005   77634 0          RTB                        COMPUTE THE MATRIX FROM INITIAL S/C
 0430   REF   1                  22,2006   44403 0                  READCDUK           AXES TO FINAL S/C AXES
 0431   REF   4  LAST  363       22,2007   03276 1          STORE   BCDU             STORE INITIAL S/C ANGLES
 0437                            22,2010   51535 0          SLOAD   ABS              CHECK THE MAGNITUDE OF THE DESIRED
 0438   REF   1                  22,2011   0C324 1                  CPSI             MIDDLE GIMBAL ANGLE
 0439                            22,2012   51025 1          DSU     BPL
 0440   REF   1                  22,2013   04403 1                  LOCKANGL         IF GREATER THAN 70 DEG ABORT MANEUVER
 0441   REF   1                  22,2014   44724 0                  TOOBADF
 0442                            22,2015   72364 0          AXC,2   TLOAD
 0443   REF   4  LAST  141       22,2016   03245 1                  MIS
 0444   REF   5  LAST  363       22,2017   03276 1                  BCDU
 0445                            22,2020   77624 1          CALL                     COMPUTE THE TRANSFORMATION FROM INITIAL
 0446   REF   1                  22,2021   44410 1                  CDUTODCM         S/C AXES TO STABLE MEMBER AXES
 0447                            22,2022   72364 0          AXC,2   TLOAD
 0448   REF   3  LAST  121       22,2023   02221 1                  MFS              PREPARE TO CALCULATE ARRAY MFS
 0449   REF   2  LAST  352       22,2024   00322 1                  CPHI
 0450                            22,2025   77624 1          CALL
 0451   REF   2  LAST  363       22,2026   44410 1                  CDUTODCM
 0452                            22,2027   45160 1 SECAD    AXC,1   CALL             MIS AND MFS ARRAYS CALCULATED         $2
 0453   REF   5  LAST  363       22,2030   03245 1                  MIS
 0454   REF   1                  22,2031   44326 0                  TRANSPOS
 0455                            22,2032   45575 1          VLOAD   STADR
 0456   REF   7  LAST  140       22,2033   50460 0          STOVL   TMIS +12D
 0457                            22,2034   77626 0          STADR
 0458   REF   8  LAST  363       22,2035   50466 0          STOVL   TMIS +6
 0459                            22,2036   77626 0          STADR
 0460   REF   9  LAST  363       22,2037   74474 0          STORE   TMIS             TMIS = TRANSPOSE(MIS) SCALED BY 2
 0461                            22,2040   75160 1          AXC,1   AXC,2
 0462   REF  10  LAST  363       22,2041   03302 0                  TMIS
 0463   REF   4  LAST  363       22,2042   02221 1                  MFS
 0464                            22,2043   77624 1          CALL
 0465   REF   1                  22,2044   44312 1                  MXM3
 0466                            22,2045   45575 1          VLOAD   STADR
 0467   REF   1                  22,2046   51541 0          STOVL   MFI +12D
 0468                            22,2047   77626 0          STADR
 0469   REF   2  LAST  363       22,2050   51547 0          STOVL   MFI +6
 0470                            22,2051   77626 0          STADR
 0471   REF   3  LAST  363       22,2052   75555 0          STORE   MFI              MFI = TMIS MFS (SCALED BY 4)
 0472                            22,2053   45001 1          SETPD   CALL             TRANSPOSE MFI IN PD LIST
 0473                          22,2054   00023 0                    180
 0474   REF    1               22,2055   44335 1                    TRNSPSPD
 0475                          22,2056   45575 1             VLOAD  STADR
 0476   REF    1               22,2057   50460 0             STOVL  TMFI +12D
 0477                          22,2060   77626 0             STADR
 0478   REF    2  LAST  364    22,2061   50466 0             STOVL  TMFI +6
 0479                          22,2062   77626 0             STADR
 0480   REF    3  LAST  364    22,2063   74474 0             STORE  TMFI              TMFI = TRANSPOSE (MFI)  SCALED BY 4
R0481
R0482   CALCULATE COFSKEW AND MFISYM
R0483
 0484                          22,2064   45345 1             DLOAD  DSU
 0485   REF    4  LAST  364    22,2065   03305 1                    TMFI +2
 0486   REF    4  LAST  363    22,2066   02224 1                    MFI +2
 0487                          22,2067   45325 1             RDDL   DSU               CALCULATE COF SCALED BY 2/SIN(AM)
 0488   REF    5  LAST  364    22,2070   02226 0                    MFI +4
 0489   REF    5  LAST  364    22,2071   03307 0                    TMFI +4
 0490                          22,2072   45325 1             PDDL   DSU
 0491   REF    6  LAST  364    22,2073   03315 0                    TMFI +10D
 0492   REF    6  LAST  364    22,2074   02234 0                    MFI +10D
 0493                          22,2075   77666 1             VDEF
 0494   REF    4  LAST  140    22,2076   03325 0             STORE  COFSKEW           EQUALS MFISKEW
R0495
R0496   CALCULATE AM AND PROCEED ACCORDING TO ITS MAGNITUDE
R0497
 0498                          22,2077   43345 1             DLOAD  DAD
 0499   REF    7  LAST  364    22,2100   02222 1                    MFI
 0500   REF    8  LAST  364    22,2101   02242 1                    MFI +16D
 0501                          22,2102   43225 0             DSU    DAD
 0502   REF    2  LAST   38    22,2103   06475 1                    DP1/4TH
 0503   REF    9  LAST  364    22,2104   02232 0                    MFI +8D
 0504   REF    2  LAST  140    22,2105   03333 1             STORE  CAM               CAM = (MFI0+MFI4+MFI8-1)/2 HALF SCALE
 0505                          22,2106   77726 1             ARCCOS
 0506   REF    1               22,2107   03335 1             STORE  AM                AM=ARCCOS(CAM)  (AM SCALED BY 2)
 0507                          22,2110   51025 1             DSU    BPL
 0508   REF    1               22,2111   04363 0                    MINANG
 0509   REF    1               22,2112   44117 0                    CHECKMAX
 0510                          22,2113   77751 1             TLOAD                    MANEUVER LESS THAN .25 DEGREES
 0511   REF    3  LAST  363    22,2114   00322 1                    CPHI              GO DIRECTLY INTO ATTITUDE HOLD
 0512   REF    9  LAST  208    22,2115   37235 1             STCALL CDUXD             ABOUT COMMANDED ANGLES
 0513   REF    1               22,2116   44742 0                    TOOBADI           STOP RATE AND EXIT

 0514                          22,2117   45345 1   CHECKMAX  DLOAD  DSU
 0515   REF    2  LAST  364    22,2120   03335 1                    AM
 0516   REF    1               22,2121   04365 0                    MAXANG
 0517                          22,2122   77244 0             BPL    VLOAD
 0518   REF    1               22,2123   44131 1                    ALTCALC           UNIT
 0519   REF    5  LAST  364    22,2124   03325 0                    COFSKEW           COFSKEW
 0520                          22,2125   77656 1             UNIT
 0521   REF    1               22,2126   03270 1             STORE  COF               COF IS THE MANEUVER AXIS
 0522                         22,2127   77650 1            GOTO               SEE IF MANEUVER GOES THRU GIMBAL LOCK
 0523   REF   1               22,2130   44744 0                    LOCSKIRT
 0524                         22,2131   53375 0  ALTCALC   VLOAD   VAD        IF AM GREATER THAN 170 DEGREES
 0525   REF  10  LAST  364    22,2132   02222 1                    MFI
 0526   REF   7  LAST  364    22,2133   03303 1                    TMFI
 0527                         22,2134   77762 1            VSR1
 0528   REF   1               22,2135   27303 1            STOVL   MFISYM
 0529   REF  11  LAST  365    22,2136   02230 1                    MFI +6
 0530                         22,2137   74455 0            VAD     VSR1
 0531   REF   8  LAST  365    22,2140   03311 1                    TMFI +6
 0532   REF   2  LAST  365    22,2141   27311 1            STOVL   MFISYM +6
 0533   REF  12  LAST  365    22,2142   02236 1                    MFI +12D
 0534                         22,2143   74455 0            VAD     VSR1
 0535   REF   9  LAST  365    22,2144   03317 1                    TMFI +12D
 0536   REF   3  LAST  365    22,2145   03317 1            STORE   MFISYM +12D    MFISYM=(MFI+TMFI)/2  SCALED BY 4
R0537
R0538
R0539   CALCULATE COF
R0540
 0541                         22,2146   70545 1            DLOAD   SR1
 0542   REF   3  LAST  364    22,2147   03333 1                    CAM
 0543                         22,2150   45325 1            PDDL    DSU            PD0 CAM                                   $4
 0544   REF   1               22,2151   06503 1                    DPHALF
 0545   REF   4  LAST  365    22,2152   03333 1                    CAM
 0546                         22,2153   65204 1            BOVB    PDDL           PD2 1 - CAM                               $2
 0547   REF   1               22,2154   31765 1                    SIGNMPAC
 0548   REF   4  LAST  365    22,2155   03323 0                    MFISYM +16D
 0549                         22,2156   56225 1            DSU     DDV
 0550                         22,2157   00001 0                    0
 0551                         22,2160   00003 1                    2
 0552                         22,2161   65366 1            SQRT    PDDL           COFZ = SQRT(MFISYM8-CAM)/1-CAM)
 0553   REF   5  LAST  365    22,2162   03313 0                    MFISYM +8D                                        $ ROOT 2
 0554                         22,2163   56225 1            DSU     DDV
 0555                         22,2164   00001 0                    0
 0556                         22,2165   00003 1                    2
 0557                         22,2166   65366 1            SQRT    PDDL           COFY = SQRT(MFISYM4-CAM)/(1-CAM)  $ROOT2
 0558   REF   6  LAST  365    22,2167   03303 1                    MFISYM
 0559                         22,2170   56225 1            DSU     DDV
 0560                         22,2171   00001 0                    0
 0561                         22,2172   00003 1                    2
 0562                         22,2173   55566 1            SQRT    VDEF           COFX = SQRT(MFISYM-CAM)/(1-CAM)  $ROOT 2
 0563                         22,2174   77656 1            UNIT
 0564   REF   2  LAST  364    22,2175   03270 1            STORE   COF
R0565
R0566   DETERMINE  LARGEST COF AND ADJUST ACCORDINGLY
R0567
 0568                         22,2176   45345 1  COFMAXGO  DLOAD   DSU
 0569   REF   3  LAST  365    22,2177   03270 1                    COF
 0570   REF   4  LAST  365    22,2200   03272 0                    COF +2
 0571                         22,2201   71240 1            BMN     DLOAD          COFY G COFX
```

```
0572   REF   1                22,2202   44211 0                      COMP12
0573   REF   5  LAST  365     22,2203   03270 1                      COF
0574                          22,2204   50025 0              DSU     BMN
0575   REF   6  LAST  366     22,2205   03274 0                      COF +4
0576   REF   1                22,2206   44266 0                      METHOD3          COFZ G COFX OR COFY
0577                          22,2207   77650 1              GOTO
0578   REF   1                22,2210   44242 0                      METHOD1          COFX G COFY OR COFZ
0579                          22,2211   45345 1   COMP12     DLOAD   DSU
0580   REF   7  LAST  366     22,2212   03272 0                      COF +2
0581   REF   8  LAST  366     22,2213   03274 0                      COF +4
0582                          22,2214   77640 0              BMN
0583   REF   2  LAST  366     22,2215   44266 0                      METHOD3          COFZ G COFY OR COFX

0584                          22,2216   51145 0   METHOD2    DLOAD   BPL              COFY MAX
0585   REF   6  LAST  364     22,2217   03327 1                      COFSKEW +2       UY
0586   REF   1                22,2220   44224 0                      U2POS
0587                          22,2221   57575 1              VLOAD   VCOMP
0588   REF   9  LAST  366     22,2222   03270 1                      COF
0589   REF  10  LAST  366     22,2223   03270 1              STORE   COF
0590                          22,2224   51145 0   U2POS      DLOAD   BPL
0591   REF   7  LAST  365     22,2225   03305 1                      MEISYM +2        UX UY
0592   REF   1                22,2226   44232 1                      OKU21
0593                          22,2227   57545 1              DLOAD   DCOMP            SIGN OF UX OPPOSITE TO UY
0594   REF  11  LAST  366     22,2230   03270 1                      COF
0595   REF  12  LAST  366     22,2231   03270 1              STORE   COF
0596                          22,2232   51145 0   OKU21      DLOAD   BPL
0597   REF   8  LAST  366     22,2233   03315 0                      MEISYM +10D      UY UZ
0598   REF   2  LAST  365     22,2234   44744 0                      LOCSKIRT
0599                          22,2235   57545 1              DLOAD   DCOMP            SIGN OF UZ OPPOSITE TO UY
0600   REF  13  LAST  366     22,2236   03274 0                      COF +4
0601   REF  14  LAST  366     22,2237   03274 0              STORE   COF +4
0602                          22,2240   77650 1              GOTO
0603   REF   3  LAST  366     22,2241   44744 0                      LOCSKIRT
0604                          22,2242   51145 0   METHOD1    DLOAD   BPL              COFX MAX
0605   REF   7  LAST  366     22,2243   03325 0                      COFSKEW          UX
0606   REF   1                22,2244   44250 0                      U1POS
0607                          22,2245   57575 1              VLOAD   VCOMP
0608   REF  15  LAST  366     22,2246   03270 1                      COF
0609   REF  16  LAST  366     22,2247   03270 1              STORE   COF
0610                          22,2250   51145 0   U1POS      DLOAD   BPL
0611   REF   9  LAST  366     22,2251   03305 1                      MEISYM +2        UX UY
0612   REF   1                22,2252   44256 0                      OKU12
0613                          22,2253   57545 1              DLOAD   DCOMP
0614   REF  17  LAST  366     22,2254   03272 0                      COF +2           SIGN OF UY OPPOSITE TO UY
0615   REF  18  LAST  366     22,2255   03272 0              STORE   COF +2
0616                          22,2256   51145 0   OKU12      DLOAD   BPL
0617   REF  10  LAST  366     22,2257   03307 0                      MEISYM +4        UX UZ
0618   REF   4  LAST  366     22,2260   44744 0                      LOCSKIRT
0619                          22,2261   57545 1              DLOAD   DCOMP            SIGN OF UZ OPPOSITE TO UY
0620   REF  19  LAST  366     22,2262   03274 0                      COF +4
```

```
0621  REF  20  LAST  366   22,2263   03274 0              STORE  COF +4
0622                       22,2264   77650 1              GOTO
0623  REF   5  LAST  366   22,2265   44744 0                     LOCSKIRT
0624                       22,2266   51145 0  METHOD3     DLOAD  BPL            COFZ MAX
0625  REF   8  LAST  366   22,2267   03331 0                     COFSKEW +4     UZ
0626  REF   1              22,2270   44274 0                     U3POS
0627                       22,2271   57575 1              VLOAD  VCOMP
0628  REF  21  LAST  367   22,2272   03270 1                     COF
0629  REF  22  LAST  367   22,2273   03270 1              STORE  COF
0630                       22,2274   51145 0  U3POS       DLOAD  BPL
0631  REF  11  LAST  366   22,2275   03307 0                     MFISYM +4      UX UZ
0632  REF   1              22,2276   44302 0                     OKU31
0633                       22,2277   57545 1              DLOAD  DCOMP
0634  REF  23  LAST  367   22,2300   03270 1                     COF            SIGN OF UX OPPOSITE TO UZ
0635  REF  24  LAST  367   22,2301   03270 1              STORE  COF
0636                       22,2302   51145 0  OKU31       DLOAD  BPL
0637  REF  12  LAST  367   22,2303   03315 0                     MFISYM +10D    UY UZ
0638  REF   6  LAST  367   22,2304   44744 0                     LOCSKIRT
0639                       22,2305   57545 1              DLOAD  DCOMP
0640  REF  25  LAST  367   22,2306   03272 0                     COF +2         SIGN OF UY OPPOSITE TO UZ
0641  REF  26  LAST  367   22,2307   03272 0              STORE  COF +2
0642                       22,2310   77650 1              GOTO
0643  REF   7  LAST  367   22,2311   44744 0                     LOCSKIRT
```

```
R0644   MATRIX OPERATIONS

 0645                          13,2207                          BANK    13
 0646   REF   1                22,2000                          SETLOC  KALCMON2
 0647                          22,2312                          BANK

 0648   REF   6  LAST  363     E6,1675                          EBANK=  BCDU

 0649                          22,2312  76601 1  MXM3           SETPD   VLOAD*        MXM3 MULTIPLIES 2 3X3 MATRICES
 0650                          22,2313  00001 0                         0             AND LEAVES RESULT IN PD LIST
 0651                          22,2314  00001 0                         0,1           AND MPAC
 0652                          22,2315  62703 1                 VXM*    PDVL*
 0653                          22,2316  77776 1                         0,2
 0654                          22,2317  00007 0                         6,1
 0655                          22,2320  62703 1                 VXM*    PDVL*
 0656                          22,2321  77776 1                         0,2
 0657                          22,2322  00015 0                         12D,1
 0658                          22,2323  41503 1                 VXM*    PUSH
 0659                          22,2324  77776 1                         0,2
 0660                          22,2325  77616 0                 RVQ


R0661                                               RETURN WITH M1XM2 IN PD LIST
R0662
 0663                          22,2326  76601 1  TRANSPOS SETPD   VLOAD*        TRANSPOS TRANSPOSES A 3X3 MATRIX
 0664                          22,2327  00001 0                         0              AND LEAVES RESULT IN PD LIST
 0665                          22,2330  00001 0                         0,1           MATRIX ADDRESS IN XR1
 0666                          22,2331  62713 0                 PDVL*   PDVL*
 0667                          22,2332  00007 0                         6,1
 0668                          22,2333  00015 0                         12D,1
 0669                          22,2334  77606 1                 PUSH                  MATRIX IN PD
 0670                          22,2335  77776 1  TRNSPSPD EXIT                  ENTER WITH MATRIX AT 0 IN PD LIST
 0671   REF   9  LAST  310     22,2336  50 120 1                INDEX   FIXLOC
 0672                          22,2337  52 013 1                DXCH    12
 0673   REF  10  LAST  368     22,2340  50 120 1                INDEX   FIXLOC
 0674                          22,2341  52 017 0                DXCH    16
 0675   REF  11  LAST  368     22,2342  50 120 1                INDEX   FIXLOC
 0676                          22,2343  52 013 1                DXCH    12
 0677   REF  12  LAST  368     22,2344  50 120 1                INDEX   FIXLOC
 0678                          22,2345  52 015 1                DXCH    14
 0679   REF  13  LAST  368     22,2346  50 120 1                INDEX   FIXLOC
 0680                          22,2347  52 005 0                DXCH    4
 0681   REF  14  LAST  368     22,2350  50 120 1                INDEX   FIXLOC
 0682                          22,2351  52 015 1                DXCH    14
 0683   REF  15  LAST  368     22,2352  50 120 1                INDEX   FIXLOC
 0684                          22,2353  52 003 0                DXCH    2
 0685   REF  16  LAST  368     22,2354  50 120 1                INDEX   FIXLOC
 0686                          22,2355  52 007 1                DXCH    6
 0687   REF  17  LAST  368     22,2356  50 120 1                INDEX   FIXLOC
 0688                          22,2357  52 003 0                DXCH    2
 0689   REF  17  LAST  363   22,2360  0 6060 1             TC       INTPRET
 0690                        22,2361   77616 0             RVQ

 0691                        15,2162                       BANK     15
 0692   REF   2  LAST  363   22,2000                       SETLOC KALCMON1
 0693                        22,2362                       BANK

 0694   REF   7  LAST  368   E6,1675                       EBANK=  BCDU

 0695                        22,2362   00013 0  MINANG     2DEC     0.00069375
 0695                        22,2363   13563 0
 0696                        22,2364   17070 0  MAXANG     2DEC     0.472222222
 0696                        22,2365   34343 1
R0697               GIMBAL LOCK CONSTANTS

R0698   D = MGA CORRESPONDING TO GIMBAL LOCK = 60 DEGREES
R0699               NGL = BUFFER ANGLE (TO AVOID DIVISIONS BY ZERO) = 2 DEGREES

 0700                        22,2366   15666 0  SD         2DEC     .433015            = SIN(D)                      $2
 0700                        22,2367   20443 0
 0701                        22,2370   33555 1  K3S1       2DEC     .86603             = SIN(D)                      $1
 0701                        22,2371   01106 1
 0702                        22,2372   67777 1  K4         2DEC     -.25               = -COS(D)                     $2
 0702                        22,2373   77777 0
 0703                        22,2374   04000 0  K4SQ       2DEC     .125               = COS(D)COS(D)                $2
 0703                        22,2375   00000 1
 0704                        22,2376   00216 1  SNGLCD     2DEC     .008725            = SIN(NGL)COS(D)              $2
 0704                        22,2377   36323 0
 0705                        22,2400   17773 1  CNGL       2DEC     .499695            COS(NGL)                      $2
 0705                        22,2401   00057 0
 0706                        22,2402   14344 1  LOCKANGL DEC        .388889            = 70 DEGREES
R0707   INTERPRETIVE SUBROUTINE TO READ THE CDU ANGLES

 0708   REF   9  LAST  269   22,2403  3 0034 0  READCDUK CA         CDUZ               LOAD T(MPAC) WITH CDU ANGLES
 0709   REF  67  LAST  348   22,2404  54 156 1             TS       MPAC +2
 0710                        22,2405  0 0006 1             EXTEND
 0711   REF   9  LAST  317   22,2406  3 0033 1             DCA      CDUX               AND CHANGE MODE TO TRIPLE PRECISION
 0712   REF   1              22,2407  1 6517 0             TCF      TLOAD +6


 0713                        22,2410   66370 0  CDUTODCM AXT,1      SSP
 0714                        22,2411   00003 1             OCT      3
 0715   REF   1              22,2412   00051 0                      S1
 0716                        22,2413   00001 0             OCT      1                  SET XR1, S1, AND PD FOR LOOP
 0717                        22,2414   00010 0             STORE    7
 0718                        22,2415   77601 0             SETPD
 0719                        22,2416   00001 0                      0
 0720                        22,2417   47133 0  LOOPSIN    SLOAD*   RTB
 0721                        22,2420   00013 0                      10D,1
 0722   REF   9  LAST  336   22,2421   21606 1                      CDULOGIC
```

```
0723                     22,2422   00013 0        STORE  10D         LOAD PD WITH 0 SIN(PHI)
0724                     22,2423   65356 1        SIN    PDDL                     2 COS(PHI)
0725                     22,2424   00013 0               10D                      4 SIN(THETA)
0726                     22,2425   41546 0        COS    PUSH                     6 COS(THETA)
0727                     22,2426   71300 1        TIX,1  DLOAD                    8 SIN(PSI)
0728    REF   1          22,2427   44417 0               LOOPSIN                 10 COS(PSI)
0729                     22,2430   00007 0               6
0730                     22,2431   72405 0        DMP    SL1
0731                     22,2432   00013 0               10D
0732                     22,2433   10001 1        STORE  0,2         C0=COS(THETA)COS(PSI)
0733                     22,2434   41345 0        DLOAD  DMP
0734                     22,2435   00005 1               4
0735                     22,2436   00001 0               0
0736                     22,2437   41325 0        PDDL   DMP         (PD6 SIN(THETA)SIN(PHI))
0737                     22,2440   00007 0               6
0738                     22,2441   00011 1               8D
0739                     22,2442   72405 0        DMP    SL1
0740                     22,2443   00003 1               2
0741                     22,2444   72421 0        BDSU   SL1
0742                     22,2445   00015 0               12D
0743                     22,2446   10003 0        STORE  2,2         C1=-COS(THETA)SIN(PSI)COS(PHI)
0744                     22,2447   41345 0        DLOAD  DMP
0745                     22,2450   00003 1               2
0746                     22,2451   00005 1               4
0747                     22,2452   41325 0        PDDL   DMP         (PD7 COS(PHI)SIN(THETA)) SCALED 4
0748                     22,2453   00007 0               6
0749                     22,2454   00011 1               8D
0750                     22,2455   72405 0        DMP    SL1
0751                     22,2456   00001 0               0
0752                     22,2457   72415 1        DAD    SL1
0753                     22,2460   00017 1               14D
0754                     22,2461   10005 0        STORE  4,2         C2=COS(THETA)SIN(PSI)SIN(PHI)
0755                     22,2462   77745 1        DLOAD
0756                     22,2463   00011 1               8D
0757                     22,2464   10007 1        STORE  6,2         C3=SIN(PSI)
0758                     22,2465   77745 1        DLOAD
0759                     22,2466   00013 0               10D
0760                     22,2467   72405 0        DMP    SL1
0761                     22,2470   00003 1               2
0762                     22,2471   10011 0        STORE  8D,2        C4=COS(PSI)COS(PHI)
0763                     22,2472   41345 0        DLOAD  DMP
0764                     22,2473   00013 0               10D
0765                     22,2474   00001 0               0
0766                     22,2475   72476 1        DCOMP  SL1
0767                     22,2476   10013 1        STORE  10D,2       C5=-COS(PSI)SIN(PHI)
0768                     22,2477   41345 0        DLOAD  DMP
0769                     22,2500   00005 1               4
0770                     22,2501   00013 0               10D
0771                     22,2502   72476 1        DCOMP  SL1
0772                     22,2503   10015 1        STORE  12D,2       C6=-SIN(THETA)COS(PSI)
```

```
0773                             22,2504   77745 1             DLOAD
0774                             22,2505   72405 0             DMP     SL1               (PUSH UP 7)
0775                             22,2506   00011 1                     8D
0776                             22,2507   41325 0             PDDL    DMP               (PD7 COS(PHI)SIN(THETA)SIN(PSI)) SCALE4
0777                             22,2510   00007 0                     6
0778                             22,2511   00001 0                     0
0779                             22,2512   72415 1             DAD     SL1               (PUSH UP 7)
0780                             22,2513   77626 0             STADR                   C7=COS(PHI)SIN(THETA)SIN(PSI)
0781                             22,2514   67760 1             STORE   14D,2            +COS(THETA)SIN(PHI)
0782                             22,2515   77745 1             DLDAD
0783                             22,2516   72405 0             DMP     SL1               (PUSH UP 6)
0784                             22,2517   00011 1                     8D
0785                             22,2520   41325 0             PDDL    DMP               (PD6 SIN(THETA)SIN(PHI)SIN(PSI)) SCALE4
0786                             22,2521   00007 0                     6
0787                             22,2522   00003 1                     2
0788                             22,2523   72425 1             DSU     SL1               (PUSH UP 6)
0789                             22,2524   77626 0             STADR
0790                             22,2525   67756 1             STORE   16D,2           C8=-SIN(THETA)SIN(PHI)SIN(PSI)
0791                             22,2526   77616 0             RVQ                      +COS(THETA)COS(PHI)

R0792    CALCULATION OF THE MATRIX DEL......

R0793              *       *                 --T              *
R0794              DEL = (IDMATRIX)COS(A)+UU (1-COS(A))+UX SIN(A)          SCALED 1

R0795                    -
R0796              WHERE U IS A UNIT VECTOR (DP SCALED 2) ALONG THE AXIS OF ROTATION.
R0798              A IS THE ANGLE OF ROTATION (DP SCALED 2)
R0799                                                       -
R0800              UPON ENTRY THE STARTING ADDRESS OF U IS COF, AND A IS IN MPAC

0801                             22,2527   41401 1   DELCOMP   SETPD   PUSH              MPAC CONTAINS THE ANGLE A
0802                             22,2530   00001 0                     0
0803                             22,2531   65356 1             SIN     PDDL              PD0 = SIN(A)
0804                             22,2532   41546 0             COS     PUSH              PD2 = COS(A)
0805                             22,2533   65302 0             SR2     PDDL              PD2 = COS(A)                                    $8
0806                             22,2534   41021 1             BDSU    BDVB
0807     REF   2  LAST  365      22,2535   06503 1                     DPHALF
0808     REF   2  LAST  365      22,2536   31765 1                     SIGNMPAC
0809                             22,2537   77725 1             PDDL                      PD4 = 1-COS(A)

R0810    COMPUTE THE DIAGONAL COMPONENTS OF DEL

0811     REF  27  LAST  367      22,2540   03270 1                     COF
0812                             22,2541   41316 0             DSQ     DMP
0813                             22,2542   00005 1                     4
0814                             22,2543   52415 0             DAD     SL3
0815                             22,2544   00003 1                     2
0816                             22,2545   77604 0             BOVB
0817     REF   3  LAST  371      22,2546   31765 1                     SIGNMPAC
```

```
 0818   REF    1                22,2547   16222 1        STODL  KEL             UX UX(1-COS(A)) +COS(A)             $1
 0819   REF   28  LAST  371     22,2550   03272 0               COF +2
 0820                           22,2551   41316 0        DSQ    DMP
 0821                           22,2552   00005 1               4
 0822                           22,2553   52415 0        DAD    SL3
 0823                           22,2554   00003 1               2
 0824                           22,2555   77604 0        BOVB
 0825   REF    4  LAST  371     22,2556   31765 1               SIGNMPAC
 0826   REF    2  LAST  372     22,2557   16232 0        STODL  KEL +8D         UY UY(1-COS(A)) +COS(A)             $1
 0827   REF   29  LAST  372     22,2560   03274 0               COF +4
 0828                           22,2561   41316 0        DSQ    DMP
 0829                           22,2562   00005 1               4
 0830                           22,2563   52415 0        DAD    SL3
 0831                           22,2564   00003 1               2
 0832                           22,2565   77604 0        BOVB
 0833   REF    5  LAST  372     22,2566   31765 1               SIGNMPAC
 0834   REF    3  LAST  372     22,2567   02242 1        STORE  KEL +16D        UZ UZ(1-COS(A)) +COS(A)             $1

R0835   COMPUTE THE OFF DIAGONAL TERMS OF DEL

 0836                           22,2570   41345 0        DLOAD  DMP
 0837   REF   30  LAST  372     22,2571   03270 1               COF
 0838   REF   31  LAST  372     22,2572   03272 0               COF +2
 0839                           22,2573   72405 0        DMP    SL1
 0840                           22,2574   00005 1               4
 0841                           22,2575   41325 0        PDDL   DMP             D6  UX UY (1-COS A)             $ 4
 0842   REF   32  LAST  372     22,2576   03274 0               COF +4
 0843                           22,2577   00001 0               0
 0844                           22,2600   43206 1        PUSH   DAD             D8  UZ SIN A                    $ 4
 0845                           22,2601   00007 0               6
 0846                           22,2602   41112 0        SL2    BOVB
 0847   REF    6  LAST  372     22,2603   31765 1               SIGNMPAC
 0848   REF    4  LAST  372     22,2604   16230 1        STODL  KEL +6
 0849                           22,2605   62421 1        BDSU   SL2
 0850                           22,2606   77604 0        BOVB
 0851   REF    7  LAST  372     22,2607   31765 1               SIGNMPAC
 0852   REF    5  LAST  372     22,2610   16224 1        STODL  KEL +2
 0853   REF   33  LAST  372     22,2611   03270 1               COF
 0854                           22,2612   41205 0        DMP    DMP
 0855   REF   34  LAST  372     22,2613   03274 0               COF +4
 0856                           22,2614   00005 1               4
 0857                           22,2615   65352 0        SL1    PDDL            D6  UX UZ (1-COS A )            $ 4
 0858   REF   35  LAST  372     22,2616   03272 0               COF +2
 0859                           22,2617   41405 0        DMP    PUSH            D8  UY SIN(A)
 0860                           22,2620   00001 0               0
 0861                           22,2621   62415 0        DAD    SL2
 0862                           22,2622   00007 0               6
 0863                           22,2623   77604 0        BOVB
 0864   REF    8  LAST  372     22,2624   31765 1               SIGNMPAC
 0865   REF    6  LAST  372     22,2625   16226 0        STODL  KEL +4          UX UZ  (1-COS(A))+UY SIN(A)
 0866                             22,2626   62421 1            BDSU    SL2
 0867                             22,2627   77604 0            BOVB
 0868   REF   9  LAST  372        22,2630   31765 1                    SIGNMPAC
 0869   REF   7  LAST  372        22,2631   16236 1            STODL   KEL +12D          UX UZ (1-COS(A))-UY SIN(A)
 0870   REF  36  LAST  372        22,2632   03272 0                    COF +2
 0871                             22,2633   41205 0            DMP     DMP
 0872   REF  37  LAST  373        22,2634   03274 0                    COF +4
 0873                             22,2635   00005 1                    4
 0874                             22,2636   65352 0            SL1     PDDL              D6  UY UZ (1-COS(A))              $ 4
 0875   REF  38  LAST  373        22,2637   03270 1                    COF
 0876                             22,2640   41405 0            DMP     PUSH              D8  UX SIN(A)
 0877                             22,2641   00001 0                    0
 0878                             22,2642   62415 0            DAD     SL2
 0879                             22,2643   00007 0                    6
 0880                             22,2644   77604 0            BOVB
 0881   REF  10  LAST  373        22,2645   31765 1                    SIGNMPAC
 0882   REE   8  LAST  373        22,2646   16240 0            STODL   KEL +14D          UY UZ(1-COS(A)) +UX SIN(A)
 0883                             22,2647   62421 1            BDSU    SL2
 0884                             22,2650   77604 0            BOVB
 0885   REF  11  LAST  373        22,2651   31765 1                    SIGNMPAC
 0886   REF   9  LAST  373        22,2652   02234 0            STORE   KEL +10D          UY UZ (1-COS(A)) -UX SIN(A)
 0887                             22,2653   77616 0            RVQ

R0888   DIRECTION COSINE MATRIX TO CDU ANGLE ROUTINE
R0889   X1 CONTAINS THE COMPLEMENT OF THE STARTING ADDRESS FOR MATRIX (SCALED 2)
R0890   LEAVES CDU ANGLES SCALED 2PI IN V(MPAC)
R0891   COS(MGA) WILL BE LEFT IN S1 (SCALED 1)

R0892   THE DIRECTION COSINE MATRIX RELATING S/C AXES TO STABLE MEMBER AXES CAN BE WRITTEN AS***

R0894             C =COS(THETA)COS(PSI)
R0895              0
R0896             C =-COS(THETA)SIN(PSI)COS(PHI)+SI (THETA)SIN(PHI)
R0897              1
R0898             C =COS(THETA)SIN(PSI)SIN(PHI) + S N(THETA)COS(PHI)
R0899              2
R0900             C =SIN(PSI)
R0901              3
R0902             C =COS(PSI)COS(PHI)
R0903              4
R0904             C =-COS(PSI)SIN(PHI)
R0905              5
R0906             C =-SIN(THETA)COS(PSI)
R0907              6
R0908             C =SIN(THETA)SIN(PSI)COS(PHI)+COS THETA)SIN(PHI)
R0909              7
R0910             C =-SIN(THETA)SIN(PSI)SIN(PHI)+CO (THETA)COS(PHI)
R0911              8
```

```
R0912              WHERE PHI = OGA
R0913                    THETA = IGA
R0914                    PSI = MGA

 0915                         22,2654   67543 1  DCMTOCDU DLOAD* ARCSIN
 0916                         22,2655   00007 0                   6,1
 0917                         22,2656   71406 0           PUSH    COS                PD +0   PSI
 0918                         22,2657   41152 1           SL1     BOVB
 0919   REF  12  LAST  373    22,2660   31765 1                   SIGNMPAC
 0920   REF   2  LAST  369    22,2661   00051 0           STORE   S1
 0921                         22,2662   57543 1           DLOAD*  DCOMP
 0922                         22,2663   00015 0                   12D,1
 0923                         22,2664   67471 1           DDV     ARCSIN
 0924   REF   3  LAST  374    22,2665   00051 0                   S1
 0925                         22,2666   51123 0           PDDL*   BPL                PD +2  THETA
 0926                         22,2667   00001 0                   0,1                MUST CHECK THE SIGN OF COS(THETA)
 0927   REF   1               22,2670   44702 1                   OKTHETA            TO DETERMINE THE PROPER QUADRANT
 0928                         22,2671   57545 1           DLOAD   DCOMP
 0929                         22,2672   43244 1           BPL     DAD
 0930   REF   1               22,2673   44677 1                   SUHALFA
 0931   REF   3  LAST  371    22,2674   06503 1                   DPHALF
 0932                         22,2675   77650 1           GOTO
 0933   REF   1               22,2676   44701 1                   CALCPHI
 0934                         22,2677   77625 0  SUHALFA  DSU
 0935   REF   4  LAST  374    22,2700   06503 1                   DPHALF
 0936                         22,2701   77606 1  CALCPHI  PUSH
 0937                         22,2702   57543 1  OKTHETA  DLOAD*  DCOMP
 0938                         22,2703   00013 0                   10D,1
 0939                         22,2704   67471 1           DDV     ARCSIN
 0940   REF   4  LAST  374    22,2705   00051 0                   S1
 0941                         22,2706   51123 0           PDDL*   BPL                PUSH DOWN PHI
 0942                         22,2707   00011 1                   8D,1
 0943   REF   1               22,2710   44722 0                   OKPHI
 0944                         22,2711   57545 1           DLOAD   DCOMP              PUSH UP PHI
 0945                         22,2712   43244 1           BPL     DAD
 0946   REF   1               22,2713   44717 0                   SUHALFAP
 0947   REF   5  LAST  374    22,2714   06503 1                   DPHALF
 0948                         22,2715   77650 1           GOTO
 0949   REF   1               22,2716   44723 1                   VECOFANG
 0950                         22,2717   52025 1  SUHALFAP DSU     GOTO
 0951   REF   6  LAST  374    22,2720   06503 1                   DPHALF
 0952   REF   2  LAST  374    22,2721   44723 1                   VECOFANG
 0953                         22,2722   77745 1  OKPHI    DLOAD                      PUSH UP PHI
 0954                         22,2723   43466 1  VECOFANG VDEF    RVQ
```

```
P0955   ROUTINES FOR TERMINATING THE AUTOMATIC MANEUVER AND RETURNING TO USER

 0956                            22,2724   77776 1  TOOBADF  EXIT
 0957   REF  16  LAST  283       22,2725  0 5571 1           TC        ALARM
 0958                            22,2726   00401 1           OCT       00401

 0959   REF   1                  22,2727  1 2732 1           TCF       NOGO              DO NOT ZERO ATTITUDE ERRORS

 0960   REF  69  LAST  352       22,2730  0 4607 1           TC        BANKCALL
 0961   REF   2  LAST  297       22,2731   40154 0           CADR      ZATTEROR          ZERO ATTITUDE ERRORS

 0962   REF  70  LAST  375       22,2732  0 4607 1  NOGO     TC        BANKCALL
 0963   REF   2  LAST  300       22,2733   40166 1           CADR      STOPRATE          STOP RATES

 0964   REF  14  LAST  344       22,2734  3 4743 0           CAF       TWO
 0965                            22,2735  0 0004 0           INHINT                      ALL RETURNS ARE NOW MADE VIA GOODEND
 0966   REF  12  LAST  308       22,2736  0 5205 0           TC        WAITLIST
 0967   REF   8  LAST  369       E6,1675                     EBANK=    BCDU
 0968   REF   1                  22,2737   03234 1           2CADR     GOODMANU
 0968   REF   1                  22,2740   44066 1
 0969   REF  32  LAST  348       22,2741  1 5146 0           TCF       ENDOFJOB

 0970                            22,2742   77776 1  TOOBADI  EXIT
 0971   REF   2  LAST  375       22,2743  1 2732 1           TCF       NOGO
```

```
L       GIMBAL LOCK AVOIDANCE                                                                       USER'S PAGE NO.   1      EO S3

 0001                          15,2162                      BANK    15

 0002   REF   3  LAST  369    22,2000                      SETLOC KALCMON1
 0003                          22,2744                      BANK

R0004
R0005   DETECTING GIMBAL LOCK
 0006   REF   1                22,2744             LOCSKIRT EQUALS NOGIMLOC

 0007                          22,2744   77614 1  NOGIMLOC SET
 0008   REF   1                22,2745   01074 0                   CALCMAN3
 0009                          22,2746   70740 0  WCALC    LXC,1   DLOAD*
 0010   REF   3  LAST  306    22,2747   01322 0                   RATEINDX         CHOOSE THE DESIRED MANEUVER RATE
 0011   REF   1                22,2750   04772 1                   ARATE,1          FROM A LIST OF FOUR
 0012                          22,2751   45002 1           SR4     CALL             COMPUTE THE INCREMENTAL ROTATION MATRIX
 0013   REF   1                22,2752   44527 1                   DELCOMP          DEL CORRESPONDING TO A 1 SEC ROTATION
A0014                                                                               ABOUT COF
 0015                          22,2753   74343 0           DLOAD*  VXSC
 0016   REF   2  LAST  376    22,2754   04772 1                   ARATE,1
 0017   REF  39  LAST  373    22,2755   03270 1                   COF
 0018   REF   1                22,2756   17325 0           STODL   BRATE            COMPONENT MANEUVER RATES 45 DEG/SEC
 0019   REF   3  LAST  364    22,2757   03335 1                   AM
 0020                          22,2760   55605 1           DMP     DDV*
 0021   REF   1                22,2761   05002 0                   ANGLTIME
 0022   REF   3  LAST  376    22,2762   04772 1                   ARATE,1
 0023                          22,2763   77661 0           SR
 0024                          22,2764   20606 0                   5
 0025   REF   1                22,2765   03333 1           STORE   TM               MANEUVER EXECUTION TIME SCALED AS T2
 0026                          22,2766   77614 1           SETGO
 0027   REF   1                22,2767   01035 0                   CALCMAN2         0(OFF) = CONTINUE MANEUVER
 0028   REF   1                22,2770   45010 1                   NEWANGL +1       1(ON) = START MANEUVER
R0029               THE FOUR SELECTABLE FREE FALL MANEUVER RATES SELECTED BY
R0030               LOADING RATEINDX WITH 0,2,4,6, RESPECTIVELY


 0031                          22,2771   00221 0  ARATE    2DEC    .0088888888      = 0.2 DEG/SEC       $ 22.5 DEG/SEC
 0031                          22,2772   24255 0
 0032                          22,2773   00554 0           2DEC    .0222222222      = 0.5 DEG/SEC       $ 22.5 DEG/SEC
 0032                          22,2774   02660 0
 0033                          22,2775   02660 0           2DEC    .0888888888      = 2.0 DEG/SEC       $ 22.5 DEG/SEC
 0033                          22,2776   13301 1
 0034                          22,2777   16161 0           2DEC    .4444444444      = 10.0 DEG/SEC      $ 22.5 DEG/SEC
 0034                          22,3000   30707 1
 0035                          22,3001   00003 1  ANGLTIME 2DEC    .0001907349      = 100B-19     FUDGE FACTOR TO CONVERT
 0035                          22,3002   04000 0
A0036                                                                               MANEUVER ANGLE TO MANEUVER TIME
```

```
L       KALCMANU STEERING                                                                  USER'S PAGE NO.   1       E0 S3

R0001   GENERATION OF STEERING COMMANDS FOR DIGITAL AUTOPILOT FREE FALL MANEUVERS

R0003   NEW COMMANDS WILL BE GENERATED EVERY ONE SECOND DURING THE MANEUVER

0004    REF   1                E6,1706                          EBANK= TTEMP

0005    REF  71  LAST  375     22,3003  0 4607 1  NEWDELHI TC      BANKCALL          CHECK FOR AUTO STABILIZATION
0006    REF   1                22,3004   54274 1           CADR    ISITAUTO          ONLY
0007    REF  51  LAST  344     22,3005  10 000 0           CCS     A
0008    REF   3  LAST  375     22,3006  1 2730 0           TCF     NOGO -2
0009    REF  18  LAST  369     22,3007  0 6060 1  NEWANGL  TC      INTPRET
0010                           22,3010   75160 1           AXC,1   AXC,2
0011    REF   6  LAST  363     22,3011   03245 1                   MIS               COMPUTE THE NEW MATRIX FROM S/C TO
0012    REF  10  LAST  373     22,3012   02221 1                   KEL               STABLE MEMBER AXES
0013                           22,3013   77624 1           CALL
0014    REF   2  LAST  363     22,3014   44312 1                   MXM3
0015                           22,3015   45575 1           VLOAD   STADR
0016    REF   7  LAST  377     22,3016   50515 0           STOVL   MIS +12D          CALCULATE NEW DESIRED CDU ANGLES
0017                           22,3017   77626 0           STADR
0018    REF   8  LAST  377     22,3020   50523 0           STOVL   MIS +6D
0019                           22,3021   77626 0           STADR
0020    REF   9  LAST  377     22,3022   74531 0           STORE   MIS
0021                           22,3023   45160 1           AXC,1   CALL
0022    REF  10  LAST  377     22,3024   03245 1                   MIS
0023    REF   1                22,3025   44654 0                   DCMTOCDU          PICK UP THE NEW CDU ANGLES FROM MATRIX
0024                           22,3026   77634 0           RTB
0025    REF   1                22,3027   21630 1                   V1STO2S
0026    REF   1                22,3030   03303 1           STORE   NCDU              NEW CDU ANGLES
0027                           22,3031   77414 0           BONCLR  EXIT
0028    REF   2  LAST  376     22,3032   01215 0                   CALCMAN2
0029    REF   1                22,3033   45122 1                   MANUSTAT          TO START MANEUVER
0030    REF  15  LAST  375     22,3034  3 4743 0           CAF     TWO                         +0 OTHERWISE
0031    REF   1                22,3035  55'261 1  INCRDCDU TS      SPNDX
0032    REF   2  LAST  377     22,3036  51'261 0           INDEX   SPNDX
0033    REF   9  LAST  375     22,3037  3 1675 1           CA      BCDU              INITIAL CDU ANGLES
0034                           22,3040  0 0006 1           EXTEND                    OR PREVIOUS DESIRED CDU ANGLES
0035    REF   3  LAST  377     22,3041  5 1261 0           INDEX   SPNDX
0036    REF   2  LAST  377     22,3042  21'702 1           MSU     NCDU
0037                           22,3043  0 0006 1           EXTEND
0038    REF   4  LAST  376     22,2000                     SETLOC  KALCMON1
0039                           22,3044                     BANK

0040    REF   1                22,3044  7 3121 1           MP      DT/TAU
0041    REF  52  LAST  377     22,3045  10 000 0           CCS     A                 CONVERT TO 2S COMPLEMENT
0042    REF  18  LAST  351     22,3046  6 4744 1           AD      ONE
0043                           22,3047  1 3051 1           TCF     +2
0044                           22,3050  4 0000 0           COM
0045    REF   4  LAST  377     22,3051  51'261 0           INDEX   SPNDX
0046    REF   1                22,3052  55'637 0           TS      DELDCDU           ANGLE INCREMENTS TO BE ADDED TO
0047    REF   5  LAST  377     22,3053  51'261 0           INDEX   SPNDX             CDUXD, CDUYD, CDUZD EVERY TENTH SECOND
```

```
 0048   REF  3  LAST  377   22,3054  3 1702 0            CA       NCDU              BY LEM DAP
 0049   REF  6  LAST  377   22,3055  51'261 0            INDEX    SPNDX
 0050   REF 10  LAST  377   22,3056  57'675 1            XCH      BCDU
 0051   REF  7  LAST  378   22,3057  51'261 0            INDEX    SPNDX
 0052   REF 10  LAST  364   22,3060  55'634 0            TS       CDUXD
 0053   REF  8  LAST  378   22,3061  11'261 1            CCS      SPNDX
 0054   REF  1              22,3062  1 3035 0            TCF      INCRDCDU          LOOP FOR THREE AXES

 0055                       22,3063  0 0003 1            RELINT

R0056   COMPARE PRESENT TIME WITH TIME TO TERMINATE MANEUVER

 0057   REF  1              22,3064  0 3075 0  TMANUCHK  TC       TIMECHK
 0058   REF  1              22,3065  1 3170 0            TCF      CONTMANU
 0059   REF 19  LAST  377   22,3066  3 4744 1            CAF      ONE
 0060                       22,3067  0 0004 0  MANUSTAL  INHINT                     END MAJOR PART OF MANEUVER WITHIN 1 SEC
 0061   REF 13  LAST  375   22,3070  0 5205 0            TC       WAITLIST          UNDER WAITLIST CALL TO MANUSTOP
 0062   REF  2  LAST  377   E6,1706                      EBANK=   TTEMP
 0063   REF  1              22,3071   03213 1            2CADR    MANUSTOP
 0063   REF  1              22,3072   44066 1
 0064                       22,3073  0 0003 1            RELINT
 0065   REF 33  LAST  375   22,3074  1 5146 0            TCF      ENDOFJOB


 0066                       22,3075  0 0006 1  TIMECHK   EXTEND
 0067   REF 12  LAST  318   22,3076  4 0025 1            DCS      TIME2
 0068   REF  3  LAST  378   22,3077  53'707 1            DXCH     TTEMP
 0069                       22,3100  0 0006 1            EXTEND
 0070   REF  2  LAST  376   22,3101  3 1733 1            DCA      TM
 0071   REF  4  LAST  378   22,3102  21'707 1            DAS      TTEMP
 0072   REF  5  LAST  378   22,3103  11'706 0            CCS      TTEMP
 0073   REF 34  LAST  348   22,3104  0 0002 0            TC       Q
 0074                       22,3105  1 3107 0            TCF      +2
 0075   REF  1              22,3106  1 3117 1            TCF      2NDRETRN
 0076   REF  6  LAST  378   22,3107  11'707 1            CCS      TTEMP +1
 0077   REF 35  LAST  378   22,3110  0 0002 0            TC       Q
 0078   REF  1              22,3111  1 3113 0            TCF      MANUOFF
 0079                       22,3112  4 0000 0            COM
 0080   REF  1              22,3113  6 3166 0  MANUOFF   AD       ONESEK +1
 0081                       22,3114  0 0006 1            EXTEND
 0082   REF  2  LAST  378   22,3115  6 3117 0            BZMF     2NDRETRN
 0083   REF 36  LAST  378   22,3116  24 002 0            INCR     Q
 0084   REF 37  LAST  378   22,3117  24 002 0  2NDRETRN  INCR     Q
 0085   REF 38  LAST  378   22,3120  0 0002 0            TC       Q

 0086                       22,3121   03146 1  DT/TAU    DEC      .1

 0087                       22,3122   77776 1  MANUSTAT  EXIT                       INITIALIZATION ROUTINE
 0088                       22,3123  0 0006 1            EXTEND                     FOR AUTOMATIC MANEUVERS
 0089   REF 13  LAST  378   22,3124  3 0025 0            DCA      TIME2
```

```
0090  REF   3  LAST  378   22,3125  21'733 0            DAS      TM                TM+TO     MANEUVER COMPLETION TIME
0091                       22,3126  C 0006 1            EXTEND
0092  REF   2  LAST  378   22,3127  4 3166 1            DCS      DNESEK
0093  REF   4  LAST  379   22,3130  21'733 0            DAS      TM                (TM+TO)-1
0094                       22,3131  C 0004 0            INHINT
0095  REF  16  LAST  377   22,3132  3 4743 0            CAF      TWO
0096  REF   2  LAST  140   22,3133  55'700 0  RATEBIAS  TS       KSPNDX
0097                       22,3134  6 0000 1            DOUBLE
0098  REF   2  LAST  140   22,3135  55'701 1            TS       KDPNDX
0099  REF  93  LAST  377   22,3136  50 000 1            INDEX    A
0100  RFF   2  LAST  376   22,3137  3 1724 1            CA       BRATE
0101  REF   3  LAST  379   22,3140  51'700 1            INDEX    KSPNDX            STORE MANEUVER RATE IN
0102  REF   5  LAST  206   22,3141  55'642 1            TS       OMEGAPD           OMEGAPD, OMEGAQD, OMEGARD
0103                       22,3142  C 0006 1            EXTEND
0104                       22,3143  6 3145 1            BZMF     +2                COMPUTF ATTITUDE ERROR
0105                       22,3144  4 0000 0            COM                        OFFSET = (WX)ABS(WX)/2AJX
0106                       22,3145  C 0C06 1            EXTEND                     WHERE AJX= 2-JET ACCELFRATION
0107  REF   1              22,3146  7 3167 0            MP       BIASCALE          = -1/16
0108                       22,3147  0 CC06 1            EXTEND
0109  REF   3  LAST  379   22,3150  5 1701 0            INDEX    KDPNDX
0110  REF   3  LAST  379   22,3151  7 1724 0            MP       BRATE
0111                       22,3152  C 0006 1            EXTEND
0112  REF   4  LAST  379   22,3153  5 1700 1            INDFX    KSPNDX
0113  REF   4  LAST  138   22,3154  11'530 1            DV       1JACC             =AJX   $ 90 DEG/SEC-SFC
0114  RFF   5  LAST  379   22,3155  51'700 1            INDEX    KSPNDX
0115  REF   1              22,3156  55'274 0            TS       DELPERUR              $ 180 DEG
0116  REF   6  LAST  379   22,3157  11'700 0            CCS      KSPNDX
0117  REF   1              22,3160  1 3133 1            TCF      RATEBIAS

0120  REF   9  LAST  346   22,3161  3 0025 0            CA       TIME1
0121  REF   3  LAST  379   22,3162  6 3166 0            AD       ONESEK +1
0122  REF   1              22,3163  57'705 1            XCH      NEXTIMF
0123  REF   2  LAST  378   22,3164  1 3034 1            TCF      INCRDCDU -1

0124                       22,3165   00000 1  ONESEK    DFC      0
0125                       22,3166   00144 0            DEC      100

0126                       22,3167   75777 1  BIASCALF  OCT      75777             = -1/16

0127  RFF  10  LAST  379   22,3170  4 0025 1  CDNTMANU  CS       TIME1             RFSET FOR NEXT DCDU UPDATE
0128  REF   2  LAST  379   22,3171  6 1705 1            AD       NEXTIME
0129  REF  94  LAST  379   22,3172  10 000 0            CCS      A
0130  REF  20  LAST  378   22,3173  6 4744 1            AD       ONE
0131  RFF   1              22,3174  1 3177 1            TCF      MANUCALL
0132  RFF   1              22,3175  6 4726 0            AD       NEGMAX
0133                       22,3176  4 0000 0            COM
0134                       22,3177  C 0004 0  MANUCALL  INHINT                     CALL FOR NEXT UPDATE VIA WAITLIST
0135  REF  14  LAST  378   22,3200  C 5205 0            TC       WAITLIST
0136  REF   7  LAST  378   E6,1706                      EBANK=   TTEMP
0137  REF   1              22,3201   03206 0            2CADR    UPDTCALL
0137  RFF   1              22,3202   44066 1
```

```
 0138    REF   4  LAST  379   22,3203   3 3166 0            CAF      ONESEK +1       INCREMENT TIME FOR NEXT UPDATE
 0139    REF   3  LAST  379   22,3204  27'705 0            ADS      NEXTIME
 0140    REF  34  LAST  378   22,3205   1 5146 0            TCF      ENDOFJOB


 0141    REF   1              22,3206   3 7735 1  UPDTCALL  CAF      PRIO26          SATELLITE PROGRAM TO CALL FOR UPDATE
 0142    REF  13  LAST  311   22,3207   0 5076 0            TC       FINDVAC         OF STEERING COMMANDS
 0143    REF   8  LAST  379   E6,1706                       EBANK=   TTEMP
 0144    REF   1              22,3210    03003 1            2CADR    NEWDELHI
 0144    REF   1              22,3211    44066 1
 0145    REF   5  LAST  294   22,3212   0 5263 0            TC       TASKOVER
```

```
P0146   ROUTINE FOR TERMINATING AUTOMATIC MANEUVERS

 0147   REF  38  LAST  348   22,3213  3 4746 0  MANUSTOP CAF      ZERO            ZERO MANEUVER RATES
 0148   REF   1              22,3214  55'641 1           TS       DELDCDU2
 0149   REF   2  LAST  207   22,3215  55'644 1           TS       OMEGARD
 0150   REF   1              22,3216  55'276 1           TS       DELREROR
 0151   REF   1              22,3217  55'640 0           TS       DELDCDU1
 0152   REF   3  LAST  207   22,3220  55'643 0           TS       OMEGAQD
 0153   REF   1              22,3221  55'275 1           TS       DELQEROR
 0154   REF   2  LAST  363   22,3222  3 0323 0           CA       CPSI            SET DESIRED GIMBAL ANGLES TO
 0155   REF   4  LAST  215   22,3223  55'636 1           TS       CDUZD           DESIRED FINAL GIMBAL ANGLES
 0156   REF   1              22,3224  3 0322 1           CA       CTHETA
 0157   REF   5  LAST  215   22,3225  55'635 1           TS       CDUYD
 0158   REF   4  LAST  364   22,3226  3 0321 1  ENDROLL  CA       CPHI            NO FINAL YAW
 0159   REF  11  LAST  378   22,3227  55'634 0           TS       CDUXD
 0160   REF  39  LAST  381   22,3230  3 4746 0           CAF      ZERO
 0161   REF   6  LAST  379   22,3231  55'642 1           TS       OMEGAPD         I.E. MANEUVER DID NOT GO THRU
 0162   REF   2  LAST  377   22,3232  55'637 0           TS       DELDCDU         GIMBAL LOCK ORIGINALLY
 0163   REF   2  LAST  379   22,3233  55'274 0           TS       DELPEROR
 0164   REF   1              22,3234  3 1306 0  GOODMANU CA       ATTPRIO         RESTORE USERS PRIO
 0165   REF   2  LAST  243   22,3235  54 063 0           TS       NEWPRIO

 0166   REF  40  LAST  381   22,3236  3 4746 0           CA       ZERO            ZERO ATTCADR
 0167   REF   3  LAST  233   22,3237  53'305 1           DXCH     ATTCADR

 0168   REF   2  LAST  244   22,3240  0 5107 1           TC       SPVAC           RETURN TO USER

 0169   REF   6  LAST  380   22,3241  0 5263 0           TC       TASKOVER
```

```
L       SYSTEM TEST STANDARD LEAD INS                                                  USER'S PAGE NO.   1      FO S3

 0001   REF   4  LAST  332   E5,1642                   EBANK= XSM

 0002                        33,2113                   BANK    33
 0003   REF   1              04,2000                   SETLOC E/PROG
 0004                        04,2617                   BANK

 0005   REF   1                                        COUNT* $$/P07

R0006             SPECIAL PROGRAMS TO EASE THE PANGS OF ERASABLE MEMORY PROGRAMS.

R0007   E/BKCALL   FOR DOING BANKCALLS FROM AND RETURNING TO ERASABLE.

R0008             THIS ROUTINE IS CALLABLE FROM ERASABLE OR FIXED.  LIKE BANKCALL, HOWEVER, SWITCHING BETWEEN S3 AND S4
R0010   IS NOT POSSIBLE.

R0011             THE CALLING SEQUENCE IS:

A0012                                                  TC      BANKCALL
A0013                                                  CADR    E/BKCALL
A0014                                                  CADR    ROUTINE          WHERE YOU WANT TO GO IN FIXED.
A0015                                                  RETURN HERE FROM DISPLAY TERMINATE, BAD STALL OR TC Q.
A0016                                                  RETURN HERE FROM DISPLAY PROCEED OR GOOD RETURN FROM STALL.
A0017                                                  RETURN HERE FROM DISPLAY ENTER OR RECYCLE.

R0018             THIS ROUTINE REQUIRES TWO ERASABLES (EBUF2, +1) IN UNSWITCHED WHICH ARE UNSHARED BY INTERRUPTS AND
R0020   OTHER EMEMORY PROGRAMS.

R0021             A + L ARE PRESERVED THROUGH BANKCALL AND E/BKCALL.

 0022   REF   3  LAST  255   04,2617  52 134 0  E/BKCALL DXCH    EBUF2            SAVE A,L AND GET DP RETURN.
 0023   REF   1              04,2620  53'167 1           DXCH    EBUF2            SAVE DP RETURN.
 0024   REF   2  LAST  382   04,2621  25'166 1           INCR    EBUF2            RETURN +1 BECAUSE DOUBLE CADR.
 0025   REF  11  LAST  230   04,2622  3 0006 1           CA      BBANK
 0026   REF   3  LAST  316   04,2623  7 5003 0           MASK    LOW10            GET CURRENT EBANK.  (SBANK SOMEDAY)
 0027   REF   3  LAST  382   04,2624  27'167 1           ADS     EBUF2 +1         FORM BBCON.  (WAS EBANK)
 0028   REF   4  LAST  382   04,2625  51'166 1           NDX     EBUF2
 0029                        04,2626  2'7777 0           CA      0 -1             GET CADR OF ROUTINE.
 0030   REF   1              04,2627  0 4613 1           TC      SWCALL           GO TO ROUTINE, SETTING Q TO SWRETURN
A0031                                                                             AND RESTORING A + L.
 0032                        04,2630  0 2634 1           TC      +4               TX Q, V34, OR BAD STALL RETURN.
 0033                        04,2631  0 2633 0           TC      +2               PROCEED OR GOOD STALL RETURN.
 0034   REF   5  LAST  382   04,2632  25'166 1           INCR    EBUF2            ENTER OR RECYCLE RETURN.
 0035   REF   6  LAST  382   04,2633  25'166 1           INCR    EBUF2
 0036   REF   7  LAST  382   04,2634  53'167 1  E/SWITCH DXCH    EBUF2
 0037                        04,2635  52 006 0           DTCB
```

```
L        SYSTEM TEST STANDARD LEAD INS                                                              USER'S PAGE NO.   2      E5 S3

P0038    E/CALL          FOR CALLING A FIXED MEMORY INTERPRETIVE SUBROUTINE FROM ERASABLE AND RETURNING TO ERASABLE.

R0040                THE CALLING SEQUENCE IS...
A0041                                                            RTB
A0042                                                                   E/CALL
A0043                                                            CADR   ROUTINE          THE INTERPRETIVE SUBROUTINE YOU WANT.
A0044                                                                                    RETURNS HERE IN INTERPRETIVE.

 0045   REF   1                04,2636  22 164 1  E/CALL    LXCH   LOC              ADRES -1 OF CADR.
 0046   REF  33  LAST  348     04,2637  50 001 0            INDEX  L
 0047   REF  34  LAST  383     04,2640  3 0001 0            CA     L                CADR IN A.
 0048   REF  35  LAST  383     04,2641  24 001 0            INCR   L
 0049   REF  36  LAST  383     04,2642  24 001 0            INCR   L                RETURN ADRES IN L.
 0050   REF   8  LAST  332     04,2643  53'167 1            DXCH   EBUF2            STORE CADR AND RETURN.
 0051   REF  19  LAST  377     04,2644  0 6060 1            TC     INTPRET
 0052                          04,2645   77624 1            CALL
 0053   REF   9  LAST  383     04,2646   01166 1                   EBUF2            INDIRECTLY EXECUTE ROUTINE.  IT MUST
 0054                          04,2647   77776 1            EXIT                    LEAVE VIA PVQ OR EQUIVALENT.
 0055   REF  10  LAST  383     04,2650  23'167 0            LXCH   EBUF2 +1         PICK UP RETURN.
 0056   REF  20  LAST  383     04,2651  1 6062 1            TCF    INTPRET +2       SET LOC AND RETURN TO CALLER.
```

```
P0057   E/JOBWAK          FOR WAKING UP ERASABLE MEMORY JOBS.

R0058             THIS ROUTINE MUST BE CALLED IN INTERRUPT OR WITH INTERRUPTS INHIBITED.

R0060             THE CALLING SEQUENCE IS:

A0061                                                               INHINT
A0062                                                                 .
A0063                                                                 .
A0064                                                               CA      WAKEADR          ADDRESS OF SLEEPING JOB
A0065                                                               TC      IBNKCALL
A0066                                                               CADR    E/JOBWAK
A0067                                                                 .                      RETURNS HERE
A0068                                                                 .
A0069                                                                 .
A0070                                                               RELINT                   IF YOU DID AN INHINT.

 0071                           33,2113                             BANK    33
 0072   REF   2  LAST  382      04,2000                             SETLOC  E/PROG
 0073                           04,2652                             BANK

 0074   REF   2 LAST  382 TO  384:     27    27*                    COUNT*  $$/P07

 0075   REF   1                 04,2652  0 5130 0  E/JOBWAK TC      JOBWAKE          ARRIVE IWTH ADRES IN A.
 0076   REF  17  LAST  244      04,2653  4 4732 1           CS      BIT11
 0077   REF   1                 04,2654  50 C64 0           NDX     LOCCTR
 0078   REF   2  LAST  383      04,2655  26 164 0           ADS     LOC              KNOCK FIXED MEMORY BIT OUT OF ADRES.
 0079   REF   2  LAST  158      04,2656  0 C072 1           TC      RUPTREG3         RETURN
```

```
R0001   NAME- IMU PERFORMANCE TESTS 2

R0002   DATE- MARCH 20,1967

R0003   BY- SYSTEM TEST GROUP 864-6900 EXT. 1274

R0004   MODNO.- ZERO

R0005   FUNCTIONAL OESCRIPTION

R0006   POSITIONING ROUTINES FOR THE IMU PERFORMANCE TESTS AS WELL AS SOME OF
R0007   THE TESTS THEMSELVES. FOR A OESCRIPTION OF THESE SUBROUTINES ANO THE
R0008   OPERATING PROCEDURES (TYPICALLY) SEE STG MEMO 685.THEORETICAL REF.E-1973

 0009                          33,2113                         BANK    33
 0010   REF    2  LAST   46    37,2000                         SETLOC  IMU2
 0011                          37,2002                         BANK
 0012   REF    2  LAST  132    E5,1416                         EBANK=  POSITON
 00121  REF    2 LAST   46 TO   46:      2      2*             COUNT*  $$/P07

 00122  REF    1               37,2002  0 5313 0  REOO         TC      NEWMOOEX
 00124                         37,2003   00007 0               MM      07

 0021   REF    1               37,2004  0 2325 1  GEOIMUTT     TC      IMUZERR
 0022   REF   41  LAST  381    37,2005  3 4746 0  IMUBACK      CA      ZERO
 0023   REF    2  LAST  132    37,2006  55'414 0               TS      NDXCTR
 0024   REF    1               37,2007  55'440 1               TS      TORQNOX
 0025   REF    2  LAST  385    37,2010  55'441 0               TS      TORQNOX +1
 00251  REF    1               37,2011  55'576 0               TS      OVFLOWCK
 0026   REF    1               37,2012  3 4352 1  NBPOSPL      CA      DEC17
 0027   REF    1               37,2013  55'571 1               TS      ZERONDX
 0028   REF    1               37,2014  3 2476 0               CA      XNBAOR
 0029   REF    1               37,2015  0 2367 1               TC      ZEROING
 0030   REF    3  LAST  346    37,2016  3 4727 1               CA      HALF
 0031   REF    1               37,2017  55'664 0               TS      XNB
 0032   REF   21  LAST  383    37,2020  0 6060 1  GUESS        TC      INTPRET
 0033                          37,2021   62545 1  LATAZCHK     DLOAO   SL2
 0034   REF    2  LAST  132    37,2022   02403 1                       LATITUDE
 0035   REF   14  LAST  329    37,2023   15046 1               STOOL   DSPTEM1 +1
 0036   REF    2  LAST  132    37,2024   02401 0                       AZIMUTH
 0037                          37,2025   77434 1               RTB     EXIT
 0038   REF    1               37,2026   21624 1                       1STO2S
 0039   REF   68  LAST  369    37,2027  56 154 1               XCH     MPAC
 0040   REF   15  LAST  385    37,2030  55'044 1               TS      OSPTEM1
 0041   REF    1               37,2031  3 2473 0               CAF     VN0641
 0042   REF   72  LAST  377    37,2032  0 4607 1               TC      BANKCALL
 0043   REF    4  LAST  352    37,2033   20471 1               CADR    GOFLASH
 0044   REF    1               37,2034  0 2270 0               TC      ENDTEST1
 0045                          37,2035  0 2037 1               TC      +2
 0046                          37,2036  0 2031 1               TC      -5
```

```
0047    REF  22  LAST  385    37,2037  0 6060 1             TC      INTPRET
0048                          37,2040   47135 0             SLOAD   RT8
0049    REF  16  LAST  385    37,2041   01045 1                     DSPTEM1
0050    REF  10  LAST  369    37,2042   21606 1                     CDULOGIC
0051    REF   3  LAST  385    37,2043   02401 0             STORE   AZIMUTH
0052                          37,2044   60535 1             SLOAD   SR2
0053    REF  17  LAST  386    37,2045   01046 1                     DSPTEM1 +1
0054    REF   3  LAST  385    37,2046   02403 1             STORE   LATITUDE
0055                          37,2047   57546 1             COS     DCOMP
0056                          37,2050   77752 1             SL1
0057    REF   1               37,2051   16437 0             STODL   WANGI
0058    REF   4  LAST  386    37,2052   02403 1                     LATITUDE
0059                          37,2053   72556 1             SIN     SL1
0060    REF   1               37,2054   16435 1             STODL   WANGO
0061    REF   4  LAST  386    37,2055   02401 0                     AZIMUTH
0062                          37,2056   73406 1             PUSH    SIN
0063    REF   1               37,2057   02675 1             STORE   YNB +2
0064    REF   1               37,2060   16705 1             STODL   ZNB +4
0065                          37,2061   77746 1             COS
0066    REF   2  LAST  386    37,2062   02677 0             STORE   YNB +4
0067                          37,2063   77676 0             DCOMP
0068    REF   2  LAST  386    37,2064   36703 0  POSGMBL    STCALL  ZNB +2
0069    REF   1               37,2065   47336 1                     CALCGA
0070                          37,2066   77776 1             EXIT
0071    REF  73  LAST  385    37,2067  0 4607 1             TC      BANKCALL
0072    REF   2  LAST  281    37,2070   16765 1             CADR    IMUCOARS
0073    REF  34  LAST  305    37,2071  3 4727 1             CAF     BIT14              IF BIT14 SET, GIMBAL LOCK
0074    REF   8  LAST  302    37,2072  7 0077 0             MASK    FLAGWRD3
0075                          37,2073  0 0006 1             EXTEND
0076                          37,2074  1 2076 0             BZF     +2
0077    REF   3  LAST  385    37,2075  25'414 1             INCR    NDXCTR             +1 IF IN GIMBAL LOCK,OTHERWISE 0
0078    REF  26  LAST  352    37,2076  0 5520 0             TC      DOWNFLAG
0079    REF   2  LAST  240    37,2077   00056 1             ADRES   GLOKFAIL           RESET GIMBAL LOCK FLAG
0080    REF   1               37,2100  0 2315 1             TC      IMUSLLLG
0081    REF   4  LAST  386    37,2101  11'414 0             CCS     NDXCTR             IF ONE GO AND DO A PIPA TEST ONLY
0082    REF   1               37,2102  0 2126 0             TC      PIPACHK            ALIGN AND MEASURE VERTICAL PIPA RATE
0084    REF   1               37,2103  0 2320 1             TC      FINIMUDD
0085                          37,2104  0 0006 1             EXTEND
00851   REF   1               37,2105  3 1575 1             DCA     PERFDLAY
00852   REF   1               37,2106  0 5301 0             TC      LONGCALL           DELAY WHILE SUSPENSION STABILIZES
008525  REF   3  LAST  385    E5,1416                       EBANK=  POSITON
00853   REF   1               37,2107   02113 0             2CADR   GOESTIMS
00853   REF   1               37,2110   76065 0
00854   REF   1               37,2111  3 2116 0             CA      ESTICADR
00855   REF   1               37,2112  0 5124 0             TC      JOBSLEEP
00856   REF   2  LAST  386    37,2113  3 2116 0  GOESTIMS   CA      ESTICADR
00857   REF   2  LAST  384    37,2114  0 5130 0             TC      JOBWAKE
00858   REF   7  LAST  381    37,2115  0 5263 0             TC      TASKOVER
00859   REF   1               37,2116   76500 0  ESTICADR   CADR    ESTIMS
0086    REF  42  LAST  385    37,2117  3 4746 0  TORQUE     CA      ZERO
```

```
 0087    REF    7  LAST  329    37,2120  55'047 1            TS       DSPTEM2
 0088    REF    1               37,2121  3 1504 1            CA       DRIFTI
 0089    REF    8  LAST  387    37,2122  55'050 1            TS       DSPTEM2 +1
 0090    REF    4  LAST  386    37,2123  51'416 0            INDEX    POSITON
 0091    REF    2  LAST  132    37,2124  55'420 1            TS       SOUTHDR -1
 0092    REF    1               37,2125  0 2457 0            TC       SHOW

 0093    REF    5  LAST  386    37,2126  51'414 1  PIPACHK   INDEX    NDXCTR              PIPA TEST
 0094                           37,2127  0 2130 1            TC       +1
 0095    REF    1               37,2130  0 2447 1            TC       EARTHR*
 0096    REF    2  LAST  335    37,2131  3 4352 1            CA       DEC17               ALLOW PIP COUNTER TO OVERFLOW 17 TIMES
 0097    REF    1               37,2132  55'476 1            TS       DATAPL +4           IN THE ALLOTED TIME INTERVAL
 0098    REF    1               37,2133  3 2474 1            CA       DEC58
 0099    REF    2  LAST  132    37,2134  55'412 0            TS       LENGTHOT
 0100    REF   21  LAST  379    37,2135  3 4744 1            CA       ONE
 0101    REF    1               37,2136  55'537 0            TS       RESULTCT
 0102    REF   43  LAST  386    37,2137  3 4746 0            CA       ZERO
 0103    REF    2  LAST  132    37,2140  51'415 0            INDEX    PIPINDEX
 0104    REF    5  LAST  317    37,2141  54 037 1            TS       PIPAX
 0105    REF    2  LAST  387    37,2142  55'472 0            TS       DATAPL
 0106    REF    1               37,2143  0 2332 1            TC       CHECKG
 0107                           37,2144  0 0004 0            INHINT
 0108    REF   17  LAST  379    37,2145  3 4743 0            CAF      TWO
 0109    REF    1               37,2146  0 5175 1            TC       TWIDDLE
 0110    REF    5  LAST  382    E5,1642                      EBANK=   XSM
 0111    REF    1               37,2147   02151 0            ADRES    PIPATASK
 0112    REF   35  LAST  380    37,2150  0 5146 1            TC       ENDOFJOB


 0113                           37,2151  0 0006 1  PIPATASK  EXTEND
 0114    REF    3  LAST  387    37,2152  27'412 0            DIM      LENGTHOT
 0115    REF    4  LAST  387    37,2153  3 1412 1            CA       LENGTHOT
 0116                           37,2154  0 0006 1            EXTEND
 0117    REF    1               37,2155  6 2161 0            BZMF     STARTPIP
 0118    REF   17  LAST  346    37,2156  3 4733 1            CAF      BIT10
 0119    REF    2  LAST  387    37,2157  0 5175 1            TC       TWIDDLE
 0120    REF    6  LAST  387    E5,1642                      EBANK=   XSM
 0121    REF    2  LAST  387    37,2160   02151 0            ADRES    PIPATASK
 0122    REF    2  LAST  282    37,2161  3 4727 1  STARTPIP  CAF      PRIO20
 0123    REF   14  LAST  380    37,2162  0 5076 0            TC       FINDVAC
 0124    REF    7  LAST  387    E5,1642                      EBANK=   XSM
 0125    REF    1               37,2163   02166 1            2CADR    PIPJOBB
 0125    REF    1               37,2164   76065 0
 0126    REF    8  LAST  386    37,2165  0 5263 0            TC       TASKOVER


 0127    REF    6  LAST  387    37,2166  51'414 1  PIPJOBB   INDEX    NDXCTR
 0128                           37,2167  0 2170 0            TC       +1
 0129    REF    2  LAST  387    37,2170  0 2447 1            TC       EARTHR*
 0130    REF    5  LAST  387    37,2171  3 1412 1            CA       LENGTHOT
```

```
0131                           37,2172  0 0006 1                EXTEND
0132                           37,2173  6 2175 0                BZMF    +2
0133    REF  36  LAST  387     37,2174  0 5146 1                TC      ENDOFJOB

0134    REF   7  LAST  270     37,2175  3 4747 1                CA      FIVE
0135    REF   2  LAST  387     37,2176  55'537 0                TS      RESULTCT
0136    REF   2  LAST  387     37,2177  0 2332 1                TC      CHECKG
0137    REF   3  LAST  387     37,2200  11'473 1                CCS     DATAPL +1
0138                           37,2201  0 2205 1                TC      +4
0139    REF   1                37,2202  0 5701 1                TC      CCSHOLE
0140    REF   4  LAST  388     37,2203  4 1476 1                CS      DATAPL +4
0141    REF   5  LAST  388     37,2204  55'476 1                TS      DATAPL +4
0142                           37,2205  0 0006 1                EXTEND
0143    REF   6  LAST  388     37,2206  4 1473 1                DCS     DATAPL
0144    REF   7  LAST  388     37,2207  21'477 0                DAS     DATAPL +4

0145    REF  23  LAST  386     37,2210  0 6060 1                TC      INTPRET
0146                           37,2211   45345 1                DLOAD   DSU
0147    REF   8  LAST  388     37,2212   02501 1                         DATAPL +6
0148    REF   9  LAST  388     37,2213   02475 0                        DATAPL +2
0149                           37,2214   45044 0                BPL     CALL
0150    REF   1                37,2215   76217 1                        AINGOTN
0151    REF   1                37,2216   76275 0                        OVERFFIX
0152                           37,2217   56325 0     AINGOTN    PDDL    DDV
0153    REF  10  LAST  388     37,2220   02477 1                        DATAPL +4
0154                           37,2221   47075 0                DMPR    PTB
0155    REF   1                37,2222   37056 0                        DEC585           DEC585 HAS BEEN REDEFINED FOR LEM
0156    REF   1                37,2223   21622 1                        SGNAGREE
0157    REF   9  LAST  387     37,2224   01050 0                STORE   DSPTEM2
0158                           37,2225   77776 1                EXIT
0159    REF   7  LAST  387     37,2226  11'414 0                CCS     NDXCTR
0160    REF   1                37,2227  0 2301 1                TC      COAALIGN          TAKE PLATFORM OUT OF GIMBAL LOCK
0161    REF   2  LAST  387     37,2230  0 2457 0                TC      SHOW
0162    REF   1                37,2231  3 2471 1     VERTDRFT   CA      3990DEC           ABOUT 1 HOUR VERTICAL DRIFT TEST
0163    REF   6  LAST  387     37,2232  55'412 0                TS      LENGTHOT
0164    REF   5  LAST  387     37,2233  51'416 0                INDEX   POSITON
0165    REF   3  LAST  387     37,2234  4 1417 0                CS      SOUTHDR -2
0166    REF   1                37,2235  55'442 0                TS      DRIFTT
01661   REF   3  LAST  387     37,2236  11'415 1                CCS     PIPINDEX          OFFSET PLATFORM TO MISS PIP DEAD-ZONES
01662   REF   1                37,2237  1 2245 1                TCF     PON4              Z UP IN POS 4
01663   REF  18  LAST  312     37,2240  4 4740 1     PON2       CS      BIT5              X UP
01664   REF   1                37,2241  27'565 1                ADS     ERCOMP +2
01665   REF  19  LAST  388     37,2242  3 4740 0                CA      BIT5
01666   REF   2  LAST  388     37,2243  27'567 0                ADS     ERCOMP +4
01667   REF   1                37,2244  1 2251 1                TCF     PON
01668   REF  20  LAST  388     37,2245  4 4740 1     PON4       CS      BIT5
01669   REF   3  LAST  388     37,2246  27'565 1                ADS     ERCOMP +2
016691  REF  21  LAST  388     37,2247  3 4740 0                CA      BIT5
016692  REF   4  LAST  388     37,2250  27'563 1                ADS     ERCOMP
0167    REF   3  LAST  387     37,2251  0 2447 1     PON        TC      EARTHR*
```

```
 0168   REF  44  LAST  387   37,2252  3 4746 0             CA      ZERO            ALLOW ONLY SOUTH GYRO EARTH RATE COMPENS
 0169   REF   2  LAST  132   37,2253  55'404 1             TS      ERVECTOR
 0170   REF   3  LAST  389   37,2254  55'405 0             TS      ERVECTOR +1
 0171   REF   4  LAST  230   37,2255  3 4724 1  GLESS1     CAF     POSMAX
 0172   REF   3  LAST  385   37,2256  55'440 1             TS      TORQNDX
 0173   REF   4  LAST  389   37,2257  55'441 0             TS      TORQNDX +1
 0174   REF  10  LAST  369   37,2260  3 0032 0             CA      CDUX
 0175   REF   2  LAST  132   37,2261  55'413 1             TS      LOSVEC
 0176   REF   2  LAST  386   37,2262  0 2500 0             TC      ESTIMS
 0177   REF   1              37,2263  3 1502 1  VALMIS     CA      DRIFTO
 0178   REF  10  LAST  388   37,2264  55'050 1             TS      DSPTEM2 +1
 0179   REF  45  LAST  389   37,2265  3 4746 0             CA      ZERO
 0180   REF  11  LAST  389   37,2266  55'047 1             TS      DSPTEM2
 0181   REF   3  LAST  388   37,2267  0 2457 0             TC      SHOW


 0182   REF  27  LAST  386   37,2270  0 5520 0  ENDTEST1   TC      DOWNFLAG
 0183   REF   3  LAST  299   37,2271   00007 0             ADRES   IMUSE
 0184   REF  46  LAST  389   37,2272  4 4746 1             CS      ZERO
 0185   REF   2  LAST  244   37,2273  0 5316 0             TC      NEWMODEA
 0186   REF  28  LAST  352   37,2274  0 5474 0             TC      ENDEXT
```

```
0187                         37,2275   43215 0  OVERFFIX DAD     DAD
0188  REF   3  LAST  312     37,2276   06513 0                   DPPOSMAX
0189  REF   1                37,2277   37064 1                   ONEDPP
0190                         37,2300   77616 0           RVQ


0191                         37,2301  0 0006 1  COAALIGN EXTEND                          COARSE ALIGN SUBROUTINE
0192  REF   2  LAST  385     37,2302  23'571 0           QXCH    ZERONDX
0193  REF  47  LAST  389     37,2303  3 4746 0           CA      ZERO
0194  REF  11  LAST  317     37,2304  54 321 0           TS      THETAD
0195  REF  12  LAST  390     37,2305  54 322 0           TS      THETAD +1
0196  REF  13  LAST  390     37,2306  54 323 1           TS      THETAD +2
0197  REF  74  LAST  386     37,2307  0 4607 1           TC      BANKCALL
0198  REF   3  LAST  386     37,2310   16765 1           CADR    IMUCOARS
0199  REF  75  LAST  390     37,2311  0 4607 1  ALIGNCOA TC      BANKCALL
0200  REF   7  LAST  345     37,2312   17735 0           CADR    IMUSTALL
0201  REF   1                37,2313  0 3047 1           TC      SOMERR2
0202  REF   3  LAST  390     37,2314  0 1571 0           TC      ZERONDX


0203                         37,2315  0 0006 1  IMUSLLLG EXTEND
0204  REF   4  LAST  390     37,2316  23'571 0           QXCH    ZERONDX
0205  REF   1                37,2317  0 2311 0           TC      ALIGNCOA

0206                         37,2320  0 0006 1  FINIMUDD EXTEND
0207  REF   5  LAST  390     37,2321  23'571 0           QXCH    ZERONDX
0208  REF  76  LAST  390     37,2322  0 4607 1           TC      BANKCALL
0209  REF   2  LAST  285     37,2323   17175 1           CADR    IMUFINE
0210  REF   2  LAST  390     37,2324  0 2311 0           TC      ALIGNCOA

0211                         37,2325  0 0006 1  IMUZERR  EXTEND
0212  REF   6  LAST  390     37,2326  23'571 0           QXCH    ZERONDX
0213  REF  77  LAST  390     37,2327  0 4607 1           TC      BANKCALL
0214  REF   3  LAST  278     37,2330   16701 0           CADR    IMUZERO
0215  REF   3  LAST  390     37,2331  0 2311 0           TC      ALIGNCOA


0216                         37,2332  0 0006 1  CHECKG   EXTEND                        PIP PULSE CATCHING ROUTINE
0217  REF   4  LAST  302     37,2333  23'417 1           QXCH    QPLACE
0218                         37,2334  0 2342 0           TC      +6
0219                         37,2335  0 0003 1  CHECKG1  RELINT
0220  REF   3  LAST  276     37,2336  3 0067 0           CA      NEWJOB
0221                         37,2337  0 0006 1           EXTEND
0222                         37,2340  6 2346 1           BZMF    +6
0223  REF   2  LAST  276     37,2341  0 5113 1           TC      CHANG1
0224                         37,2342  0 0004 0           INHINT
0225  REF   4  LAST  388     37,2343  51'415 0           INDEX   PIPINDEX
0226  REF   6  LAST  387     37,2344  4 0037 1           CS      PIPAX
0227  REF   7  LAST  390     37,2345  55'571 1           TS      ZERONDX
0228                         37,2346  0 0004 0           INHINT
```

```
0229   REF   5  LAST  390    37,2347  51'415 0              INDEX   PIPINDEX
0230   REF   7  LAST  390    37,2350  3 0037 0              CA      PIPAX
0231   REF   8  LAST  390    37,2351  6 1571 0              AD      ZERONDX
0232                         37,2352  0 0006 1              EXTEND
0233   REF   1               37,2353  1 2335 1              BZF     CHECKG1
0234   REF   6  LAST  391    37,2354  51'415 0              INDEX   PIPINDEX
0235   REF   8  LAST  391    37,2355  3 0037 0              CA      PIPAX
0236   REF   3  LAST  388    37,2356  51'537 1              INDEX   RESULTCT
0237   REF  11  LAST  388    37,2357  55'472 0              TS      DATAPL
0238   REF   1               37,2360  0 4102 0              TC      FINETIME
0239   REF   4  LAST  391    37,2361  51'537 1              INDEX   RESULTCT
0240   REF  12  LAST  391    37,2362  55'473 1              TS      DATAPL +1
0241   REF   5  LAST  391    37,2363  51'537 1              INDEX   RESULTCT
0242   REF  13  LAST  391    37,2364  23'474 1              LXCH    DATAPL +2
0243                         37,2365  0 0003 1              RELINT
0244   REF   5  LAST  390    37,2366  0 1417 1   ENDCHKG    TC      QPLACE


0245   REF  37  LAST  383    37,2367  54 001 1   ZEROING    TS      L
0246                         37,2370  1 2372 1              TCF     +2
0247   REF   9  LAST  391    37,2371  55'571 1   ZEROING1   TS      ZERONDX
0248   REF  48  LAST  390    37,2372  3 4746 0              CAF     ZERO
0249   REF  38  LAST  391    37,2373  50 001 0              INDEX   L
0250                         37,2374  54 000 0              TS      0
0251   REF  39  LAST  391    37,2375  24 001 0              INCR    L
0252   REF  10  LAST  391    37,2376  11'571 1              CCS     ZERONDX
0253   REF   1               37,2377  1 2371 1              TCF     ZEROING1
0254   REF  39  LAST  378    37,2400  0 0002 0              TC      Q
```

```
 0258                         37,2401   65345 0  ERTHRVSE DLOAD   PDDL
 0259   REF   1               37,2402   37057 1                   SCHZEROS       PD24 = (SIN          -COS     0)(OMEG/MS)
 0260   REF   5  LAST   386   37,2403   02403 1                   LATITUDE
 0261                         37,2404   57546 1           COS     DCOMP
 0262                         37,2405   73525 1           PDDL    SIN
 0263   REF   6  LAST   392   37,2406   02403 1                   LATITUDE
 0264                         37,2407   74266 0           VDEF    VXSC
 0265   REF   1               37,2410   36001 0                   OMEG/MS
 0266   REF   4  LAST   389   37,2411   02405 1           STORE   ERVECTOR
 0267                         37,2412   77634 0           RTB
 0268   REF   4  LAST   351   37,2413   21603 1                   LOADTIME
 0269   REF   2  LAST   132   37,2414   26433 1           STOVL   TMARK
 0270   REF   2  LAST   392   37,2415   37057 1                   SCHZEROS
 0271   REF   5  LAST   338   37,2416   02564 1           STORE   ERCOMP
 0272                         37,2417   77616 0           RVQ

 0276                         37,2420   47020 0  EARTHR   ITA     RT8
 0277   REF   4  LAST   335   37,2421   00051 0                   S2
 0278   REF   5  LAST   392   37,2422   21603 1                   LOADTIME
 0279   REF   2  LAST   132   37,2423   02431 0           STORE   TEMPTIME
 0280                         37,2424   51025 1           DSU     BPL
 0281   REF   3  LAST   392   37,2425   02433 1                   TMARK
 0282   REF   1               37,2426   76431 0                   ERTHR
 0283                         37,2427   77624 1           CALL
 0284   REF   2  LAST   388   37,2430   76275 0                   OVEREFIX
 0285                         37,2431   74261 1  ERTHR    SL      VXSC
 0286                         37,2432   20212 1                   9D
 0287   REF   5  LAST   392   37,2433   02405 1                   ERVECTOR
 0288                         37,2434   53321 1           MXV     VAD
 0289   REF   8  LAST   387   37,2435   02643 1                   XSM
 0290   REF   6  LAST   392   37,2436   02564 1                   ERCOMP
 0291   REF   7  LAST   392   37,2437   16564 1           STODL   ERCOMP
 0292   REF   3  LAST   392   37,2440   02431 0                   TEMPTIME
 0293   REF   4  LAST   392   37,2441   02433 1           STORE   TMARK
 0294                         37,2442   47170 1           AXT,1   RTB
 0295   REF   8  LAST   392   37,2443   02563 0           ECADR   ERCOMP
 0296   REF   1               37,2444   21715 1                   PULSEIMU
 0297                         37,2445   77650 1           GOTO
 0298   REF   5  LAST   392   37,2446   00051 0                   S2

 02991                        37,2447  0 0006 1  EARTHR*  EXTEND
 02992  REF   2  LAST   132   37,2450  23420 0            QXCH    QPLACES
 02993  REF  24  LAST   388   37,2451  0 6060 1           TC      INTPRET
 02994                        37,2452   77624 1           CALL
 02995  REF   1               37,2453   76420 0                   EARTHR
 02996                        37,2454   77776 1           EXIT
 02997  REF   2  LAST   386   37,2455  0 2315 1           TC      IMUSLLLG
 02998  REF   3  LAST   392   37,2456  0 1420 0           TC      QPLACES

 0300                         37,2457  0 0006 1  SHOW     EXTEND
```

```
0301  REF   6  LAST  391   37,2460  23'417 1            QXCH    QPLACE
0302  REF   6  LAST  388   37,2461  3 1416 0  SHOW1     CA      POSITON
0303  REF  12  LAST  389   37,2462  55'051 0            TS      DSPTEM2 +2
0304  REF   1              37,2463  3 2472 1            CA      VB06N98
0305  REF  78  LAST  390   37,2464  0 4607 1            TC      BANKCALL
0306  REF   5  LAST  385   37,2465   20471 1            CADR    GOFLASH
0307  REF   2  LAST  385   37,2466  0 2270 0            TC      ENDTEST1              V 34
0308  REF   7  LAST  393   37,2467  0 1417 1            TC      QPLACE                 V33
0309  REF   1              37,2470  1 2461 1            TCF     SHOW1


0311                       37,2471   07626 1  3990DEC   DEC     3990
0312                       37,2472   01542 0  VB06N98   VN      0698
0313                       37,2473   01451 0  VN0641    VN      0641
0315  REF   1                 4352            DEC17     =       ND1
0316                       37,2474   00072 1  DEC58     DEC     58
0317  REF  10  LAST  329   37,2475   02737 0  OGCPL     ECADR   OGC
0318  REF   4  LAST  312      4770            1SECX     =       1SEC
0319  REF   2  LAST  385   37,2476   01664 1  XN8ADR    GENADR  XN8
0320  REF   9  LAST  392   37,2477   01642 0  XSMADR    GENADR  XSM
0322                          4102                      BLOCK   2
0323  REF   1                                           COUNT*  $$/P07
0324                          4102  0 0004 0  FINETIME  INHINT                      RETURNS WITH INTERRUPT INHIBITED
0325                          4103  0 0006 1            EXTEND
0326  REF   1                 4104  00 004 0            READ    LOSCALAR
0327  REF  40  LAST  391      4105  54 001 1            TS      L
0328                          4106  0 0006 1            EXTEND
0329  REF   2  LAST  393      4107  06 004 0            RXOR    LOSCALAR
0330                          4110  0 0006 1            EXTEND
0331                          4111  1 4115 1            BZF     +4
0332                          4112  0 0006 1            EXTEND
0333  REF   3  LAST  393      4113  00 004 0            READ    LOSCALAR
0334  REF  41  LAST  393      4114  54 001 1            TS      L
0335  REF   5  LAST  389      4115  4 4724 0  +4        CS      POSMAX
0336  REF  42  LAST  393      4116  6 0001 0            AD      L
0337                          4117  0 0006 1            EXTEND
0338  REF   2  LAST  391      4120  1 4103 0            BZF     FINETIME +1
0339                          4121  0 0006 1            EXTEND
0340  REF   1                 4122  00 003 1            READ    HISCALAR
0341  REF  40  LAST  391      4123  0 0002 0            TC      Q
```

```
R0001   PROGRAM-IMU PERFORMANCE TESTS 4
R0002   DATE-NOV 15,1966
R0003   BY- GEORGE SCHMIDT IL7-146 EXT 1126
R0004   MOD NO-ZERO


R0005   FUNCTIONAL DESCRIPTION

R0006   THIS SECTION CONSISTS OF THE FILTER FOR THE GYRO DRIFT TESTS. NO COMPASS
R0007   IS DONE IN LEM. FOR A DESCRIPTION OF THE FILTER SEE E-1973. THIS
R0008   SECTION IS ENTERED FROM IMU 2. IT RETURNS THERE AT END OF TEST.

R0009   EARTHR,OGC ZERO,ERTHRVSE

R0010   NORMAL EXIT

R0011   LENGTHOT GOES TO ZERO-RETURN TO IMU PERF TESTS 2 CONTROL

R0012   ALARMS

R0013   1600 OVERFLOW IN DRIFT TEST
R0014   1601    BAD IMU MODING IN ANY ROUTINE THAT USES IMUSTALL
R0015   OUTPUT

R0016   FLASHING DISPLAY OF RESULTS-CONTROLLED IN IMU PERF TESTS 2

R0017   DEBRIS

R0018   ALL CENTRALS-ALL OF EBANK XSM
```

```
 0019                          33,2113                          BANK    33
 0020   RFF    1               37,2000                          SETLOC IMU4
 0021                          37,2500                          BANK
 0022   REF    3 LAST  385 TO  393:    318    320*              COUNT* $$/P07

 0023   REF   10  LAST  393    E5,1642                          EBANK= XSM


 0024                          37,2500  0 0004 0  ESTIMS        INHINT
 0025   REF    1               37,2501  31'572 0                CAE     1SECXT
 0026   REF    3  LAST  387    37,2502  0 5175 1                TC      TWIDDLE
 0027   REF   11  LAST  395    E5,1642                          EBANK= XSM
 0028   REF    1               37,2503   02536 0                ADRES   ALLOOP
 0029   REF   49  LAST  391    37,2504  3 4746 0                CAF     ZFRO                ZERO THE PIPAS
 0030   REF    9  LAST  391    37,2505  54 037 1                TS      PIPAX
 0031   REF    4  LAST  211    37,2506  54 C40 1                TS      PIPAY
 0032   REF    3  LAST  211    37,2507  54 041 0                TS      PIPAZ
 0033                          37,2510  0 0003 1                RFLINT
 0034   REF    1               37,2511  3 3075 0                CA      77DECML
 0035   REF   11  LAST  391    37,2512  55'571 1                TS      ZERONDX
 0036   REF    1               37,2513  3 3076 0                CA      ALXXXZ
 0037   REF    2  LAST  385    37,2514  0 2367 1                TC      ZEROING
 0038   RFF   25  LAST  392    37,2515  0 6C60 1                TC      INTPRFT
 0039                          37,2516   77735 0                SLOAD
 0040   REF    3  LAST  392    37,2517   37057 1                        SCHZEROS
 0041   REF   10  LAST  348    37,2520   25477 1                STOVL   GCOMPSW -1
 0042   REF    1               37,2521   37070 1                        INTVAL +2
 0043   REF    1               37,2522   26445 0                STOVL   ALX1S
 0044   REF    4  LAST  395    37,2523   37057 1                        SCHZEROS
 0045   REF    6  LAST  341    37,2524   00325 0                STORE   DELVX
 0046   REF   23  LAST  349    37,2525   01472 1                STORE   GCOMP
 00461                         37,2526   77735 0                SLOAD
 00462  REF    5  LAST  389    37,2527   02441 1                        TORQNDX
 00463                         37,2530   50076 0                DCOMP   BMN
 00464  REF    1               37,2531   76534 1                        VERTSKIP
 0047                          37,2532   77624 1                CALL
 00471  REF    1               37,2533   76401 0                        ERTHRVSE
 00472                         37,2534   77776 1  VERTSKIP      EXIT
 0048   REF    1               37,2535  0 3035 1                TC      SLEEPIF +1
 00481  REF   2  LAST  385    37,2536  3 1576 1  ALLOOP   CA      OVFLOWCK
 004815                       37,2537  0 0006 1           EXTEND
 00482                        37,2540  1 2542 1           BZF     +2
 00483  REF   9  LAST  387    37,2541  0 5263 0           TC      TASKOVER
 0049   REF   1               37,2542  11'530 1           CCS     ALTIM
 0050   REF  55  LAST  379    37,2543  3 0000 1           CA      A                   SHOULD NEVER HIT THIS LOCATION
 0051   REF   1               37,2544  55'531 0           TS      ALTIMS
 0052   REF  56  LAST  396    37,2545  4 0000 0           CS      A
 0053   REF   2  LAST  396    37,2546  55'530 1           TS      ALTIM
 00531  REF  22  LAST  387    37,2547  4 4744 0           CS      ONE
 00532  REF   1               37,2550  6 1562 1           AD      GEOCOMPS
 00533                        37,2551  0 0006 1           EXTEND
 00534                        37,2552  1 2556 1           BZF     +4
 0054   REF   7  LAST  388    37,2553  3 1412 1           CA      LENGTHOT
 0055                         37,2554  0 0006 1           EXTEND
 0056                         37,2555  6 2562 1           BZMF    +5
 0057   REF   2  LAST  395    37,2556  31'572 0           CAE     1SECXT
 0058   REF   4  LAST  395    37,2557  0 5175 1           TC      TWIDDLE
 0059   REF  12  LAST  395    E5,1642                     EBANK=  XSM
 0060   REF   2  LAST  395    37,2560   02536 0           ADRES   ALLOOP
 0061   REF  50  LAST  395    37,2561  3 4746 0           CAF     ZERO
 0062   REF  10  LAST  395    37,2562  56 037 0           XCH     PIPAX
 0063   REF   7  LAST  395    37,2563  54 324 0           TS      DELVX
 0064   REF  51  LAST  396    37,2564  3 4746 0           CAF     ZERO
 0065   REF   5  LAST  395    37,2565  56 040 0           XCH     PIPAY
 0066   REF   4  LAST  341    37,2566  54 326 1           TS      DELVY
 0067   REF  52  LAST  396    37,2567  3 4746 0           CAF     ZERO
 0068   REF   4  LAST  395    37,2570  56 041 1           XCH     PIPAZ
 0069   REF   3  LAST  342    37,2571  54 330 0           TS      DELVZ
 0070   REF   3  LAST  387    37,2572  3 4727 1  SPECSTS  CAF     PRIO20
 0071   REF  15  LAST  387    37,2573  0 5076 0           TC      FINDVAC
 0072   REF  13  LAST  396    E5,1642                     EBANK=  XSM
 0073   REF   1               37,2574   02577 0           2CADR   ALFLT                START THE JOB
 0073   REF   1               37,2575   76065 0
 0074   REF  10  LAST  396    37,2576  0 5263 0           TC      TASKOVER
 0075    REF   2  LAST  396    37,2577  11'562 0  ALFLT     CCS      GEOCOMPS
 0076                          37,2600  0 2602 1            TC       +2
 00761   REF   1               37,2601  0 2604 1            TC       NCRMLOP
 0077    REF  79  LAST  393    37,2602  0 4607 1            TC       BANKCALL
 0078    REF   1               37,2603   15333 0            CADR     1/P1PA
 0079    REF  26  LAST  395    37,2604  0 6060 1  NCRMLOP   TC       INTPRET
 0080                          37,2605   77745 1            DLOAD
 0081    REF   2  LAST  395    37,2606   37066 0                     INTVAL
 0082    REF   5  LAST  374    37,2607   24051 0            STOVL    S1
 00821   REF   8  LAST  396    37,2610   00325 0                     DELVX
 00822                         37,2611   76505 0            VXM      VSL1
 008231  REF  14  LAST  396    37,2612   02643 1                     XSM
 008232                        37,2613   57545 1            DLOAD    DCOMP
 008233  REF  69  LAST  385    37,2614   00160 0                     MPAC +3
 008234  REF   1               37,2615   16523 1            STODL    DP1PAY
 008235  REF  70  LAST  397    37,2616   00162 1                     MPAC +5
 008236  REF   1               37,2617   02527 0            STORE    DP1PAZ

 008237                        37,2620   76001 1            SETPD    AXT,1
 00824                         37,2621   00001 0                     0
 00825                         37,2622   00010 0                     8D
 00826                         37,2623   57535 0            SLOAD    DCOMP
 00827   REF   3  LAST  397    37,2624   02563 0                     GEOCOMPS
 00828                         37,2625   77640 0            BMN
 00829   REF   1               37,2626   76772 1                     PERFERAS
 0083                          37,2627   50135 0  ALCGKK    SLOAD    BMN
 0084    REF   2  LAST  396    37,2630   02532 1                     ALT1MS
 0085    REF   1               37,2631   76644 0                     ALFLT3
 0086                          37,2632   72174 0  ALKCG     AXT,2    LXA,1                    LOADS SLOPES AND TIME CONSTANTS AT RQST
 0087                          37,2633   00014 1                     12D
 0088    REF   2  LAST  395    37,2634   02444 1                     ALX1S
 0089                          37,2635   62143 0  ALKCG2    DLOAD*   INCR,1
 0090    RFF   1               37,2636   02243 0                     ALFDK +144D,1
 0091                          37,2637   77775 1            DEC      -2
 0092    REF   1               37,2640   12545 0            STORE    ALDK +10D,2
 0093                          37,2641   66104 1            TIX,2    SXA,1
 0094    REF   1               37,2642   76635 0                     ALKCG2
 0095    REF   3  LAST  397    37,2643   02444 1                     ALX1S

 01074                         37,2644   77770 1  ALFLT3    AXT,1
 01075                         37,2645   00010 0                     8D
 0108                          37,2646   41343 0  DELMLP    DLOAD*   DMP
 0109    RFF   2  LAST  397    37,2647   02533 0                     DPIPAY +8D,1
 0110    REF   1               37,2650   37100 1                     P1PASC
 0111                          37,2651   43661 1            SLR      BDSU*
 0112                          37,2652   21212 0                     9D
 0113    REF   1               37,2653   02501 1                     INTY +8D,1
 0114    REF   2  LAST  397    37,2654   06501 0            STORE    INTY +8D,1
 0115                          37,2655   40725 0            PDDL     DMP*
 0116    REF   1               37,2656   37102 0                     VELSC
```

```
0117   REF   1                 37,2657   02521 0                    VLAUN +8D,1
0118                           37,2660   77732 1             SL2R
0119                           37,2661   45425 0             DSU    STADR
0120   REF   1                 37,2662   71216 1             STORE  DELM +8D,1
0121   REF   2  LAST  398      37,2663   06563 1             STORE  DELM +10D,1
0122                           37,2664   77100 0             TIX,1  AXT,2
0123   REF   1                 37,2665   76646 1                    DELMLP
0124                           37,2666   00004 0                    4
0125                           37,2667   56743 1  ALILP      DLOAD* DMPR*
0126   REF   2  LAST  133      37,2670   75324 0                    ALK +4,2
0127   REF   2  LAST  397      37,2671   75240 0                    ALDK +4,2
0128   REF   3  LAST  398      37,2672   12453 0             STORE  ALK +4,2
0129                           37,2673   77104 1             TIX,2  AXT,2
0130   REF   1                 37,2674   76667 1                    ALILP
0131                           37,2675   00010 0                    8D
0132                           37,2676   66140 1  ALKLP      LXC,1  SXA,1
0133   REF   1                 37,2677   02445 0                    CMPX1
0134   REF   2  LAST  398      37,2700   02445 0                    CMPX1
0135                           37,2701   56743 1             DLOAD* DMPR*
0136   REF   4  LAST  398      37,2702   02450 1                    ALK +1,1
0137   REF   3  LAST  398      37,2703   75216 0                    DELM +8D,2
0138                           37,2704   77613 0             DAD*
0139   REF   3  LAST  397      37,2705   75276 0                    INTY +8D,2
0140   REF   4  LAST  398      37,2706   12501 0             STORE  INTY +8D,2
0141                           37,2707   42743 1             DLOAD* DAD*
0142   REF   5  LAST  398      37,2710   75314 0                    ALK +12D,2
0143   REF   3  LAST  398      37,2711   75230 1                    ALDK +12D,2
0144   REF   6  LAST  398      37,2712   12463 0             STORE  ALK  +12D,2
0145                           37,2713   42673 0             DMPR*  DAD*
0146   REF   4  LAST  398      37,2714   75216 0                    DELM +8D,2
0147   REF   5  LAST  398      37,2715   75266 1                    INTY +16D,2
0148   REF   6  LAST  398      37,2716   12511 1             STORE  INTY +16D,2
0149                           37,2717   40743 0             DLOAD* DMP*
0150   REF   1                 37,2720   37105 1                    ALSK +1,1
0151   REF   5  LAST  398      37,2721   75216 0                    DELM +8D,2
0152                           37,2722   42772 0             SL1R   DAD*
0153   REF   2  LAST  398      37,2723   75256 1                    VLAUN +8D,2
0154   REF   3  LAST  398      37,2724   12521 1             STORE  VLAUN +8D,2
0155                           37,2725   76104 0             TIX,2  AXT,1
0156   REF   1                 37,2726   76676 1                    ALKLP
0157                           37,2727   00010 0                    8D


0158                           37,2730   64743 0  LOOSE      DLOAD* PDDL*
0159   REF   1                 37,2731   02523 1                    ACCWD +8D,1
0160   REF   4  LAST  398      37,2732   02521 0                    VLAUN +8D,1
0161                           37,2733   55523 0             PDDL*  VDEF
0162   REF   1                 37,2734   02531 1                    POSNV +8D,1
0163                           37,2735   76521 0             MXV    VSL1
0164   REF   2  LAST  122      37,2736   02001 1                    TRANSM1
```

```
 0165                              37,2737   77745 1           DLOAD
 0166   REF  71  LAST  397         37,2740   00155 0                   MPAC
 0167   REF   2  LAST  398         37,2741   06531 0           STORE   POSNV +8D,1
 0168                              37,2742   77745 1           DLOAD
 0169   REF  72  LAST  399         37,2743   00160 0                   MPAC +3
 0170   REF   5  LAST  398         37,2744   06521 1           STORE   VLAUN +8D,1
 0171                              37,2745   77745 1           DLOAD
 0172   REF  73  LAST  399         37,2746   00162 1                   MPAC +5
 0173   REF   2  LAST  398         37,2747   06523 0           STORE   ACCWD +8D,1
 0174                              37,2750   77700 0           TIX,1
 0175   REF   1                    37,2751   76730 1                   LOOSE


 0176                              37,2752   76174 1           AXT,2   AXT,1              EVALUATE SINES AND COSINES
 0177                              37,2753   00006 1                   6
 0178                              37,2754   00002 0                   2
 0179                              37,2755   57343 1  BOOP     DLOAD*  DMPR
 0180   REF   1                    37,2756   02503 0                   ANGX +2,1
 0181   REF   1                    37,2757   37110 0                   GEORGEJ
 0182                              37,2760.  77722 0           SR2R
 0183                              37,2761   73406 1           PUSH    SIN
 0184                              37,2762   56072 1           SL3R    XAD,1
 0185   REF   2  LAST  266         37,2763   00046 0                   X1
 0186                              37,2764   10021 0           STORE   16D,2
 0187                              37,2765   77745 1           DLOAD
 0188                              37,2766   77746 1           COS
 0189                              37,2767   10027 0           STORE   22D,2              COSINES
 0190                              37,2770   77704 1           TIX,2
 0191   REF   1                    37,2771   76755 1                   BOOP


 0192                              37,2772   77776 1  PERFERAS EXIT
 0193   REF   2  LAST  259         37,2773  3 5007 0           CA      EBANK7
 0194   REF  13  LAST  348         37,2774  54 003 0           TS      EBANK
 0195   REF   1                    E7,1400                     EBANK=  ATIGINC
 0196   REF   2  LAST  399         37,2775  0 1400 1           TC      ATIGINC           GOTO ERASABLE TO CALCULATE ONLY TO RETN

R0197                   CAUTION

R0198    THE ERASABLE PROGRAM THAT DOES THE CALCULATIONS MUST BE LOADED
R0199    BEFORE ANY ATTEMPT IS MADE TO RUN THE IMU PERFORMANCE TEST

 01995  REF   5  LAST  386         E5,1400                     EBANK=  AZIMUTH
 0290   REF   8  LAST  396         37,2776  11'412 0           CCS     LENGTHOT
 0291   REF   2  LAST  395         37,2777  0 3034 0           TC      SLEEPIE
 0292   REF   6  LAST  395         37,3000  11'440 1           CCS     TORQNDX
 0293                              37,3001  1 3003 0           TCF     +2
 0294   REF   1                    37,3002  0 3005 1           TC      SETUPER1
 0295   REF  11  LAST  389         37,3003  3 0032 0           CA      CDUX
 0296   REF   3  LAST  389         37,3004  55'414 0           TS      LOSVEC +1          FOR TROUBLESHOOTING VD POSNS 2$4
```

```
0297  REF  27  LAST  397   37,3005  0 6060 1  SETUPER1 TC      INTPRET
0298                       37,3006   65345 0           DLOAD   PDDL              ANGLES FROM DRIFT TEST ONLY
0299  REF   1              37,3007   02473 0                   ANGZ
0300  REF   1              37,3010   02477 1                   ANGY
0301                       37,3011   55525 0           PDDL    VDEF
0302  REF   2  LAST  399   37,3012   02501 1                   ANGX
0303                       37,3013   74276 1           VCOMP   VXSC
0304  REF   2  LAST  399   37,3014   37110 0                   GEORGEJ
0305                       37,3015   74521 1           MXV     VSR1
0306  REF  15  LAST  397   37,3016   02643 1                   XSM
0307  REF  11  LAST  393   37,3017   02740 0           STORE   OGC
0308                       37,3020   77776 1           EXIT


0309  REF   1              37,3021  3 2475 0           CA      OGCPL
0310  REF  30  LAST  397   37,3022  0 4607 1           TC      BANKCALL
0311  REF   3  LAST  345   37,3023   17310 0           CADR    IMUPULSE
0312  REF   3  LAST  392   37,3024  0 2315 1           TC      IMUSLLLG
0313  REF   7  LAST  399   37,3025  11'440 1  GEOSTRT4 CCS     TORQNDX           ONLY POSITIVE IF IN VERTICAL DRIFT TEST
0314  REF   1              37,3026  0 2263 1           TC      VALMIS
0315  REF  28  LAST  400   37,3027  0 6060 1           TC      INTPRET
03151                      37,3030   77624 1           CALL
03152 REF   2  LAST  395   37,3031   76401 0                   ERTHRVSE
03153                      37,3032   77776 1           EXIT
0316  REF   1              37,3033  0 2117 1           TC      TORQUE


0317  REF   9  LAST  399   37,3034  55'412 0  SLEEPIE  TS      LENGTHOT          TEST NOT OVER-DECREMENT LENGTHOT
0318  REF   8  LAST  400   37,3035  11'440 1           CCS     TORQNDX           ARE WE DOING VERTDRIFT
0319  REF   4  LAST  388   37,3036  0 2447 1           TC      EARTHR*
0320  REF  37  LAST  388   37,3037  0 5146 1           TC      ENDOFJOB


0321  REF   2  LAST  259   37,3040  3 5005 1  SCMEERRR CA      EBANK5
03211 REF  14  LAST  399   37,3041  54 003 0           TS      EBANK
03212 REF  23  LAST  396   37,3042  3 4744 1           CA      ONE
03213 REF   3  LAST  396   37,3043  55'576 0           TS      OVFLOWCK          STOP ALLOOP FROM CALLING ITSELF
03214 REF  17  LAST  375   37,3044  0 5571 1           TC      ALARM
0322                       37,3045   01600 0           OCT     1600
0323  REF   3  LAST  393   37,3046  0 2270 0           TC      ENDTEST1
0324  REF   1              37,3047  3 3054 0  SCMERR2  CAF     OCT1601
0325  REF   2  LAST  190   37,3050  0 5740 1           TC      VARALARM
0330  REF  28  LAST  389   37,3051  0 5520 0           TC      DOWNFLAG
0331  REF   4  LAST  389   37,3052   00007 0           ADRES   IMUSE
0332  REF  38  LAST  400   37,3053  0 5146 1           TC      ENDOFJOB


0333                       37,3054   01601 1  OCT1601  OCT     01601
0334                       37,3055   06200 0  DEC585   OCT     06200             3200 B+14  ORDER IS IMPORTANT
0335                       37,3056   00000 1  SCHZEROS 2DEC    .00000000
0335                       37,3057   00000 1
```

```
0336                          37,3060    00000 1             2DEC     .00000000
0336                          37,3061    00000 1
0337                          37,3062    00000 1             OCT      00000
0338                          37,3063    00000 1  ONEDPP     OCT      00000             ORDER IS IMPORTANT
0339                          37,3064    00001 0             OCT      00001


0340                          37,3065    00004 0  INTVAL     OCT      4
0341                          37,3066    00002 0             OCT      2
0342                          37,3067    00220 1             DEC      144
0343                          37,3070    77776 1             DEC      -1
0344                          37,3071    35730 0  SOUPLY     2DEC     .93505870         INITIAL GAINS FOR PIP OUTPUTS
0344                          37,3072    00035 1
0345                          37,3073    10317 0             2DEC     .26266423         INITIAL GAINS/4 FOR ERECTION ANGLES
0345                          37,3074    17550 1


0346                          37,3075    00115 1  77DECML    DEC      77
0347  REF   4  LAST   397     37,3076    01443 0  ALXXXZ     GENADR   ALX1S -1
0348                          37,3077    04133 1  PIPASC     2DEC     .13055869
0348                          37,3100    02265 1
0349                          37,3101    57223 0  VELSC      2DEC     -.52223476        512/980.402
0349                          37,3102    66451 1
0350                          37,3103    05427 0  ALSK       2DEC     .17329931        SSWAY VEL GAIN X 980.402/4096
0350                          37,3104    12577 1
0351                          37,3105    77567 0             2DEC     -.00835370       SSWAY ACCEL GAIN X 980.402/4096
0351                          37,3106    44202 1


0352                          37,3107    24276 1  GEORGEJ    2DEC     .63661977
0352                          37,3110    14066 1
0353                          37,3111    23073 1  GEORGEK    2DEC     .59737013
0353                          37,3112    11773 1
```

```
R0001   PROGRAM NAME - KEYBOARD AND DISPLAY PROGRAM
R0002   MOD NO - 4       DATE - 27 APRIL 1967       ASSEMBLY - PINDANCE REV 18
R0003   MOD BY - FILENE
R0004   LOG SECTION - PINBALL GAME  BUTTONS AND LIGHTS

R0009   FUNCTIONAL DESCRIPTION-

R0010      THE KEYBOARD AND DISPLAY SYSTEM PROGRAM OPERATES UNDER EXECUTIVE
R0011   CONTROL AND PROCESSES INFORMATION EXCHANGED BETWEEN THE AGC AND THE
R0012   COMPUTER OPERATOR.  THE INPUTS TO THE PROGRAM ARE FROM THE KEYBOARD,
R0013   FROM INTERNAL PROGRAMS, AND FROM THE UPLINK.
R0014      THE LANGUAGE OF COMMUNICATION WITH THE PROGRAM IS A PAIR OF WORDS
R0015   KNOWN AS VERB AND NOUN.  EACH OF THESE IS REPRESENTED BY A 2 CHARACTER
R0016   DECIMAL NUMBER.  THE VERB CODE INDICATES WHAT ACTION IS TO BE TAKEN, THE
R0017   NOUN CODE INDICATES TO WHAT THIS ACTION IS APPLIED.  NOUNS USUALLY
R0018   REFER TO A GROUP OF ERASABLE REGISTERS.

R0020   VERBS ARE GROUPED INTO DISPLAYS, LOADS, MONITORS (DISPLAYS THAT ARE
R0021   UPDATED ONCE PER SECOND), SPECIAL FUNCTIONS, AND EXTENDED VERBS(THESE
R0022   ARE OUTSIDE OF THE DOMAIN OF PINBALL AND CAN BE FOUND UNDER LOG SECTION
R0023   :EXTENDED VERBS:).
R0024   A LIST OF VERBS AND NOUNS IS GIVEN IN LOG SECTION :ASSEMBLY AND
R0025   OPERATION INFORMATION:.


R0026   CALLING SEQUENCES-

R0027   KEYBOARD:
R0028      EACH DEPRESSION OF A KEYBOARD BUTTON ACTIVATES INTERRUPT KEYRUPT1
R0029   AND PLACES THE 5 BIT KEY CODE INTO CHANNEL 15.  KEYRUPT1 PLACES THE KEY
R0030   CODE INTO MPAC, ENTERS AN EXECUTIVE REQUEST FOR THE KEYBOARD AND DISPLAY
R0031   PROGRAM (AT :CHARIN:), AND EXECUTES A RESUME.

R0032   UPLINK:
R0033      EACH WORD RECEIVED BY THE UPLINK ACTIVATES INTERRUPT UPRUPT WHICH
R0034   PLACES THE 5 BIT KEY CODE INTO MPAC, ENTERS AN EXECUTIVE REQUEST FOR THE
R0035   KEYBOARD AND DISPLAY PROGRAM (AT:CHARIN:) AND EXECUTES A RESUME.

R0036   INTERNAL PROGRAMS:
R0037      INTERNAL PROGRAMS CALL PINBALL AT :NVSUB: WITH THE DESIRED VERB/NOUN
R0038   CODE IN A (LOW 7 BITS FOR NOUN, NEXT 7 BITS FOR VERB).  DETAILS
R0039   DESCRIBED ON REMARKS CARDS JUST BEFORE :NVSUB: AND :NVSBWAIT: (SEE
R0040   SYMBOL TABLE FOR PAGE NUMBERS).


R0045   NORMAL EXIT MODES-

R0046      IF PINBALL WAS CALLED BY EXTERNAL ACTION, THERE ARE FOUR EXITS:
R004605          1) ALL BUT (2), (3), AND (4) EXIT DIRECTLY TO ENDOFJOB.
R00461           2) EXTENDED VERBS GO TO THE EXTENDED VERB FAN AS PART OF THE
```

```
R004615             PINBALL EXECUTIVE JOB WITH PRIORITY 30000.  IT IS THE
R00462              RESPONSIBILITY OF THE EXTENDED VERB CALLED TO EVENTUALLY
R00463              CHANGE PRIORITY (IF NECESSARY) AND DO AN ENDOFJOB.
R004635             ALSO PINBALL IS A NOVAC JOB. EBANK SET FOR COMMON.
R00464           3) VERB 37. CHANGE OF PROGRAM (MAJOR MODE) CALLS :V37: IN THE
R00465              SERVICE ROUTINES AS PART OF THE PINBALL EXEC JOB WITH PRIO
R00466              30000.  THE NEW PROGRAM CODE (MAJOR MODE) IS LEFT IN A.
R00467           4) KEY RELEASE BUTTON CALLS :PINBRNCH: IN THE DISPLAY INTERFACE
R00468              ROUTINES AS PART OF THE PINBALL EXEC JOB WITH PRIO 30000 IF
R00469              THE KEY RELEASE LIGHT IS OFF AND :CADRSTOR: IS NOT +0.

R0047        IF PINBALL WAS CALLED BY INTERNAL PROGRAMS, EXIT FROM PINBALL IS BACK
R0048     TO CALLING ROUTINE.  DETAILS DESCRIBED IN REMARKS CARDS JUST BEFORE
R0049     :NVSUB: AND :NVSBWAIT: (SEE SYMBOL TABLE FOR PAGE NUMBERS).


R0050     ALARM OR ABORT EXIT MODES-

R0051     EXTERNAL INITIATION:
R0052        IF SOME IMPROPER SEQUENCE OF KEY CODES IS DETECTED, THE OPERATOR
R0053     ERROR LIGHT IS TURNED ON AND EXIT IS TO :ENDOFJOB:.

R0054     INTERNAL PROGRAM INITIATION:
R0055        IF AN ILLEGAL V/N COMBINATION IS ATTEMPTED, AN ABORT IS CAUSED
R0056     (WITH OCTAL 01501).
R00561       IF A SECOND ATTEMPT IS MADE TO GO TO SLEEP IN PINBALL, AN ABORT IS
R00562    CAUSED (WITH OCTAL 01206). THERE ARE TWO WAYS TO GO TO SLEEP IN PINBALL:
R00563             1) ENDIDLE OR DATAWAIT.
R00564             2) NVSBWAIT, PRENVBSY, OR NVSUBUSY.

R0057     CONDITIONS LEADING TO THE ABOVE ARE DESCRIBED IN FORTHCOMING MIT/IL
R0058     E-REPORT DESCRIBING KEYBOARD AND DISPLAY OPERATION FOR 278.


R0059     OUTPUT-

R0060        INFORMATION TO BE SENT TO THE DISPLAY PANEL IS LEFT IN THE :DSPTAB:
R0061     BUFFERS REGISTERS (UNDER EXEC CONTROL).  :DSPOUT: (A PART OF T4RUPT)
R0062     HANDLES THE PLACING OF THE :DSPTAB: INFORMATION INTO OUTPUT CHANNEL 10
R0063     IN INTERRUPT.


R0064     ERASABLE INITIALIZATION-

R0065        FRESH START AND RESTART INITIALIZE THE NECESSARY E REGISTERS FOR
R0066     PINBALL IN :STARTSUB:.   REGISTERS ARE:  DSPTAB BUFFER, CADRSTOR,
R0067     REQRET, CLPASS, DSPLOCK, MONSAVE, MONSAVE1, VERBREG, NOUNREG, DSPLIST,
R0068     DSPCOUNT, NOUT.

R0069     A COMPLETE LIST OF ALL THE ERASABLES (BOTH RESERVED AND TEMPORARIES) FOR
```

```
R0070    PINBALL IS GIVEN BELOW.


R0071    THE FOLLOWING ARE OF GENERAL INTEREST-

R0072       REMARKS CARDS PRECEDE THE REFERENCED SYMBOL DEFINITION.  SEE SYMBOL
R0073    TABLE TO FIND APPROPRIATE PAGE NUMBERS.

R0074       NVSUB   CALLING POINT FOR INTERNAL USE OF PINBALL.
R0075                 OF RELATED INTEREST   NVSBWAIT
R0076                                       NVSUBUSY
R0077                                       PRENVBSY

R0083       ENDIDLE   ROUTINE FOR INTERNAL PROGRAMS WISHING TO GO TO SLEEP WHILE
R0084                 AWAITING OPERATORS RESPONSE.

R00851      DSPMM   ROUTINE BY WHICH AN INTERNAL PROGRAM MAY DISPLAY A DECIMAL
R00852              PROGRAM CODE (MAJOR MODE) IN THE PROGRAM (MAJOR MODE) LIGHTS.
R008525             (DSPMM DOES NOT DISPLAY DIRECTLY BUT ENTERS EXEC REQUEST
R008527             FOR DSPMMJB WITH PRIO 30000 AND RETURNS TO CALLER.)

R00853      BLANKSUB   ROUTINE BY WHICH AN INTERNAL PROGRAM MAY BLANK ANY
R00854                 COMBINATION OF THE DISPLAY REGISTERS R1, R2, R3.

R00855      JAMTERM   ROUTINES BY WHICH AN INTERNAL PROGRAM MAY PERFORM THE
R00856      JAMPROC   TERMINATE (V 34) OR PROCEED (V 33) FUNCTION.

R0086       MONITOR   VERBS FOR PERIODIC ( 1 PER SEC) DISPLAY.

R00861      PLEASE PERFORM, PLEASE MARK SITUATIONS
R00862                   REMARKS DESCRIBING HOW AN INTERNAL ROUTINE SHOULD HANDLE
R00863                   THESE SITUATIONS CAN BE FOUND JUST BEFORE :NVSUB: (SEE
R00864                   SYMBOL TABLE FOR PAGE NUMBER).

R0087       THE NOUN TABLE FORMAT IS DESCRIBED ON A PAGE OF REMARKS CARDS JUST
R0088       BEFORE :DSPABC: (SEE SYMBOL TABLE FOR PAGE NUMBER).

R0089       THE NOUN TABLES THEMSELVES ARE FOUND IN LOG SECTION :PINBALL NOUN
R00891      TABLES:.


R0090    FOR FURTHER DETAILS ABOUT OPERATION OF THE KEYBOARD AND DISPLAY SYSTEM
R0091    PROGRAM, SEE THE MISSION PLAN AND/OR MIT/IL E-2129
R0092    DESCRIBING KEYBOARD AND DISPLAY OPERATION FOR 278.


R0150    THE FOLLOWING QUOTATION IS PROVIDED THROUGH THE COURTESY OF THE AUTHORS.

R0151          ::IT WILL BE PROVED TO THY FACE THAT THOU HAST MEN ABOUT THEE THAT
R0152    USUALLY TALK OF A NOUN AND A VERB, AND SUCH ABOMINABLE WORDS AS NO
```

```
R0153   CHRISTIAN EAR CAN ENDURE TO HEAR.::

R0154                       HENRY 6, ACT 2, SCENE 4


R0155   THE FOLLOWING ASSIGNMENTS FOR PINBALL ARE MADE ELSEWHERE


R0156   RESERVED FOR PINBALL EXECUTIVE ACTION

R0157   DSPCOUNT ERASE                          DISPLAY POSITION INDICATOR
R0158   DECBRNCH ERASE                          +DEC, - DEC, OCT INDICATOR
R0159   VERBREG  ERASE                          VERB CODE
R0160   NOUNREG  ERASE                          NOUN CODE
R0161   XREG     ERASE                          R1 INPUT BUFFER
R0162   YREG     ERASE                          R2 INPUT BUFFER
R0163   ZREG     ERASE                          R3 INPUT BUFFER
R0164   XREGLP   ERASE                          LO PART OF XREG (FOR DEC CONV ONLY)
R0165   YREGLP   ERASE                          LO PART OF YREG (FOR DEC CONV ONLY)
R0166   HITEMOUT =        YREGLP                TEMP FOR DISPLAY OF HRS, MIN, SEC
R0167                                                     MUST = LOTEMOUT-1.
R0168   ZREGLP   ERASE                          LO PART OF ZREG (FOR DEC CONV ONLY)
R0169   LOTEMOUT =        ZREGLP                TEMP FOR DISPLAY OF HRS, MIN, SEC
R0170                                                     MUST = HITEMOUT+1.
R0171   MODREG   ERASE                          MODE CODE
R0172   DSPLOCK  ERASE                          KEYBOARD/SUBROUTINE CALL INTERLOCK
R0173   REQRET   ERASE                          RETURN REGISTER FOR LOAD
R0174   LOADSTAT ERASE                          STATUS INDICATOR FOR LOADTST
R0175   CLPASS   ERASE                          PASS INDICATOR CLEAR
R0176   NOUT     ERASE                          ACTIVITY COUNTER FOR DSPTAB
R0177   NOUNCADR ERASE                          MACHINE CADR FOR NOUN
R0178   MONSAVE  ERASE                          N/V CODE FOR MONITOR. (= MONSAVE1-1)
R0179   MONSAVE1 ERASE                          NOUNCADR FOR MONITOR(MATBS) =MONSAVE +1
R01795  MONSAVE2 ERASE                          NVMONOPT OPTIONS
R0180   DSPTAB   ERASE            +13D          0-10,DISPLAY PANEL BUFFER.11-13,C RELAYS
R0181   CADRSTOR ERASE                          ENDIDLE STORAGE
R0182   NVQTEM   ERASE                          NVSUB STORAGE FOR CALLING ADDRESS
R0183                                           MUST = NVBNKTEM-1
R0184   NVBNKTEM ERASE                          NVSUB STORAGE FOR CALLING BANK
R0185                                           MUST = NVQTEM+1
R0186   VERBSAVE ERASE                          NEEDED FOR RECYCLE
R0187   DSPLIST  ERASE                          WAITING REG FOR DSP SYST INTERNAL USE
R0188   EXTVBACT REASE                          EXTENDED VERB ACTIVITY INTERLOCK
R0189   DSPTEM1  ERASE            +2            BUFFER STORAGE AREA 1 (MOSTLY FOR TIME)
R0190   DSPTEM2  ERASE            +2            BUFFER STORAGE AREA 2 (MOSTLY FOR DEG)
R0191   END OF ERASABLES RESERVED FOR PINBALL EXECUTIVE ACTION


R0192   TEMPORARIES FOR PINBALL EXECUTIVE ACTION
```

```
R0193    DSPEXIT   =       INTB15+            RETURN FOR DSPIN
R0194    EXITEM    =       INTB15+            RETURN FOR SCALE FACTOR ROUTINE SELECT
R0195    BLANKRET  =       INTB15+            RETURN FOR 2BLANK

R0196    WRDRET    =       INTBIT15           RETURN FOR 5BLANK
R0197    WDRET     =       INTBIT15           RETURN FOR DSPWD
R0198    DECRET    =       INTBIT15           RETURN FOR PUTCOM(DEC LOAD)
R0199    21/22REG  =       INTBIT15           TEMP FOR CHARIN

R0200    UPDATRET  =       POLISH             RETURN FOR UPDATNN, UPDATVB
R0201    CHAR      =       POLISH             TEMP FOR CHARIN
R0202    ERCNT     =       POLISH             COUNTER FOR ERROR LIGHT RESET
R0203    DECOUNT   =       POLISH             COUNTER FOR SCALING AND DISPLAY (DEC)

R0204    SGNON     =       VBUF               TEMP FOR +,- ON
R0205    NOUNTEM   =       VBUF               COUNTER FOR MIXNOUN FETCH
R0206    DISTEM    =       VBUF               COUNTER FOR OCTAL DISPLAY VERBS
R0207    DECTEM    =       VBUF               COUNTER FOR FETCH (DEC DISPLAY VERBS)

R0208    SGNOFF    =       VBUF     +1        TEMP FOR +,- ON
R0209    NVTEMP    =       VBUF     +1        TEMP FOR NVSUB
R0210    SFTEMP1   =       VBUF     +1        STORAGE FOR SF CONST HI PART(=SFTEMP2-1)
R0211    HITEMIN   =       VBUF     +1        TEMP FOR LOAD OF HRS, MIN, SEC
R0212                                                    MUST = LOTEMIN-1.
R0213    CODE      =       VBUF     +2        FOR DSPIN
R0214    SFTEMP2   =       VBUF     +2        STORAGE FOR SF CONST LO PART(=SFTEMP1+1)
R0215    LOTEMIN   =       VBUF     +2        TEMP FOR LOAD OF HRS, MIN, SEC
R0216                                                    MUST = HITEMIN+1.
R0217    MIXTEMP   =       VBUF     +3        FOR MIXNOUN DATA
R0218    SIGNRET   =       VBUF     +3        RETURN FOR +,- ON

R0219    ALSO MIXTEMP+1 = VBUF+4, MIXTEMP+2 = VBUF+5.

R0220    ENTRET    =       DOTINC             EXIT FROM ENTER

R0221    WDCNT     =       DOTRET             CHAR COUNTER FOR DSPWD
R0222    INREL     =       DOTRET             INPUT BUFFER SELECTOR ( X,Y,Z, REG )

R0223    DSPMMTEM  =       MATINC             DSPCOUNT SAVE FOR DSPMM
R0224    MIXBR     =       MATINC             INDICATOR FOR MIXED OR NORMAL NOUN

R0225    TEM1      ERASE                      EXEC TEMP
R0226    DSREL     =       TEM1               REL ADDRESS FOR DSPIN

R0227    TEM2      ERASE                      EXEC TEMP
R0228    DSMAG     =       TEM2               MAGNITUDE STORE FOR DSPIN
R0229    IDADDTEM  =       TEM2               MIXNOUN INDIRECT ADDRESS STORAGE

R0230    TEM3      ERASE                      EXEC TEMP
R0231    COUNT     =       TEM3               FOR DSPIN
```

```
R0232   TEM4      ERASE                      EXEC TEMP
R0233   LSTPTR    =        TEM4   .          LIST POINTER FOR GRABUSY
R0234   RELRET    =        TEM4              RETURN FOR RELDSP
R0235   FREERET   =        TEM4              RETURN FOR FREEDSP
R0236   DSPWDRET  =        TEM4              RETURN FOR DSPSIGN
R0237   SEPSCRET  =        TEM4              RETURN FOR SEPSEC
R0238   SEPMNRET  =        TEM4              RETURN FOR SEPMIN

R0239   TEM5      ERASE                      EXEC TEMP
R0240   NOUNADD   =        TEM5              TEMP STORAGE FOR NOUN ADDRESS

R0241   NNADTEM   ERASE                      TEMP FOR NOUN ADDRESS TABLE ENTRY
R0242   NNTYPTEM  ERASE                      TEMP FOR NOUN TYPE TABLE ENTRY
R0243   IDAD1TEM  ERASE                      TEMP FOR INDIR ADPESS TABLE ENTRY(MIXNN)
R0244                                        MUST = IDAD2TEM-1, = IDAD3TEM-2.
R0245   IDAD2TEM  ERASE                      TEMP FOR INDIR ADRESS TABLE ENTRY(MIXNN)
R0246                                        MUST = IDAD1TEM+1, = IDAD3TEM-1.
R0247   IDAD3TEM  ERASE                      TEMP FOR INDIR ADRESS TABLE ENTRY(MIXNN)
R0248                                        MUST = IDAD1TEM+2, = IDAD2TEM+1.
R0249   RUTMXTEM  ERASE                      TEMP FOR SF ROUT TABLE ENTRY(MIXNN ONLY)
R0250   END OF TEMPORARIES FOR PINBALL EXECUTIVE ACTION


R02501  ADDITICNAL TEMPORARIES FOR PINBALL EXECUTIVE ACTION

R02502  MPAC, THRU MPAC +6
R02503  BUF, +1, +2
R02504  BUF2, +1, +2
R02506  MPTEMP
R02507  ADDRWD
R02505    END OF ADDITIONAL TEMPS FOR PINBALL EXEC ACTION


R0251   RESERVED FOR PINBALL INTERRUPT ACTION

R0252   DSPCNT    ERASE                      COUNTER FOR DSPOUT
R0253   UPLOCK    ERASE                      BIT1 = UPLINK INTERLOCK (ACTIVATED BY
A0254                                                                    RECEPTION OF A BAD MESSAGE IN UPLINK)
R0255   END OF ERASABLES PESERVED FOR PINBALL INTERRUPT ACTION


R0256   TEMPORARIES FOR PINBALL INTERRUPT ACTION

R0257   KEYTEMP1 =        WAITEXIT           TEMP FOR KEYRUPT, UPRUPT
R0258   DSRUPTEM =        WAITEXIT           TEMP FOR DSPOUT
R0259   KEYTEMP2 =        RUPTAGN            TEMP FOR KEYRUPT, UPRUPT
R0260   END OF TEMPORARIES FOR PINBALL INTERRUPT ACTION
```

```
R0261   THE INPUT CODES ASSUMED FOR THE KEYBOARD ARE,
R0262   0           10000
R0263   1           00001
R0264   9           01001
R0265   VERB        10001
R0266   ERROR RES10010
R0267   KEY RLSE 11001
R0268   +           11010
R0269   -           11011
R0270   ENTER       11100
R0271   CLEAR       11110
R0272   NOUN        11111


R0273   OUTPUT FORMAT FOR DISPLAY PANEL. SET OUT0 TO  AAAABCCCCCDDDDD.
R0274   A-S SELECT A RELAYWORD. THIS DETERMINES WHICH PAIR OF CHARACTERS ARE
R0275   ENERGIZED.
R0276   B FOR SPECIAL RELAYS SUCH AS SIGNS ETC.
R0277   C-S  5 BIT RELAY CODE FOR LEFT CHAR OF PAIR SELECTED BY RELAYWORD
R0278   D-S  5 BIT RELAY CODE FOR RIGHTCHAR OF PAIR SELECTED BY RELAYWORD.

R0279   THE PANEL APPEARS AS FOLLOWS,
R0280   MD1     MD2                                    (MAJOR MODE)
R0281   VD1     VD2 (VERB)     ND1      ND2      (NOUN)
R0282   R1D1    R1D2    R1D3    R1D4     R1D5     (R1)
R0283   R2D1    R2D2    R2D3    R2D4     R2D5     (R2)
R0284   R3D1    R3D2    R3D3    R3D4     R3D5     (R3)

R0285   EACH OF THESE IS GIVEN A DSPCOUNT NUMBER FOR USE WITHIN COMPUTATION ONLY
R0286   MD1    25      R2D1   11            ALL ARE OCTAL
R0287   MD2    24      R2D2   10
R0288   VD1    23      R2D3    7
R0289   VD2    22      R2D4    6
R0290   ND1    21      R2D5    5
R0291   ND2    20      R3D1    4
R0292   R1D1   16      R3D2    3
R0293   R1D2   15      R3D3    2
R0294   R1D3   14      R3D4    1
R0295   R1D4   13      R3D5    0
R0296   R1D5   12


R0297   THERE IS AN 11 REGISTER TABLE (DSPTAB) FOR THE DISPLAY PANEL.

R0298   DSPTAB RELAYWD         BIT11      BITS 10-6      BITS 5-1
R0299   RELADD
R0300   10       1011                     MD1  (25)      MD2  (24)
R0301   9        1010                     VD1  (23)      VD2  (22)
R0302   8        1001                     ND1  (21)      ND2  (20)
R0303   7        1000                                    R1D1 (16)
```

```
R0304   6       0111          +R1        R1D2 (15)      R1D3 (14)
R0305   5       0110          -R1        R1D4 (13)      R1D5 (12)
R0306   4       0101          +R2        R2D1 (11)      R2D2 (10)
R0307   3       0100          -R2        R2D3 (7)       R2D4 (6)
R0308   2       0011                     R2D5 (5)       R3D1 (4)
R0309   1       0010          +R3        R3D2 (3)       R3D3 (2)
R0310   0       0001          -R3        R3D4 (1)       R3D5 (0)
R0311           0000   NO RELAYWORD

R0312   THE 5 BIT OUTPUT RELAY CODES ARE:
R0313   BLANK       00000
R0314   0           10101
R0315   1           00011
R0316   2           11001
R0317   3           11011
R0318   4           01111
R0319   5           11110
R0320   6           11100
R0321   7           10011
R0322   8           11101
R0323   9           11111

R03231  OUTPUT BITS USED BY PINBALL:

R03232              KEY RELEASE LIGHT    - BIT 5 OF CHANNEL 11
R03233              VERB/NOUN FLASH      - BIT 6 OF CHANNEL 11
R03234              OPERATOR ERROR LIGHT - BIT 7 OF CHANNEL 11
```

```
P0324   START OF EXECUTIVE SECTION OF PINBALL


 0325                          40,2057                         BANK    40
 0325C1 REF    2  LAST  311    40,2000                         SETLOC  PINBALL1
 0325C2                        40,2057                         BANK

 03258  REF    1                                               COUNT*  $$/PIN
 0330   REF   24  LAST  400    40,2057   3 4744 1   CHARIN     CAF     ONE                 BLOCK DISPLAY SYST
 0331   REF    2  LAST  233    40,2060  57'011 0               XCH     DSPLOCK             MAKE DSP SYST BUSY, BUT SAVE OLD
 0332   REF    1               40,2061  54 115 0               TS      21/22REG            C(DSPLOCK) FOR ERROR LIGHT RESET.
 03321  REF    2  LAST  233    40,2062  11'041 1               CCS     CADRSTOR            ALL KEYS EXCEPT ER TURN ON KR LITE IF
 03322                         40,2063   0 2065 0              TC      +2                  CADRSTOR IS FULL.  THIS REMINDS OPERATOR
 03323  REF    1               40,2064   0 2072 0              TC      CHARIN2             TO RE-ESTABLISH A FLASHING DISPLAY
 03324  REF    1               40,2065   4 2136 0              CS      FLRCODE1            WHICH HE HAS OBSCURED WITH DISPLAYS OF
 03325  REF   74  LAST  399    40,2066   6 0154 1              AD      MPAC                HIS OWN (SEE REMARKS PRECEDING ROUTINE
 03326                         40,2067   0 0006 1              EXTEND                      VBRELDSP).
 03327  REF    2  LAST  410    40,2070   1 2072 1              BZF     CHARIN2
 03328  REF    1               40,2071   0 4365 0              TC      RELDSPON
 0333   REF   75  LAST  410    40,2072  56 154 1    CHARIN2    XCH     MPAC
 0334   REF    1               40,2073  54 117 1               TS      CHAR
 0335   REF   97  LAST  396    40,2074  50 000 1               INDEX   A
 0336                          40,2075   0 2076 1              TC      +1                  INPUT CODE      FUNCTION
 0337   REF    1               40,2076   0 3463 0              TC      CHARALRM            0
 0338   REF    1               40,2077   0 2155 1              TC      NUM                 1
 0339   REF    2  LAST  410    40,2100   0 2155 1              TC      NUM                 2
 0340   REF    3  LAST  410    40,2101   0 2155 1              TC      NUM                 3
 0341   REF    4  LAST  410    40,2102   0 2155 1              TC      NUM                 4
 0342   REF    5  LAST  410    40,2103   0 2155 1              TC      NUM                 5
 0343   REF    6  LAST  410    40,2104   0 2155 1              TC      NUM                 6
 0344   REF    7  LAST  410    40,2105   0 2155 1              TC      NUM                 7
 0345   REF    1               40,2106   0 2141 1              TC      89TEST              10                  8
 0346   REF    2  LAST  410    40,2107   0 2141 1              TC      89TEST              11                  9
 0347   REF    2  LAST  410    40,2110   0 3463 0              TC      CHARALRM            12
 0348   REF    3  LAST  410    40,2111   0 3463 0              TC      CHARALRM            13
 0349   REF    4  LAST  410    40,2112   0 3463 0              TC      CHARALRM            14
 0350   REF    5  LAST  410    40,2113   0 3463 0              TC      CHARALRM            15
 0351   REF    6  LAST  410    40,2114   0 3463 0              TC      CHARALRM            16
 0352   REF    7  LAST  410    40,2115   0 3463 0              TC      CHARALRM            17
 0353   REF    8  LAST  410    40,2116   0 2153 1              TC      NUM      -2         20                  0
 0354   REF    1               40,2117   0 2343 1              TC      VERB                21                  VERB
 0355   REF    1               40,2120   0 3646 0              TC      ERROR               22                  ERROR LIGHT RESET
 0356   REF    8  LAST  410    40,2121   0 3463 0              TC      CHARALRM            23
 0357   REF    9  LAST  410    40,2122   0 3463 0              TC      CHARALRM            24
 0358   REF   10  LAST  410    40,2123   0 3463 0              TC      CHARALRM            25
 0359   REF   11  LAST  410    40,2124   0 3463 0              TC      CHARALRM            26
 0360   REF   12  LAST  410    40,2125   0 3463 0              TC      CHARALRM            27
 0361   REF   13  LAST  410    40,2126   0 3463 0              TC      CHARALRM            30
 0362   REF    1               40,2127   0 3517 1              TC      VBRELDSP            31                  KEY RELEASE
 0363   REF    1               40,2130   0 2376 1              TC      POSGN               32                  +
 0364    REF   1                40,2131   0 2363 0             TC       NEGSGN            33                    -
 0365    REF   1                40,2132   0 2137 0             TC       ENTERJMP          34                    ENTER
 0366    REF  14   LAST   410   40,2133   0 3463 0             TC       CHARALRM          35
 0367    REF   1                40,2134   0 2456 1             TC       CLEAR             36                    CLEAR
 0368    REF   1                40,2135   0 2357 1             TC       NOUN              37                    NOUN


 03685                          40,2136    00022 1  ELRCODE1 OCT      22
 0369    REF  18   LAST   311   40,2137   0 4626 1  ENTERJMP TC       POSTJUMP
 0370    REF   1                40,2140    62022 0             CADR     ENTER

 0371    REF   3   LAST   234   40,2141  10 776 0   89TEST     CCS      DSPCOUNT
 0372                           40,2142   0 2146 0             TC       +4                +
 0373                           40,2143   0 2146 0             TC       +3                +0
 0374    REF  39   LAST   400   40,2144   0 5146 1             TC       ENDOFJOB          - BLOCK DATA IN IF DSPCOUNT IS - OR -0
 0375    REF  40   LAST   411   40,2145   0 5146 1             TC       ENDOFJOB          -0
 0376    REF   4   LAST   351   40,2146   3 6266 0             CAF      THREE
 0377    REF   1                40,2147   7 0777 1             MASK     DECBRNCH
 0378    REF  98   LAST   410   40,2150  10 000 0              CCS      A
 0379    REF   9   LAST   410   40,2151   0 2155 1             TC       NUM               IF DECBRNCH IS +, 8 OR 9 OK
 0380    REF  15   LAST   411   40,2152   0 3463 0             TC       CHARALRM          IF DECBRNCH IS +0, REJECT 8 OR 9

R0381    NUM ASSEMBLES OCTAL 3 BITS AT A TIME. FOR DECIMAL IT CONVERTS INCOMING
R0382    WORD AS A FRACTION, KEEPING RESULTS TO DP.
R0383    OCTAL RESULTS ARE LEFT IN XREG, YREG, OR ZREG. HI PART OF DEC IN XREG,
R0384    YREG, ZREG. THE LOW PARTS IN XREGLP, YREGLP, OR ZREGLP)
R0385    DECBRNCH IS LEFT AT +0 FOR OCT, +1 FOR + DEC, +2 FOR - DEC.
R0386    IF DSPCOUNT WAS LEFT -, NO MORE DATA IS ACCEPTED.

 0387    REF  53   LAST   396   40,2153   3 4746 0             CAF      ZERO
 0388    REF   2   LAST   410   40,2154  54 117 1              TS       CHAR
 0389    REE   4   LAST   411   40,2155  10 776 0   NUM        CCS      DSPCOUNT
 0390                           40,2156   0 2162 0             TC       +4                +
 0391                           40,2157   0 2162 0             TC       +3                +0
 0392                           40,2160   0 2161 0             TC       +1                -BLOCK DATA IN IF DSPCOUNT IS -
 0393    REF  41   LAST   411   40,2161   0 5146 1             TC       ENDOFJOB          -0
 0394    REF   1                40,2162   0 2313 1             TC       GETINREL
 0395    REF   2   LAST   233   40,2163  11'014 1              CCS      CLPASS            IF CLPASS IS + OR +0, MAKE IT +0.
 0396    REF  54   LAST   411   40,2164   3 4746 0             CAF      ZERO
 0397    REF   3   LAST   411   40,2165  55'014 1              TS       CLPASS
 0398                           40,2166   0 2167 0             TC       +1
 0399    REF   3   LAST   411   40,2167  50 117 0              INDEX    CHAR
 0400    REF   2   LAST   167   40,2170   3 4066 0             CAF      RELTAB
 0401    REF   1                40,2171   7 4337 0             MASK     LOW5
 0402    REF   1                40,2172  54 124 1              TS       CODE
 0403    RFF   5   LAST   411   40,2173   3 0776 1             CA       DSPCOUNT
 0404    REF   1                40,2174  54 143 0              TS       COUNT
 0405    REF   1                40,2175   0 3351 0             TC       DSPIN
 0406    REF   5   LAST   411   40,2176   3 6266 0             CAF      THREE
 0407   REF   2  LAST  411   40,2177  7 0777 1            MASK    DECBRNCH
 0408   REF  99  LAST  411   40,2200  10 000 0            CCS     A                     +0, OCTAL.  +1, + DEC.  +2, - DEC.
 0409   REF   1              40,2201  0 2212 1            TC      DECTOBIN              +
 0410   REF   1              40,2202  50 137 1            INDEX   INREL                 +0 OCTAL
 0411   REF   2  LAST  233   40,2203  57'000 0            XCH     VERBREG
 0412   REF   1              40,2204  54 022 0            TS      CYL
 0413   REF   2  LAST  412   40,2205  4 0022 0            CS      CYL
 0414   REF   3  LAST  412   40,2206  4 0022 0            CS      CYL
 0415   REF   4  LAST  412   40,2207  56 022 1            XCH     CYL
 0416   REF   4  LAST  411   40,2210  6 0117 0            AD      CHAR
 0417   REF   1              40,2211  0 2227 1            TC      ENDNMTST
 0418   REF   2  LAST  412   40,2212  50 137 1  DECTOBIN  INDEX   INREL
 0419   REF   3  LAST  412   40,2213  57'000 0            XCH     VERBREG
 0420   REF  76  LAST  410   40,2214  54 154 0            TS      MPAC                  SUM X 2EXP-14 IN MPAC
 0421   REF  55  LAST  411   40,2215  3 4746 0            CAF     ZERO
 0422   REF  77  LAST  412   40,2216  54 155 1            TS      MPAC     +1
 0423   REF   4  LAST  233   40,2217  3 4354 1            CAF     TEN                   10 X 2EXP-14
 0424   REF   1              40,2220  0 7330 0            TC      SHORTMP               10SUM X 2EXP-28 IN MPAC, MPAC+1
 0425   REF  78  LAST  412   40,2221  56 155 0            XCH     MPAC     +1
 0426   REF   5  LAST  412   40,2222  6 0117 0            AD      CHAR
 0427   REF  79  LAST  412   40,2223  54 155 1            TS      MPAC     +1
 0428   REF   2  LAST  412   40,2224  0 2227 1            TC      ENDNMTST              NO OF
 0429   REF  80  LAST  412   40,2225  26 154 0            ADS     MPAC                  OF MUST BE 5TH CHAR
 0430   REF   1              40,2226  0 2245 0            TC      DECCEND
 0431   REF   3  LAST  412   40,2227  50 137 1  ENDNMTST  INDEX   INREL
 0432   REF   4  LAST  412   40,2230  55'000 1            TS      VERBREG
 0433   REF   6  LAST  411   40,2231  4 0776 0            CS      DSPCOUNT
 0434   REF   4  LAST  412   40,2232  50 137 1            INDEX   INREL
 0435   REF   1              40,2233  6 2304 1            AD      CRITCON
 0436                        40,2234  0 0006 1            EXTEND
 0437   REF   1              40,2235  1 2237 1            BZF     ENDNUM                -0, DSPCOUNT = CRITCON
 0438   REF   1              40,2236  0 2301 1            TC      MORNUM                - , DSPCOUNT G/ CRITCON
 0439   REF   6  LAST  411   40,2237  3 6266 0  ENDNUM    CAF     THREE
 0440   REF   3  LAST  412   40,2240  7 0777 1            MASK    DECBRNCH
 0441   REF 100  LAST  412   40,2241  10 000 0            CCS     A
 0442   REF   2  LAST  412   40,2242  0 2245 0            TC      DECCEND
 0443   REF   7  LAST  412   40,2243  4 0776 0  ENDALL    CS      DSPCOUNT              BLOCK NUMIN BY PLACING DSPCOUNT
 0444   REF   2  LAST  412   40,2244  0 2302 1            TC      MORNUM   +1           NEGATIVELY
 04442  REF  81  LAST  400   40,2245  0 4607 1  DECCEND   TC      BANKCALL
 04443  REF   1              40,2246   60250 0            CADR    DECEND
 04444  REF   1              40,2247  0 2243 0            TC      ENDALL
 0445   REF  25  LAST  410   40,2250  4 4744 0  DECEND    CS      ONE
 0446   REF   5  LAST  412   40,2251  6 0137 1            AD      INREL
 0447                        40,2252  0 0006 1            EXTEND
 0448   REF   2  LAST  412   40,2253  6 2243 0            BZMF    ENDALL                IF INREL=0,1(VBREG,NNREG), LEAVE WHOLE
 04481  REF   2  LAST  411   40,2254  0 2313 1            TC      GETINREL
 04482  REF   6  LAST  412   40,2255  50 137 1            INDEX   INREL
 04483  REF   5  LAST  412   40,2256  3 1000 0            CA      VERBREG
 04484  REF  81  LAST  412   40,2257  54 155 1            TS      MPAC +1
 0449   REF   1              40,2260  0 7124 1            TC      DMP                   IF INREL=2,3,4(R1,R2,R3),CONVERT TO FRAC
```

```
A0450                                                                          MULT SUM X 2EXP-28 IN MPAC, MPAC+1 BY
 0451  REF   1                40,2261   02311 0            ADRES   DECON       2EXP14/10EXP5. GIVES(SUM/10EXP5)X2EXP-14
 0452  REF   7  LAST  412     40,2262  3 6266 0            CAF     THREE       IN MPAC, +1, +2.
 0453  REF   4  LAST  412     40,2263  7 0777 1            MASK    DECBRNCH
 0454  REF 101  LAST  412     40,2264  50 000 1            INDEX   A
 0455                         40,2265  0 2265 1            TC      +0
 0456  REF   1                40,2266  0 2272 1            TC      +DECSGN
 0457                         40,2267  0 0006 1            EXTEND                - CASE
 0458  REF  82  LAST  412     40,2270  4 0156 1            DCS     MPAC    +1
 0459  REF  83  LAST  413     40,2271  52 156 1            DXCH    MPAC    +1
 0460  REF  84  LAST  413     40,2272  56 156 0  +DECSGN   XCH     MPAC    +2
 0461  REF   7  LAST  412     40,2273  50 137 1            INDEX   INREL
 0462  REF   1                40,2274  55'003 1            TS      XREGLP  -2
 0463  REF  85  LAST  413     40,2275  56 155 0            XCH     MPAC    +1
 0464  REF   8  LAST  413     40,2276  50 137 1            INDEX   INREL
 0465  REF   6  LAST  412     40,2277  55'000 1            TS      VERBREG
 0466  REF   3  LAST  340     40,2300  0 4622 0            TC      SWRETURN
 0467  REF   8  LAST  412     40,2301  10 776 0  MORNUM    CCS     DSPCOUNT      DECREMENT DSPCOUNT
 0468  REF   9  LAST  413     40,2302  54 776 0            TS      DSPCOUNT
 0469  REF  42  LAST  411     40,2303  0 5146 1            TC      ENDOFJOB

 0470                         40,2304   00022 1  CRITCON   OCT     22            (DEC 18)
 0471                         40,2305   00020 0            OCT     20            (DEC 16)
 0472                         40,2306   00012 1            OCT     12            (DEC 10)
 0473                         40,2307   00005 1            OCT     5
 0474                         40,2310   00000 1            OCT     0

 0475                         40,2311   05174 0  DECON     2DEC    E-5 B14       2EXP14/10EXP5 = .16384 DEC
 0475                         40,2312   13261 0


R0476  GETINREL GETS PROPER DATA REG REL ADDRESS FOR CURRENT C(DSPCOUNT) AND
R0477  PUTS IN INTO INREL. +0 VERBREG, 1 NOUNREG, 2 XREG, 3 YREG, 4 ZREG.

 0478  REF  10  LAST  413     40,2313  50 776 1  GETINREL  INDEX   DSPCOUNT
 0479  REF   1                40,2314  3 2317 0            CAF     INRELTAB
 0480  REF   9  LAST  413     40,2315  54 137 0            TS      INREL         (A TEMP, REG)
 0481  REF  41  LAST  393     40,2316  0 0002 0            TC      Q

 0482                         40,2317   00004 0  INRELTAB  OCT     4             R3D5 (DSPCOUNT = 0)
 0483                         40,2320   00004 0            OCT     4             R3D4             =(1)
 0484                         40,2321   00004 0            OCT     4             R3D3             =(2)
 0485                         40,2322   00004 0            OCT     4             R3D2             =(3)
 0486                         40,2323   00004 0            OCT     4             R3D1             =(4)
 0487                         40,2324   00003 1            OCT     3             R2D5             =(5)
 0488                         40,2325   00003 1            OCT     3             R2D4             =(6)
 0489                         40,2326   00003 1            OCT     3             R2D3             =(7)
 0490                         40,2327   00003 1            OCT     3             R2D2             =(8D)
 0491                         40,2330   00003 1            OCT     3             R2D1             =(9D)
 0492                         40,2331   00002 0            OCT     2             R1D5             =(10D)
 0493                              40,2332   00002 0             OCT      2              R1D4           =(11D)
 0494                              40,2333   00002 0             OCT      2              R1D3           =(12D)
 0495                              40,2334   00002 0             OCT      2              R1D2           =(13D)
 0496                              40,2335   00002 0             OCT      2              R1D1           =(14D)
 0497    REF   2  LAST  388        40,2336  0 5701 1             TC       CCSHOLE        NO DSPCOUNT NUMBER = 15D
 0498                              40,2337   00001 0             OCT      1              ND2            =(16D)
 0499                              40,2340   00001 0             OCT      1              ND1            =(17D)
 0500                              40,2341   00000 1             OCT      0              VD2            =(18D)
 0501                              40,2342   00000 1             OCT      0              VD1            =(19D)


 0502    REF  56  LAST  412        40,2343  3 4746 0  VERB       CAF      ZERO
 0503    REF   7  LAST  413        40,2344  55'000 1             TS       VERBREG
 0504    REF   2  LAST  234        40,2345  3 4351 1             CAF      VD1
 0505    REF  11  LAST  413        40,2346  54 776 0  NVCOM      TS       DSPCOUNT
 0506    REF   1                   40,2347  0 2570 1             TC       2BLANK
 0507    REF  26  LAST  412        40,2350  3 4744 1             CAF      ONE
 0508    REF   5  LAST  413        40,2351  54 777 1             TS       DECBRNCH       SET FOR DEC V/N CODE
 0509    REF  57  LAST  414        40,2352  3 4746 0             CAF      ZERO
 0510    REF   2  LAST  233        40,2353  55'012 1             TS       REQRET         SET FOR ENTPASO
 0511    REF   1                   40,2354  3 4210 0             CAF      ENDINST        IF DSPALARM OCCURS BEFORE FIRST ENTPASO
 0512    REF   1                   40,2355  54 136 1             TS       ENTRET         OR NVSUB, ENTRET MUST ALREADY BE SET
A0513                                                                                    TO TC ENDOFJOB
 0514    REF  43  LAST  413        40,2356  0 5146 1             TC       ENDOFJOB
 0515    REF  58  LAST  414        40,2357  3 4746 0  NOUN       CAF      ZERO
 0516    REF   7  LAST  316        40,2360  55'001 0             TS       NOUNREG
 0517    REF   2  LAST  393        40,2361  3 4352 1             CAF      ND1            ND1, OCT 21 (DEC 17)
 0518    REF   1                   40,2362  0 2346 1             TC       NVCOM


 0519    REF   1                   40,2363  0 2435 1  NEGSGN     TC       SIGNTEST
 0520    REF   1                   40,2364  0 2422 1             TC       -ON
 0521    REF  18  LAST  387        40,2365  3 4743 0             CAF      TWO
 0522    REF  10  LAST  413        40,2366  50 137 1  BOTHSGN    INDEX    INREL          SET DEC COMP BIT TO 1 (IN DECBRNCH)
 0523    REF  19  LAST  270        40,2367  6 4736 1             AD       BIT7           BIT 5 FOR R1,  BIT 4 FOR R2,
 0524    REF   6  LAST  414        40,2370  26 777 1             ADS      DECBRNCH       BIT 3 FOR R3.
 0525    REF   4  LAST  411        40,2371  11'014 1  FIXCLPAS   CCS      CLPASS         IF CLPASS IS + OR +0, MAKE IT +0.
 0526    REF  59  LAST  414        40,2372  3 4746 0             CAF      ZERO
 0527    REF   5  LAST  414        40,2373  55'014 1             TS       CLPASS
 0528                              40,2374  0 2375 1             TC       +1
 0529    REF  44  LAST  414        40,2375  0 5146 1             TC       ENDOFJOB

 0530    REF   2  LAST  414        40,2376  0 2435 1  POSGN      TC       SIGNTEST
 0531    REF   1                   40,2377  0 2402 0             TC       +ON
 0532    REF  27  LAST  414        40,2400  3 4744 1             CAF      ONE
 0533    REF   1                   40,2401  0 2366 0             TC       BOTHSGN

 0534    REF  42  LAST  413        40,2402  22 002 0  +ON        LXCH     Q
 0535    REF   3  LAST  412        40,2403  0 2313 1             TC       GETINREL
 0536    REF  11  LAST  414        40,2404  50 137 1             INDEX    INREL
 0537   REF   1              40,2405  3 2430 1            CAF     SGNTAB  -2
 0538   REF   1              40,2406  54 123 0            TS      SGNOFF
 0539   REF  28  LAST  414   40,2407  6 4744 1            AD      ONE
 0540   REF   1              40,2410  54 122 1            TS      SGNON
 0541   REF  60  LAST  414   40,2411  3 4746 0  SGNCOM    CAF     ZERO
 0542   REF   2  LAST  411   40,2412  54 124 1            TS      CODE
 0543   REF   2  LAST  415   40,2413  56 123 1            XCH     SGNOFF
 0544   REF   1              40,2414  0 3433 0            TC      11DSPIN
 0545   REF  18  LAST  384   40,2415  3 4732 0            CAF     BIT11
 0546   REF   3  LAST  415   40,2416  54 124 1            TS      CODE
 0547   REF   2  LAST  415   40,2417  56 122 0            XCH     SGNON
 0548   REF   2  LAST  415   40,2420  0 3433 0            TC      11DSPIN
 0549   REF  43  LAST  393   40,2421  0 0001 0            TC      L
 0550   REF  43  LAST  414   40,2422  22 002 0  -ON       LXCH    Q
 0551   REF   4  LAST  414   40,2423  0 2313 1            TC      GETINREL
 0552   REF  12  LAST  414   40,2424  50 137 1            INDEX   INREL
 0553   REF   2  LAST  415   40,2425  3 2430 1            CAF     SGNTAB  -2
 0554   REF   3  LAST  415   40,2426  54 122 1            TS      SGNON
 0555   REF  29  LAST  415   40,2427  6 4744 1            AD      ONE
 0556   REF   3  LAST  415   40,2430  54 123 0            TS      SGNOFF
 0557   REF   1              40,2431  0 2411 1            TC      SGNCOM

 0558                        40,2432   00005 1  SGNTAB    OCT     5                        -R1
 0559                        40,2433   00003 1            OCT     3                        -R2
 0560                        40,2434   00000 1            OCT     0                        -R3


 0561   REF  44  LAST  415   40,2435  22 002 0  SIGNTEST  LXCH    Q                        ALLOWS +,- ONLY WHEN DSPCOUNT=R1D1,
 0562   REF   8  LAST  413   40,2436  3 6266 0            CAF     THREE                    R2D1, OR R3D1. ALLOWS ONLY FIRST OF
 0563   REF   7  LAST  414   40,2437  7 0777 1            MASK    DECBRNCH                 CONSECUTIVE +/- CHARACTERS.
 0564   REF 102  LAST  413   40,2440  10 000 0            CCS     A                        IF LOW2 BITS OF DECBRNCH NOT= 0, SIGN
 0565   REF  45  LAST  414   40,2441  0 5146 1            TC      ENDOFJOB                 FOR THIS WORD ALREADY IN. REJECT.
 0566   REF   1              40,2442  4 4310 0            CS      R1D1
 0567   REF   1              40,2443  0 2451 0            TC      SGNTST1
 0568   REF   1              40,2444  4 4311 1            CS      R2D1
 0569   REF   2  LAST  415   40,2445  0 2451 0            TC      SGNTST1
 0570   REF   1              40,2446  4 4312 1            CS      R3D1
 0571   REF   3  LAST  415   40,2447  0 2451 0            TC      SGNTST1
 0572   REF  46  LAST  415   40,2450  0 5146 1            TC      ENDOFJOB                 NO MATCH FOUND. SIGN ILLEGAL
 0573   REF  12  LAST  414   40,2451  6 0776 1  SGNTST1   AD      DSPCOUNT
 0574                        40,2452  0 0006 1            EXTEND
 0575                        40,2453  1 2455 0            BZF     +2                       MATCH FOUND
 0576   REF  45  LAST  415   40,2454  0 0002 0            TC      Q
 0577   REF  44  LAST  415   40,2455  0 0001 0            TC      L                        SIGN LEGAL

R0578   CLEAR BLANKS WHICH R1, R2, R3 IS CURRENT OR LAST TO BE DISPLAYED(PERTINE
R0579   NT XREG,YREG,ZREG IS CLEARED). SUCCESSIVE CLEARS TAKE CARE OF EACH RX
R0580   L/ RC UNTIL R1 IS DONE. THEN NO FURTHER ACTION
```

```
R0581   THE SINGLE COMPONENT LOAD VERBS ALLOW ONLY THE SINGLE RC THAT IS
R0582   APPROPRIATE TO BE CLEARED.

R0583   CLPASS     +0  PASSO, CAN BE BACKED UP
R0584              +NZ  HIPASS, CAN BE BACKED UP
R0585              -NZ  PASSO, CANNOT BE BACKED UP

 0586   REF  13  LAST  415   40,2456  10 776 0  CLEAR     CCS     DSPCOUNT
 0587   REF  30  LAST  415   40,2457  6 4744 1            AD      ONE
 0588                        40,2460  0 2462 0            TC      +2
 0589   REF  31  LAST  416   40,2461  6 4744 1            AD      ONE
 0590   REF 103  LAST  415   40,2462  50 000 1            INDEX   A                DO NOT CHANGE DSPCOUNT BECAUSE MAY LATER
 0591   REF   2  LAST  413   40,2463  3 2317 0            CAF     INRELTAB         FAIL LEGALTST.
 0592   REF  13  LAST  415   40,2464  54 137 0            TS      INREL            MUST SET INREL, EVEN FOR HIPASS.
 0593   REF   6  LAST  414   40,2465  11'014 1            CCS     CLPASS
 0594   REF   1              40,2466  0 2474 1            TC      CLPASHI          +
 0595                        40,2467  0 2471 1            TC      +2               +0     IF CLPASS IS +0 OR -, IT IS PASSO
 0596                        40,2470  0 2471 1            TC      +1               -
 0597   REF  14  LAST  416   40,2471  3 0137 1            CA      INREL
 0598   REF   1              40,2472  0 2516 1            TC      LEGALTST
 0599   REF   1              40,2473  0 2511 0            TC      CLEAR1
 0600   REF  15  LAST  416   40,2474  10 137 0  CLPASHI   CCS     INREL
 0601   REF  16  LAST  416   40,2475  54 137 0            TS      INREL
 0602   REF   2  LAST  416   40,2476  0 2516 1            TC      LEGALTST
 0603   REF   1              40,2477  3 2566 0            CAF     DOUBLK +2        +3 TO - NUMBER. BACKS DATA REQUESTS.
 0604   REF   3  LAST  414   40,2500  27'012 1            ADS     REQRET
 0605   REF  17  LAST  416   40,2501  3 0137 1            CA      INREL
 0606   REF   1              40,2502  54 125 0            TS      MIXTEMP          TEMP STORAGE FOR INREL
 0607                        40,2503  0 0006 1            EXTEND
 0608   REF   8  LAST  414   40,2504  27'000 1            DIM     VERBREG          DECREMENT VERB AND RE-DISPLAY
 0609   REF  82  LAST  412   40,2505  0 4607 1            TC      BANKCALL
 0610   REF   1              40,2506   62367 1            CADR    UPDATVB
 0611   REF   2  LAST  416   40,2507  3 0125 1            CA      MIXTEMP
 0612   REF  18  LAST  416   40,2510  54 137 0            TS      INREL            RESTORE INREL
 0613   REF   1              40,2511  0 2514 0  CLEAR1    TC      CLR5
 0614   REF   7  LAST  416   40,2512  25'014 0            INCR    CLPASS           ONLY IF CLPASS IS + OR +0,
 0615   REF  47  LAST  415   40,2513  0 5146 1            TC      ENDOFJOB         SET FOR HIGHER PASS.
 0616   REF  46  LAST  415   40,2514  22 002 0  CLR5      LXCH    Q                USES 5BLANK  BUT AVOIDS ITS TC GETINREL
 0617   REF   1              40,2515  0 2527 0            TC      5BLANK  +2
 0618   REF   2  LAST  242   40,2516  6 7767 0  LEGALTST  AD      NEG2
 0619   REF 104  LAST  416   40,2517  10 000 0            CCS     A
 0620   REF  47  LAST  416   40,2520  0 0002 0            TC      Q                LEGAL  INREL G/ 2
 0621   REF   3  LAST  414   40,2521  0 5701 1            TC      CCSHOLE
 0622   REF  48  LAST  416   40,2522  0 5146 1            TC      ENDOFJOB         ILLEGAL   INREL= 0,1
 0623   REF  48  LAST  416   40,2523  0 0002 0            TC      Q                LEGAL    INREL = 2


R0624   5BLANK BLANKS 5 CHAR DISPLAY WORD IN R1, R2, OR R3. IT ALSO ZEROES XREG,
R0625   YREG, OR ZREG.PLACE ANY + DSPCOUNT NUMBER FOR PERTINENT RC INTO DSPCOUNT
R0626   DSPCOUNT IS LEFT SET TO LEFT MOST DSP NUMB FOR RC JUST BLANKED.
```

```
 0627   REF  14  LAST  416   40,2524  54 776 0           TS      DSPCOUNT         NEEDED FOR BLANKSUB
 0628   REF  49  LAST  416   40,2525  22 002 0  5BLANK   LXCH    Q
 0629   REF   5  LAST  415   40,2526  0 2313 1           TC      GETINREL
 0630   REF  61  LAST  415   40,2527  3 4746 0           CAF     ZERO
 0631   REF  19  LAST  416   40,2530  50 137 1           INDEX   INREL
 0632   REF   9  LAST  416   40,2531  55'000 1           TS      VERBREG          ZERO X, Y, Z REG.
 0633   REF  20  LAST  417   40,2532  50 137 1           INDEX   INREL
 0634   REF   2  LAST  413   40,2533  55'003 1           TS      XREGLP  -2
 0635   REF   4  LAST  415   40,2534  54 124 1           TS      CODE
 0636   REF  21  LAST  417   40,2535  50 137 1           INDEX   INREL            ZERO PERTINENT DEC COMP BIT.
 0637   REF  20  LAST  414   40,2536  4 4736 0           CS      BIT7             PROTECT OTHERS
 0638   REF   8  LAST  415   40,2537  7 0777 1           MASK    DECBRNCH
 0639   REF   1              40,2540  7 2567 0           MASK    BRNCHCON         ZERO LOW 2 BITS.
 0640   REF   9  LAST  417   40,2541  54 777 1           TS      DECBRNCH
 0641   REF  22  LAST  417   40,2542  50 137 1           INDEX   INREL
 0642   REF   1              40,2543  3 2557 1           CAF     SINBLANK -2      BLANK ISOLATED CHAR SEPARATELY
 0643   REF   2  LAST  411   40,2544  54 143 0           TS      COUNT
 0644   REF   2  LAST  411   40,2545  0 3351 0           TC      DSPIN
 0645   REF  23  LAST  417   40,2546  50 137 1  5BLANK1  INDEX   INREL
 0646   REF   2  LAST  416   40,2547  3 2562 1           CAF     DOUBLK  -2
 0647   REF  15  LAST  417   40,2550  54 776 0           TS      DSPCOUNT
 0648   REF   2  LAST  414   40,2551  0 2570 1           TC      2BLANK
 0649   REF  19  LAST  414   40,2552  4 4743 1           CS      TWO
 0650   REF  16  LAST  417   40,2553  26 776 0           ADS     DSPCOUNT
 0651   REF   3  LAST  417   40,2554  0 2570 1           TC      2BLANK
 0652   REF  24  LAST  417   40,2555  50 137 1           INDEX   INREL
 0653   REF   2  LAST  415   40,2556  3 4306 0           CAF     R1D1    -2
 0654   REF  17  LAST  417   40,2557  54 776 0           TS      DSPCOUNT         SET DSPCOUNT TO LEFT MOST DSP NUMBER
 0655   REF  45  LAST  415   40,2560  0 0001 0           TC      L                OF REG. JUST BLANKED

 0656                        40,2561   00016 0  SINBLANK OCT     16               DEC 14
 0657                        40,2562   00005 1           OCT     5
 0658                        40,2563   00004 0           OCT     4
 0659                        40,2564   00015 0  DOUBLK   OCT     15               DEC 13
 0660                        40,2565   00011 1           OCT     11               DEC 9
 0661                        40,2566   00003 1           OCT     3

 0662                        40,2567   77774 0  BRNCHCON OCT     77774

R0663   2BLANK BLANKS TWO CHAR. PLACE DSP NUMBER OF LEFT CHAR  OF THE PAIR INTO
R0664   DSPCOUNT. THIS NUMBER IS LEFT IN DSPCOUNT

 0665   REF  18  LAST  417   40,2570  3 0776 1  2BLANK   CA      DSPCOUNT
 0666   REF   1              40,2571  54 021 0           TS      SR
 0667   REF   1              40,2572  4 2603 1           CS      BLANKCON
 0668                        40,2573  0 0004 0           INHINT
 0669   REF   2  LAST  417   40,2574  50 021 1           INDEX   SR
 0670   REF  30  LAST  233   40,2575  57'022 0           XCH     DSPTAB
 0671                        40,2576  0 0006 1           EXTEND
 0672                        40,2577  6 2601 1           BZMF    +2               IF OLD CONTENTS -, NOUT OK
 0673   REF    6  LAST  233    40,2600  25'015 1           INCR    NOUT             IF OLD CONTENTS +, +1 TO NOUT
 0674                          40,2601   0 0003 1          RELINT                   IF -,NOUT OK
 0675   REF   50  LAST  417    40,2602   0 0002 0          TC      Q
 0676                          40,2603    04000 0  BLANKCON OCT     4000
```

```
P0677   ENTER PASS 0 IS THF EXECUTE FUNCTION. HIGHER ORDER ENTERS ARE TO LOAD
R0678   DATA. THE SIGN OF REQRET DETERMINES THE PASS, + FOR PASS 0,- FOR HIGHER
R0679   PASSES.

R0680   MACHINE CADR TO BF SPECIFIED (MCTBS) NCUNS DESIRF AN ECADR TO BE LOADED
R0681   WHEN LSED WITH LOAD VERBS, MONITOR VERBS, OR DISPLAY VERBS (EXCEPT
R0682   VERB = FIXED MEMORY CISPLAY, WHICH REQUIRES AN FCADR).

 0683                           41,2020                          BANK    41
 068301 REE    2  LAST  311     41,2000                          SETLOC PINBALL2
 0683C?                         41,2020                          BANK

 06835  RFF    1                                                 COUNT* $$/PIN
 0684   REF    1                41,2020   0 3613 0  NVSUBB       TC      NVSUB1          STANDARD LEAD INS. DONT MOVE.
 0685   REF    1                41,2021   0 3045 0  LOADLV1      TC      LOADLV
A0686                                                                                    END OF STANDARD LEAD INS.


 0687   REF   62  LAST  417     41,2022   3 4746 0  ENTER        CAF     ZERO
 0688   RFF    8  LAST  416     41,2023  55'014 1                TS      CLPASS
 0689   REF    2  LAST  414     41,2024   3 4210 0               CAF     ENDINST
 0690   REF    2  LAST  414     41,2025  54  136 1               TS      FNTRET
 0691   REF    4  LAST  416     41,2026  11'012 1                CCS     REQRET
 0692   REF    1                41,2027   0 2062 1               TC      ENTPASO         IF +, PASS 0
 0693   REF    2  LAST  419     41,2030   0 2062 1               TC      ENTPASO         IF +, PASS 0
 0694                           41,2031   0 2C32 1               TC      +1              IF -, NOT PASS 0
 0695   REF    1                41,2032   3 2060 0  ENTPASHI     CAF     MMADREF
 0696   REF    5  LAST  419     41,2033   6 1012 0               AD      REQRET          IF L/ 2 CHAR IN FOR MM CODE, ALARM
 0697                           41,2034   0 0006 1               EXTEND                  AND RECYCLE(DECIDE AT MMCHANG+1).
 0698   RFF    1                41,2035   1 2C47 1               BZF     ACCEPTWD
 0699   REF    9  LAST  415     41,2036   3 6266 0               CAF     THREE           IF DEC, L/5 CHAR IN FOR DATA MUST BE
 0700   RFF   10  LAST  417     41,2037   7 C777 1               MASK    DECBRNCH        SCALED (DECEND); IF 5 CHAR IN, DATA
 0701   RFF  1C5  LAST  416     41,2040  10 000 0                CCS     A               HAS ALREADY BEEN SCALED. ANY NUMBER
 0702                           41,2041   0 2043 1               TC      +2              OF DECIMAL CHARACTERS ARE ACCEPTABLE.SCR
 0703   REF    2  LAST  419     41,2042   0 2047 0               TC      ACCEPTWD        OCTAL. ANY NUMBER OF CHAR OK.
 0704   REF   19  LAST  417     41,2043  10 776 0                CCS     DSPCOUNT
 0705   REF    1                41,2044   0 2053 0               TC      LT5
 0706   REF    2  LAST  419     41,2045   0 2053 0               TC      LT5
 0707                           41,2046   0 2047 0               TC      +1              5 CHAR IN (DSPCOUNT IS -)
 0708   RFF    6  LAST  419     41,2047   4 1012 1  ACCFPTWD     CS      REQRET          5 CHAR IN (DSPCOUNT IS -)
 0709   REF    7  LAST  419     41,2050  55'012 1                TS      REQRET          SET REQRET +.
 0710   RFF    2  LAST  286     41,2051   0 4424 1               TC      FLASHOFF
 0711   REF    8  LAST  419     41,2052   0 1012 0               TC      REQRET

 071108 REF   63  LAST  419     41,2053   3 4746 0  LT5          CAF     ZERO
 071109 REF   86  LAST  413     41,2054  54 154 0                TS      MPAC
 07111  REF   83  LAST  416     41,2055   0 4607 1               TC      BANKCALL
 07112  REF    2  LAST  412     41,2056    6C254 1               CADR    DECEND +4
```

```
07113  REF   3  LAST  419   41,2057  0 2047 0            TC      ACCEPTWO
0712   REF   3  LAST  419      0136             ENTEXIT  =       ENTRET

0713   REF   1              41,2060   03471 0  MMADREF  ADRES   MMCHANG +1      ASSUMES TC REQMM AT MMCHANG.

0714                        41,2061   00034 0  LOWVERB  DEC     28              LOWER VERB THAT AVOIDS NOUN TEST.

0715   REF  64  LAST  419   41,2062  3 4746 0  ENTPASO  CAF     ZERO             NOUN VERB SUB ENTERS HERE
0716   REF  11  LAST  419   41,2063  54 777 1           TS      DECBRNCH
0717   REF   3  LAST  414   41,2064  4 4351 0           CS      VD1             BLOCK FURTHER NUM CHAR, SO THAT STRAY
0718   REF  20  LAST  419   41,2065  54 776 0           TS      DSPCOUNT        CHAR DO NOT GET INTO VERB OR NOUN LTS.
0719   REF  10  LAST  417   41,2066  4 1000 1  TESTVB   CS      VERBREG         IF VERB IS G/E LOWVB, SKIP NOUN TEST.
0720   REF   1              41,2067  55'040 0           TS      VERBSAVE        SAVE VERB FOR POSSIBLE RECYCLE.
0721   REF   1              41,2070  6 2061 1           AD      LOWVERB         LOWVERB - VB
0722                        41,2071  0 0006 1           EXTEND
0723   REF   1              41,2072  6 2160 1           BZMF    VERBFAN         VERB G/E LOWVERB
0724                        41,2073  0 0006 1  TESTNN   EXTEND                  VERB L/ LOWVERB
0725   REF   1              41,2074  3 2141 1           DCA     LODNNLOC        SWITCH BANKS TO NOUN TABLE READING
0726   REF   3  LAST  317   41,2075  52 006 0           DXCH    Z               ROUTINE.
0727   REF   3  LAST  316   41,2076  50 140 1           INDEX   MIXBR
0728                        41,2077  0 2077 0           TC      +0
0729                        41,2100  0 2102 0           TC      +2              NORMAL
0730   REF   1              41,2101  0 2246 0           TC      MIXNOUN         MIXED
0731   REF   3  LAST  316   41,2102  10 146 0           CCS     NNADTEM         NORMAL
0732   REF   2  LAST  420   41,2103  0 2156 1           TC      VERBFAN -2           NORMAL IF +
0733   REF   1              41,2104  0 2400 1           TC      GODSPALM        NOT IN USE   IF +0
0734   REF   1              41,2105  0 2111 1           TC      REQADD          SPECIFY MACHINE CADR IF -
0735   REF   1              41,2106  25'016 1           INCR    NOUNCADR        AUGMENT MACHINE CADR IF -0
0736   REF   1              41,2107  0 4302 1           TC      SETNADD         ECADR FROM NOUNCADR. SETS EB, NOUNADD.
0737   REF   1              41,2110  0 2145 0           TC      INTMCTBS +2
0738   REF  24  LAST  306   41,2111  3 4726 0  REQADD   CAF     BIT15           SET CLPASS FOR PASS0 ONLY
0739   REF   9  LAST  419   41,2112  55'014 1           TS      CLPASS
0740   REF   3  LAST  419   41,2113  4 4210 1           CS      ENDINST         TEST IF REACHED HERE FROM INTERNAL OR
0741   REF   1              41,2114  6 0136 0           AD      ENTEXIT                      FROM EXTERNAL
0742                        41,2115  0 0006 1           EXTEND
0743                        41,2116  1 2120 1           BZF     +2              EXTERNAL MACH CADR TO BE SPECIFIED
0744   REF   2  LAST  420   41,2117  0 2143 0           TC      INTMCTBS
0745   REF   1              41,2120  0 2336 0           TC      REQDATZ         EXTERNAL MACH CADR TO BE SPECIFIED
0746   REF  12  LAST  420   41,2121  10 777 1           CCS     DECBRNCH        ALARM AND RECYCLE IF DECIMAL USED
0747   REF   1              41,2122  0 6020 0           TC      ALMCYCLE        FOR MCTBS.
0748   REF   4  LAST  420   41,2123  4 4351 0           CS      VD1             OCTAL USED  OK
0749   REF  21  LAST  420   41,2124  54 776 0           TS      DSPCOUNT        BLOCK NUM CHAR IN
0750   REF   3  LAST  410   41,2125  11'041 1           CCS     CADRSTOR
0751                        41,2126  0 2131 0           TC      +3              EXTERNAL MCTBS DISPLAY WILL LEAVE FLASH
0752   REF   1              41,2127  0 2132 0           TC      USEADD          ON IF ENDIDLE NOT = +0.
0753                        41,2130  0 2131 0           TC      +1
0754   REF   1              41,2131  0 4420 0           TC      FLASHON
0755   REF   1              41,2132  57'004 1  USEADD   XCH     ZREG
0756   REF   1              41,2133  0 4274 1           TC      SETNCADR        ECADR INTO NOUNCADR. SET EB, NOUNADD.
0757                        41,2134  0 0006 1           EXTEND
```

```
 0758  REF   2  LAST  420   41,2135  3 2141 1            DCA     LODNNLOC           SWITCH BANKS TO NOUN TABLE READING
 0759  RFF   4  LAST  420   41,2136  52 C06 0            DXCH    Z                  ROUTINE.
 0760  REF   3  LAST  420   41,2137  0 2160 1            TC      VERBFAN

 0761  REF  22  LAST  420      0776                      EBANK=  DSPCOUNT
 0762  REF   1              41,2140   02110 0  LODNNLOC  2CADR   LODNNTAB
 0762  RFF   1              41,2141   64101 0

 0763                       41,2142   77772 0  NFG5      OCT     77772

 0764  REF  87  LAST  419   41,2143  3 0156 0  INTMCTBS  CA      MPAC       +2      INTERNAL MACH CADR TO BE SPECIFIED.
 0765  REF   2  LAST  420   41,2144  0 4274 1            TC      SETNCADR           ECADR INTO NOUNCADR. SET F8, NOUNADD.
 0766  REF   8  LAST  388   41,2145  4 4747 0            CS      FIVE               NVSUB CALL LEFT CADR IN MPAC+2 FOR MACH
 0767  RFF  11  LAST  42C   41,2146  6 1000 0            AD      VERRREG            CADR TO BF SPECIFIED.
 0768                       41,2147  0 C006 1            EXTEND
 0769  REF   4  LAST  421   41,2150  1 2160 0            BZF     VERBFAN            DONT DISPLAY CADR IF VB = 05.
 0770  REF   2  LAST  415   41,2151  3 4312 0            CAF     R3D1               VB NOT = 05. DISPLAY CADR.
 0771  REF  23  LAST  421   41,2152  54 776 0            TS      DSPCOUNT
 0772  REF   2  LAST  420   41,2153  3 1016 1            CA      NOUNCADR
 0773  REF   1              41,2154  0 3435 0            TC      DSPOCTWD
 0774  REF   5  LAST  421   41,2155  0 2160 1            TC      VERBFAN

 0775  REF  32  LAST  416   41,2156  6 4744 1            AD      ONE
 0776  RFF   3  LAST  421   41,2157  0 4274 1            TC      SETNCADR           ECADR INTO NOUNCADR. SETS EB, NOUNADD.
 0777  REF   1              41,2160  4 2172 0  VERBFAN   CS      LST2CON
 0778  PEF  12  LAST  421   41,2161  6 1000 0            AD      VERBREG            VERB-LST2CON
 0779  REF 106  LAST  419   41,2162  1C 000 0            CCS     A
 0780  REF  33  LAST  421   41,2163  6 4744 1            AD      ONE                VERB G/ LST2CON
 0781                       41,2164  0 2166 1            TC      +2
 0782  REF   1              41,2165  0 2173 0            TC      VBFANDIR           VERB L/ LST2CON
 0783  REF  88  LAST  421   41,2166  54 154 0            TS      MPAC
 0784  REF   4  LAST  244   41,2167  0 4450 1            TC      RELDSP             RELFASF DISPLAY SYST
 0785  RFF  19  LAST  411   41,2170  0 4626 1            TC      POSTJUMP           GO TO GOEXTVB WITH VB-40 IN MPAC.
 0786  REF   1              41,2171   66000 1            CADR    GOEXTVB
 0788                       41,2172   00050 1  LST2CON   DEC     40                 FIRST LIST2 VERB (EXTENDED VCRB)

 0790  REF  13  LAST  421   41,2173  51'000 0  VBFANDIR  INDEX   VERBREG
 0791  REF   1              41,2174  3 2176 0            CAF     VERRTAB
 0792  REF   2  LAST  284   41,2175  0 4631 1            TC      BANKJUMP

 0793  REF   2  LAST  420   41,2176   62400 1  VERBTAB   CADR    GODSPALM           VB00 ILLEGAL
 0794  REF   1              41,2177   62414 1            CADR    DSPA               VB01 DISPLAY OCT COMP 1 (R1)
 0795  REF   1              41,2200   62422 1            CADR    DSPB               VB02 DISPLAY OCT COMP 2 (R1)
 0796  REF   1              41,2201   62427 1            CADR    DSPC               VB03 DISPLAY OCT COMP 3 (R1)
 0797  REF   1              41,2202   62407 0            CADR    DSPAB              VB04 DISPLAY OCT COMP 1,2 (R1,R2)
 0798  REF   1              41,2203   62402 0            CADR    DSPABC             VB05 DISPLAY OCT COMP 1,2,3 (P1,R2,P3)
 0799  REF   1              41,2204   62552 1            CADR    DECDSP             VB06 DECIMAL DISPLAY
 0800  REF   1              41,2205   61020 1            CADR    DSPDPDEC           VB07 DP DECIMAL DISPLAY (R1,P2)
 0801  REF   3  LAST  421   41,2206   62400 1            CADR    GODSPALM           VB08 SPARE
 0802  REF   4  LAST  421   41,2207   62400 1            CADR    GODSPALM           VB09 SPARE
 0803   REF   1             41,2210   61447 1            CADR   DSPALARM       VB10 SPARE
 0804   REF   1             41,2211   63302 0            CADR   MONITOR        VB11 MONITOR OCT COMP 1 (R1)
 0805   REF   2  LAST  422  41,2212   63302 0            CADR   MONITOR        VB12 MONITOR OCT COMP 2 (R1)
 0806   REF   3  LAST  422  41,2213   63302 0            CADR   MONITOR        VB13 MONITOR OCT COMP 3 (R1)
 0807   REF   4  LAST  422  41,2214   63302 0            CADR   MONITOR        VB14 MONITOR OCT COMP 1,2 (R1,R2)
 0808   REF   5  LAST  422  41,2215   63302 0            CADR   MONITOR        VB15 MONITOR OCT COMP 1,2,3 (R1,R2,R3)
 0809   REF   6  LAST  422  41,2216   63302 0            CADR   MONITOR        VB16 MONITOR DECIMAL
 0810   REF   7  LAST  422  41,2217   63302 0            CADR   MONITOR        VB17 MONITOR DP DEC  (R1,R2)
 0811   REF   5  LAST  421  41,2220   62400 1            CADR   GODSPALM       VB18 SPARE
 0812   REF   6  LAST  422  41,2221   62400 1            CADR   GODSPALM       VB19 SPARE
 0813   REF   7  LAST  422  41,2222   62400 1            CADR   GODSPALM       VB20 SPARE
 0814   REF   1             41,2223   63002 0            CADR   ALOAD          VB21 LOAD COMP 1 (R1)
 0815   REF   1             41,2224   63013 0            CADR   BLOAD          VB22 LOAD COMP 2 (R2)
 0816   REF   1             41,2225   63030 1            CADR   CLOAD          VB23 LOAD COMP 3 (R3)
 0817   REF   1             41,2226   62753 1            CADR   ABLOAD         VB24 LOAD COMP 1,2 (R1,R2)
 0818   REF   1             41,2227   62647 0            CADR   ABCLOAD        VB25 LOAD COMP 1,2,3 (R1,R2,R3)
 0819   REF   8  LAST  422  41,2230   62400 1            CADR   GODSPALM       VB26 SPARE
 0820   REF   1             41,2231   63425 1            CADR   DSPFMEM        VB27 FIXED MEMORY DISPLAY
A0821                                                                          THE FOLLOWING VERBS MAKE NO NOUN TEST
 0822   REF   9  LAST  422  41,2232   62400 1            CADR   GODSPALM       VB28 SPARE
 0823   REF  10  LAST  422  41,2233   62400 1            CADR   GODSPALM       VB29 SPARE
 0824   REF   1             41,2234   63526 0  REQEXLOC  CADR   VBRQEXEC       VB30 REQUEST EXECUTIVE
 0825   REF   1             41,2235   63557 0            CADR   VBRQWAIT       VB31 REQUEST WAITLIST
 0826   REF   1             41,2236   61514 0            CADR   VBRESEQ        VB32 RESEQUENCE
 0827   REF   1             41,2237   61471 1            CADR   VBPROC         VB33 PROCEED WITHOUT DATA
 0828   REF   1             41,2240   61477 1            CADR   VBTERM         VB34 TERMINATE CURRENT TEST OR LOAD REQ
 0829   REF   1             41,2241   63662 0            CADR   VBTSTLTS       VB35 TEST LIGHTS
 0830   REF   1             41,2242   12454 1            CADR   SLAP1          VB36 FRESH START
 0831   REF   2  LAST  420  41,2243   63470 1            CADR   MMCHANG        VB37 CHANGE MAJOR MODE
 0832   REF  11  LAST  422  41,2244   62400 1            CADR   GODSPALM       VB38 SPARE
 0833   REF  12  LAST  422  41,2245   62400 1            CADR   GODSPALM       VB39 SPARE

R0834   THE LIST2 VERBFAN IS LOCATED IN THE EXTENDED VERB BANK.
```

```
P0835   NNADTAB CONTAINS A RELATIVE ADDRESS, IDADDREL(IN LOW 10 BITS), REFERRING
R0836   TO WHERE 3 CONSECUTIVE ADDRESSES ARE STORED (IN IDADDTAB).
R0837   MIXNOUN GETS DATA AND STORES IN MIXTEMP,+1,+2. IT SETS NOUNADD FOR
R0838    MIXTEMP.

 0839   REF   4  LAST  420   41,2246  10 146 0  MIXNOUN  CCS     NNADTEM
 0840                        41,2247   0 2253 1           TC      +4                 +  IN USE
 0841   REF  13  LAST  422   41,2250   0 2400 1           TC      GODSPALM           +0  NOT IN USE
 0842                        41,2251   0 2253 1           TC      +2                 -  IN USE
 0843                        41,2252   0 2253 1           TC      +1                 -0  IN USE
 0844   REF   8  LAST  291   41,2253   4 6263 1           CS      SIX
 0845   REF  14  LAST  421   41,2254   6 1000 0           AD      VERBREG
 0846                        41,2255   0 0006 1           EXTEND
 0847                        41,2256   6 2260 1           BZMF    +2                 VERB L/F 6
 0848   REF   6  LAST  421   41,2257   0 2160 1           TC      VERBFAN            AVOID MIXNOUN SWAP IF VB NOT = DISPLAY
 0849   REF  20  LAST  417   41,2260   3 4743 0           CAF     TWO
 0850   REF   1              41,2261  54 117 1  MIXNN1   TS      DECOUNT
 0851   REF   1              41,2262   6 2305 0           AD      MIXAD
 0852   REF   1              41,2263  54 145 0           TS      NOUNADD            SET NOUNADD TO MIXTEMP + K
 0853   REF   2  LAST  423   41,2264  50 117 0           INDEX   DECOUNT            GET IDADDTAB ENTRY FOR COMPONENT K
 0854   REF   2  LAST  316   41,2265   3 0150 0           CA      IDADITEM           OF NOUN.
 0855   REF   1              41,2266  54 122 1           TS      NOUNTEM
A0856                                                                                TEST FOR DP(FOR OCT DISPLAY). IF SO, GET
A0857                                                                                  MINOR PART ONLY.
 0858   REF   1              41,2267   0 3104 1           TC      SFRUTMIX           GET SF ROUT NUMBER IN A
 0859   REF   1              41,2270   0 2306 0           TC      DPTEST
 0860   REF   1              41,2271   0 2273 0           TC      MIXNN2             NO DP
 0861   REF   2  LAST  423   41,2272  24 122 0           INCR    NOUNTEM            DP  GET MINOR PART
 0862   REF   3  LAST  423   41,2273   3 0122 0  MIXNN2   CA      NOUNTEM
 0863   REF   3  LAST  167   41,2274   7 4347 1           MASK    LOW11              ESUBK (NO DP)  OR (ESUBK)+1    FOR DP
 0864   REF   1              41,2275   0 4304 1           TC      SETEBANK           SET EBANK, LEAVE EADRES IN A.
 0865   REF 107  LAST  421   41,2276  50 000 1           INDEX   A                  PICK UP C(ESUBK)  NOT DP
 0866                        41,2277   3 0000 1           CA      0                  OR C((ESUBK)+1)  FOR DP MINOR PART
 0867   REF   2  LAST  423   41,2300  50 145 1           INDEX   NOUNADD
 0868                        41,2301  56 000 1           XCH     0                  STORE IN MIXTEM + K
 0869   REF   3  LAST  423   41,2302  10 117 1           CCS     DECOUNT
 0870   REF   1              41,2303   0 2261 0           TC      MIXNN1
 0871   REF   7  LAST  423   41,2304   0 2160 1           TC      VERBFAN

 0872   REF   3  LAST  416   41,2305   0 0125 1  MIXAD    TC      MIXTEMP


R0873   DPTEST   ENTER WITH SF ROUT NUMBER IN A.
R0874            RETURNS TO L+1 IF NO DP.
R0875            RETURNS TO L+2 IF DP.

 0876   REF 108  LAST  423   41,2306  50 000 1  DPTEST   INDEX   A
 0877                        41,2307   1 2310 0           TCF     +1
 0878   REF  51  LAST  418   41,2310   0 0002 0           TC      Q                  OCTAL ONLY  NO DP
 0879   REF  52  LAST  423   41,2311   0 0002 0           TC      Q                  FRACT NO DP
 0880    REF  53  LAST  423    41,2312  0 0002 0             TC      Q              DEG  NO DP
 0881    REF  54  LAST  424    41,2313  0 0002 0             TC      Q              ARITH  NO DP
 0882    REF   1               41,2314  1 2330 1             TCF     DPTEST1        DP1OUT
 0883    REF   2  LAST  424    41,2315  1 2330 1             TCF     DPTEST1        DP2OUT
 0884    REF  55  LAST  424    41,2316  0 0002 0             TC      Q              LRPOSOUT  NO DP (DATA IN CHANNEL 33)
 0885    REF   3  LAST  424    41,2317  1 2330 1             TCF     DPTEST1        DP3OUT
 0886    REF  56  LAST  424    41,2320  0 0002 0             TC      Q              HMS    NO DP
 0887    REF  57  LAST  424    41,2321  0 0002 0             TC      Q              M/S    NO DP
 0888    REF   4  LAST  424    41,2322  1 2330 1             TCF     DPTEST1        DP4OUT
 08881   REF  58  LAST  424    41,2323  0 0002 0             TC      Q              ARITH1   NO DP
 08882   REF  59  LAST  424    41,2324  0 0002 0             TC      Q              2INTOUT  NO DP TO GET HI PART IN MPAC
 08883   REF  60  LAST  424    41,2325  0 0002 0             TC      Q              360-CDU    NO DP
 08884   REF  61  LAST  424    41,2326  0 0002 0             TC      Q              RRANGOUT   NO DP
 08885   REF  62  LAST  424    41,2327  0 0002 0             TC      Q              RRDOTOUT   NO DP
 0889    REF  63  LAST  424    41,2330  50 002 0  DPTEST1    INDEX   Q
 0890                          41,2331  0 0001 0             TC      1              RETURN TO L+2


 0891    REF   3  LAST  417    41,2332  3 4310 1  REQDATX    CAF     R1D1
 0892    REF   1               41,2333  1 2337 0             TCF     REQCOM
 0893    REF   2  LAST  415    41,2334  3 4311 0  REQDATY    CAF     R2D1
 0894    REF   2  LAST  424    41,2335  1 2337 0             TCF     REQCOM
 0895    REF   3  LAST  421    41,2336  3 4312 0  REQDATZ    CAF     R3D1
 0896    REF  24  LAST  421    41,2337  54 776 0  REQCOM     TS      DSPCOUNT
 0897    REF  64  LAST  424    41,2340  4 0002 1             CS      Q
 0898    REF   9  LAST  419    41,2341  55'012 1             TS      REQRET
 0899    REF  84  LAST  419    41,2342  0 4607 1             TC      BANKCALL
 0900    REF   2  LAST  416    41,2343   60525 0             CADR    5BLANK
 0901    REF   2  LAST  420    41,2344  0 4420 0             TC      FLASHON
 0902    REF   2  LAST  420    41,2345  0 0136 0  ENDRQDAT   TC      ENTEXIT

 0903    REF   8  LAST  414    41,2346  55'001 0             TS      NOUNREG
 0904    REF  65  LAST  424    41,2347  56 002 0  UPDATNN    XCH     Q
 0905    REF   1               41,2350  54 117 1             TS      UPDATRET
 0906                          41,2351  0 0006 1             EXTEND
 0907    REF   3  LAST  421    41,2352  3 2141 1             DCA     LODNNLOC       SWITCH BANKS TO NOUN TABLE READING
 0908    REF   5  LAST  421    41,2353  52 006 0             DXCH    Z              ROUTINE.
 0909    REF   5  LAST  423    41,2354  10 146 0             CCS     NNADTEM
 0910    REF  34  LAST  421    41,2355  6 4744 1             AD      ONE            NORMAL
 0911    REF   1               41,2356  1 2361 0             TCF     PUTADD
 0912    REF   2  LAST  424    41,2357  1 2362 0             TCF     PUTADD   +1    MCTBS  DONT CHANGE NOUNADD
 0913    REF   3  LAST  424    41,2360  1 2362 0             TCF     PUTADD   +1    MCTBI  DONT CHANGE NOUNADD
 0914    REF   4  LAST  421    41,2361  0 4274 1  PUTADD     TC      SETNCADR       ECADR INTO NOUNCADR. SETS EB, NOUNADD.
 0915    REF   3  LAST  414    41,2362  3 4352 1             CAF     ND1
 0916    REF  25  LAST  424    41,2363  54 776 0             TS      DSPCOUNT
 0917    REF   9  LAST  424    41,2364  3 1001 1             CA      NOUNREG
 0918    REF   1               41,2365  1 2374 1             TCF     UPDAT1

 0919    REF  15  LAST  423    41,2366  55'000 1             TS      VERBREG
 0920    REF  66  LAST  424    41,2367  56 002 0  UPDATVB    XCH     Q
 0921   REF    2  LAST  424    41,2370  54 117 1             TS      UPDATRET
 0922   REF    5  LAST  420    41,2371  3 4351 1             CAF     VD1
 0923   REF   26  LAST  424    41,2372  54 776 0             TS      DSPCOUNT
 0924   REF   16  LAST  424    41,2373  3 1000 0             CA      VERBREG
 0925   REF   20  LAST  421    41,2374  0 4626 1  UPDAT1     TC      POSTJUMP          CANT USE SWCALL TO GO TO DSPDECVN,SINCE
 0926   REF    1               41,2375   61346 1             CADR    GOVNUPDT          UPDATVB CAN ITSELF BE CALLED BY SWCALL.
 0927   REF    3  LAST  425    41,2376  0 0117 0             TC      UPDATRET


 0928   REF    2  LAST  420    41,2377  0 6020 0  GOALMCYC   TC      ALMCYCLE          NEEDED BECAUSE BANKJUMP CANT HANDLE F/F.


 0929   REF   21  LAST  425    41,2400  0 4626 1  GODSPALM   TC      POSTJUMP
 0930   REF    2  LAST  422    41,2401   61447 1             CADR    DSPALARM
```

```
R0931              NOUN   TABLES
R0932   NOUN CODE L/40, NORMAL NOUN CASE.  NOUN CODE G/E 40, MIXED NOUN CASE.
R0933   FOR NORMAL CASE, NNADTAB CONTAINS ONE        FCADR      FOR EACH NOUN.
R0934   +0 INDICATES NOUN NOT USED.   - ENTRY INDICATES MACHINE CADR(E OR F) TO
R0935   BE SPECIFIED. -1 INDICATES CHANNEL TO BE SPECIFIED. -0 INDICATES AUGMENT
R0936   OF LAST MACHINE CADR SUPPLIED.

R0937   FOR MIXED CASE, NNADTAB CONTAINS ONE INDIRECT ADDRESS(IDADDREL) IN LOW
R0938   10 BITS, AND THE COMPONENT CODE NUMBER IN THE HIGH 5 BITS.

R0939   NNTYPTAB IS A PACKED TABLE OF THE FORM MMMMMNNNNNPPPPP.

R0940   FOR THE NORMAL CASE, M-S ARE THE COMPONENT CODE NUMBER.
R0941                        N-S ARE THE SF ROUTINE CODE NUMBER.
R0942                        P-S ARE THE SF CONSTANT CODE NUMBER.

R0943   MIXED CASE,M-S ARE THE SF CONSTANT3 CODE NUMBER      3 COMPONENT CASE
R0944              N-S ARE THE SF CONSTANT2 CODE NUMBER
R0945              P-S ARE THE SF CONSTANT1 CODE NUMBER
R0946              N-S ARE THE SF CONSTANT2 CODE NUMBER      2 COMPONENT CASE
R0947              P-S ARE THE SF CONSTANT1 CODE NUMBER
R0948              P-S ARE THE SF CONSTANT1 CODE NUMBER       1 COMPONENT CASE

R0949   THERE IS ALSO AN INDIRECT ADDRESS TABLE(IDADDTAB) FOR MIXED CASE ONLY.
R0950   EACH ENTRY CONTAINS ONE ECADR.    IDADDREL IS THE RELATIVE ADDRESS OF
R0951   THE FIRST OF THESE ENTRIES.
R0952   THERE IS ONE ENTRY IN THIS TABLE FOR EACH COMPONENT OF A MIXED NOUN
R0953   THEY ARE LISTED IN ORDER OF ASCENDING K.

R0954   THERE IS ALSO A SCALE FACTOR ROUTINE NUMBER TABLE( RUTMXTAB ) FOR MIXED
R0955   CASE ONLY. THERE IS ONE ENTRY PER MIXED NOUN. THE FORM IS,
R0956          QQQQQRRRRRSSSSS
R0957   Q-S ARE THE SF ROUTINE 3 CODE NUMBER      3 COMPONENT CASE
R0958   R-S ARE THE SF ROUTINE 2 CODE NUMBER
R0959   S-S ARE THE SF ROUTINE 1 CODE NUMBER
R0960   R-S ARE THE SF ROUTINE 2 CODE NUMBER      2 COMPONENT CASE
R0961   S-S ARE THE SF ROUTINE 1 CODE NUMBER


R0962   IN OCTAL DISPLAY AND LOAD (OCT OR DEC) VERBS, EXCLUDE USE OF VERBS WHOSE
R0963   COMPONENT NUMBER IS GREATER THAN THE NUMBER OF COMPONENTS IN NOUN.
R0964   (ALL MACHINE ADDRESS TO BE SPECIFIED NOUNS ARE 3 COMPONENT.)


R0967   IN MULTI-COMPONENT LOAD VERBS, NO MIXING OF OCTAL AND DECIMAL DATA
R0968   COMPONENT WORDS IS ALLOWED. ALARM IF VIOLATION.

R0969   IN DECIMAL LOADS OF DATA, 5 NUMERICAL CHARACTERS MUST BE KEYED IN
R0970   BEFORE EACH ENTER. IF NOT, ALARM.
```

```
P0971                 DISPLAY  VERBS
 0972   REF  21  LAST  423   41,2402  4 4743 1  DSPABC   CS      TWO
 0973   REF   1              41,2403  0 2453 1           TC      COMPTEST
 0974   REF   3  LAST  423   41,2404  50 145 1           INDEX   NOUNADD
 0975                        41,2405  4 0002 1           CS      2
 0976   REF  41  LAST  348   41,2406  56 132 1           XCH     BUF      +2
 0977   REF  35  LAST  424   41,2407  4 4744 0  DSPAB    CS      ONE
 0978   REF   2  LAST  427   41,2410  0 2453 1           TC      COMPTEST
 0979   REF   4  LAST  427   41,2411  50 145 1           INDEX   NOUNADD
 0980                        41,2412  4 0001 1           CS      1
 0981   REF  42  LAST  427   41,2413  56 131 1           XCH     BUF      +1
 0982   REF   1              41,2414  0 2472 1  DSPA     TC      DECTEST
 0983   REF   1              41,2415  0 2515 1           TC      TSTFORDP
 0984   REF   5  LAST  427   41,2416  50 145 1           INDEX   NOUNADD
 0985                        41,2417  4 0000 0           CS      0
 0986   REF  43  LAST  427   41,2420  56 130 0  DSPCOM1  XCH     BUF
 0987   REF   1              41,2421  0 2434 0           TC      DSPCOM2
 0988   REF  36  LAST  427   41,2422  4 4744 0  DSPB     CS      ONE
 0989   REF   1              41,2423  0 2466 1           TC      DCOMPTST
 0990   REF   6  LAST  427   41,2424  50 145 1           INDEX   NOUNADD
 0991                        41,2425  4 0001 1           CS      1
 0992   REF   1              41,2426  0 2420 0           TC      DSPCOM1
 0993   REF  22  LAST  427   41,2427  4 4743 1  DSPC     CS      TWO
 0994   REF   2  LAST  427   41,2430  0 2466 1           TC      DCOMPTST
 0995   REF   7  LAST  427   41,2431  50 145 1           INDEX   NOUNADD
 0996                        41,2432  4 0002 1           CS      2
 0997   REF   2  LAST  427   41,2433  0 2420 0           TC      DSPCOM1
 0998   REF  23  LAST  427   41,2434  4 4743 1  DSPCOM2  CS      TWO                A  B  C  AB  ABC
 0999   REF  17  LAST  425   41,2435  6 1000 0           AD      VERBREG            -1 -0 +1 +2  +3    IN A
 1000   REF 109  LAST  423   41,2436  10 000 0           CCS     A                  +0 +0 +0 +1  +2     IN A AFTER CCS
 1001   REF   1              41,2437  0 2442 1           TC      DSPCOM3
 1002   REF   3  LAST  424   41,2440  0 0136 0           TC      ENTEXIT
 1003                        41,2441  0 2442 1           TC      +1
 1004   REF   1              41,2442  54 122 1  DSPCOM3  TS      DISTEM             +0,+1,+2 INTO DISTEM
 1005   REF 110  LAST  427   41,2443  50 000 1           INDEX   A
 1006   REF   4  LAST  424   41,2444  3 4310 1           CAF     R1D1
 1007   REF  27  LAST  425   41,2445  54 776 0           TS      DSPCOUNT
 1008   REF   2  LAST  427   41,2446  50 122 0           INDEX   DISTEM
 1009   REF  44  LAST  427   41,2447  4 0130 1           CS      BUF
 1010   REF   2  LAST  421   41,2450  0 3435 0           TC      DSPOCTWO
 1011   REF   3  LAST  427   41,2451  56 122 0           XCH     DISTEM
 1012   REF   2  LAST  427   41,2452  0 2436 1           TC      DSPCOM2 +2

R1013   COMPTEST ALARMS IF COMPONENT NUMBER OF VERB(LOAD OR OCT DISPLAY) IS
R1014   GREATER THAN THE HIGHEST COMPONENT NUMBER OF NOUN.
 1016   REF   4  LAST  317   41,2453  54 123 0  COMPTEST TS      SFTEMP1            - VERB COMP
 1017   REF  67  LAST  424   41,2454  22 002 0           LXCH    Q
 1022   REF   1              41,2455  0 2544 0  COMPTST1 TC      GETCOMP
 1023   REF   1              41,2456  0 4322 0           TC      LEFT5
 1024   REF  10  LAST  419   41,2457  7 6266 1           MASK    THREE              NOUN COMP
 1025   REF   5  LAST  427   41,2460  6 0123 1           AD      SFTEMP1          NOUN COMP - VERB COMP
 1026   REF 111  LAST  427   41,2461 10 000 0           CCS     A
 1027   REF  46  LAST  417   41,2462  0 0001 0           TC      L                NOUN COMP G/ VERB COMP
 1028   REF   4  LAST  416   41,2463  0 5701 1           TC      CCSHOLE
 1029   REF  14  LAST  423   41,2464  0 2400 1           TC      GODSPALM         NOUN COMP L/ VERB COMP
 1030   REF  47  LAST  428   41,2465  0 0001 0  NDCMPTST TC      L                NOUN COMP = VERB COMP


R1031   DCOMPTST ALARMS IF DECIMAL ONLY BIT (BIT4 OF COMP CODE NUMBER) = 1.
R1032   IF NOT, IT PERFORMS REGULAR COMPTEST.
 1033   REF   6  LAST  428   41,2466 54 123 0  DCOMPTST TS      SFTEMP1          - VERB COMP
 1034   REF  68  LAST  427   41,2467 22 002 0           LXCH    Q
 1035   REF   2  LAST  427   41,2470  0 2472 1           TC      DECTEST
 1036   REF   1              41,2471  0 2455 1           TC      COMPTST1

 1037                        41,2472  0 0006 1  DECTEST  EXTEND                   ALARMS IF DEC ONLY BIT = 1 (BIT4 OF COMP
 1038   REF  89  LAST  421   41,2473 22 156 0           QXCH    MPAC     +2      CODE NUMBER). RETURNS IF NOT.
 1039   REF   2  LAST  427   41,2474  0 2544 0           TC      GETCOMP
 1040   REF  35  LAST  386   41,2475  7 4727 0           MASK    BIT14
 1041   REF 112  LAST  428   41,2476 10 000 0           CCS     A
 1042   REF  15  LAST  428   41,2477  0 2400 1           TC      GODSPALM
 1043   REF  90  LAST  428   41,2500  0 0156 0           TC      MPAC     +2


 1044   REF  69  LAST  428   41,2501 22 002 0  DCTSTCYC LXCH    Q                ALARMS AND RECYCLES IF DEC ONLY BIT = 1
 1045   REF   3  LAST  428   41,2502  0 2544 0           TC      GETCOMP          ( BIT4 OF COMP CODE NUMBER). RETURNS
 1046   REF  36  LAST  428   41,2503  7 4727 0           MASK    BIT14            IF NOT.  USED BY LOAD VERBS.
 1047   REF 113  LAST  428   41,2504 10 000 0           CCS     A
 1048   REF   3  LAST  425   41,2505  0 6020 0           TC      ALMCYCLE
 1049   REF  48  LAST  428   41,2506  0 0001 0           TC      L


R1050   NOUNTEST ALARMS IF NC-LOAD BIT (BIT5 OF COMP CODE NUMBER) = 1.
R1051   IF NOT, IT RETURNS.
 1052   REF  70  LAST  428   41,2507 22 002 0  NOUNTEST LXCH    Q
 1053   REF   4  LAST  428   41,2510  0 2544 0           TC      GETCOMP
 1054   REF 114  LAST  428   41,2511 10 000 0           CCS     A
 1055   REF  49  LAST  428   41,2512  0 0001 0           TC      L
 1056   REF  50  LAST  428   41,2513  0 0001 0           TC      L
 1057   REF  16  LAST  428   41,2514  0 2400 1           TC      GODSPALM


 1058   REF  71  LAST  428   41,2515 22 002 0  TSTFORDP LXCH    Q                TEST FOR DP. IF SO, GET MINOR PART ONLY.
 1059   REF   6  LAST  424   41,2516  3 0146 1           CA      NNADTEM
 1060   REF  37  LAST  427   41,2517  6 4744 1           AD      ONE              IF NNADTEM = -1, CHANNEL TO BE SPECIFIED
 1061                        41,2520  0 0006 1           EXTEND
 1062   REF   1              41,2521  1 2533 1           BZF     CHANDSP
 1063   REF   4  LAST  420   41,2522 50 140 1           INDEX   MIXBR
 1064                        41,2523  0 2523 1           TC      +0
 1065                        41,2524  0 2526 1           TC      +2               NORMAL
 1066   REF  51  LAST  428   41,2525   0 0001 0             TC       L               MIXED CASE ALREADY HANDLED IN MIXNOUN
 1067   REF   1              41,2526   0 3076 0             TC       SFRUTNOR
 1068   REF   2  LAST  423   41,2527   0 2306 0             TC       DPTEST
 1069   REF  52  LAST  429   41,2530   0 0001 0             TC       L               NO DP
 1070   REF   8  LAST  427   41,2531  24 145 1              INCR     NOUNADD         DP     E+1 INTO NOUNADD FOR MINOR PART.
 1071   REF  53  LAST  429   41,2532   0 0001 0             TC       L


 1072   REF   3  LAST  421   41,2533   3 1016 1  CHANDSP    CA       NOUNCADR
 1073   REF   7  LAST  282   41,2534   7 4775 1             MASK     LOW9
 10731                      41,2535   0 0006 1             EXTEND
 10732  REF 115  LAST  428   41,2536   5 0000 1             INDEX    A
 1074                        41,2537  00 000 1              READ     0
 1075   REF 116  LAST  429   41,2540   4 0000 0             CS       A
 1076   REF   3  LAST  427   41,2541   1 2420 1             TCF      DSPCOM1


 1077   REF   2  LAST  316   41,2542    00147 0  COMPICK    ADRES    NNTYPTEM
 1078   REF   7  LAST  428   41,2543    00146 1             ADRES    NNADTEM

 1079   REF   5  LAST  428   41,2544  50 140 1   GETCOMP    INDEX    MIXBR           NORMAL                   MIXED
 1080   REF   1              41,2545   3 2541 0             CAF      COMPICK -1      ADRES NNTYPTEM           ADRES NNADTEM
 1081   REF 117  LAST  429   41,2546  50 000 1              INDEX    A
 1082                        41,2547   3 0000 1             CA       0               C(NNTYPTEM)              C(NNADTEM)
 1083   REF   4  LAST  244   41,2550   7 4341 1             MASK     H15             GET H15 OF NNTYPTAB(NORM)OF NNADTAB(MIX)
 1084   REF  72  LAST  428   41,2551   0 0002 0             TC       Q


 1085   REF   5  LAST  428   41,2552   0 2544 0  DECDSP     TC       GETCOMP
 1086   REF   2  LAST  427   41,2553   0 4322 0             TC       LEFT5
 1087   REF  11  LAST  427   41,2554   7 6266 1             MASK     THREE
 1088   REF   4  LAST  423   41,2555  54 117 1              TS       DECOUNT         COMP NUMBER INTO DECOUNT
 1089   REF   1              41,2556  54 122 1   DSPDCGET   TS       DECTEM          PICKS UP DATA
 1090   REF   9  LAST  429   41,2557   6 0145 1             AD       NOUNADD         DECTEM  1COMP +0, 2COMP +1, 3COMP +2
 1091   REF 118  LAST  429   41,2560  50 000 1              INDEX    A
 1092                        41,2561   4 0000 0             CS       0
 1093   REF   2  LAST  429   41,2562  50 122 0              INDEX    DECTEM
 1094   REF   2  LAST  317   41,2563  57 002 1              XCH      XREG            CANT USE BUF SINCE DMP USES IT.
 1095   REF   3  LAST  429   41,2564  10 122 1              CCS      DECTEM
 1096   REF   1              41,2565   0 2556 0             TC       DSPDCGET        MORE TO GET
 1097   REF  65  LAST  420   41,2566   3 4746 0  DSPDCPUT   CAF      ZERO            DISPLAYS DATA
 1098   REF  91  LAST  428   41,2567  54 155 1              TS       MPAC      +1    DECOUNT 1COMP +0, 2COMP +1, 3COMP +2
 1099   REF  92  LAST  429   41,2570  54 156 1              TS       MPAC      +2
 1100   REF   5  LAST  429   41,2571  50 117 0              INDEX    DECOUNT
 1101   REF   5  LAST  427   41,2572   3 4310 1             CAF      R1D1
 1102   REF  28  LAST  427   41,2573  54 776 0              TS       DSPCOUNT
 1103   REF   6  LAST  429   41,2574  50 117 0              INDEX    DECOUNT
 1104   REF   3  LAST  429   41,2575   4 1002 0             CS       XREG
 1105   REF  93  LAST  429   41,2576  54 154 0              TS       MPAC
 1106   REF   1              41,2577   0 3117 0             TC       SFCONUM         2X( SF CON NUMB ) IN A
```

```
L       PINBALL GAME  BUTTONS AND LIGHTS                                                      USER'S PAGE NO.  29      FO S4

 1107    REF   7  LAST  428   41,2600  54 123 0           TS       SFTEMP1
 1108                         41,2601  0 0006 1           EXTEND                     SWITCH BANKS TO SF CONSTANT TABLE
 1109    REF   1              41,2602  3 2614 0           DCA      GTSFOUTL             READING ROUTINE.
 1110    REF   6  LAST  424   41,2603  52 006 0           DXCH     Z                 LOADS SFTEMP1, SFTEMP2.
 1111    REF   6  LAST  429   41,2604  50 140 1           INDEX    MIXBR
 1112                         41,2605  0 2605 0           TC       +0
 1113    REF   1              41,2606  0 2611 0           TC       DSPSFNOR
 1114    REF   2  LAST  423   41,2607  0 3104 1           TC       SFRUTMIX
 1115    REF   1              41,2610  0 2624 0           TC       DECDSP3

 1116    REF   2  LAST  429   41,2611  0 3076 0  DSPSFNOR TC       SFRUTNOR
 1117    REF   2  LAST  430   41,2612  0 2624 0           TC       DECDSP3

 1118    REF  29  LAST  429     0776                      EBANK=   DSPCOUNT
 1119    REF   1              41,2613   02146 0  GTSFOUTL 2CADR    GTSFOUT
 1119    REF   1              41,2614   64101 0


 1120    REF  85  LAST  424   41,2615  0 4607 1  DSPDCEND TC       BANKCALL          ALL SFOUT ROUTINES END HERE
 1121    REF   1              41,2616   61255 1           CADR     DSPDECWD
 1122    REF   7  LAST  429   41,2617  10 117 1           CCS      DECOUNT
 1123                         41,2620  0 2622 0           TC       +2
 1124    REF   4  LAST  427   41,2621  0 0136 0           TC       ENTEXIT
 1125    REF   8  LAST  430   41,2622  54 117 1           TS       DECOUNT
 1126    REF   1              41,2623  0 2566 0           TC       DSPDCPUT          MORE TO DISPLAY


 1127    REF 119  LAST  429   41,2624  50 000 1  DECDSP3  INDEX    A
 1128    REF   1              41,2625  3 2627 0           CAF      SFOUTABR
 1129    REF   3  LAST  421   41,2626  0 4631 1           TC       BANKJUMP

 1130    REF   1              41,2627   61445 0  SFOUTABR CADR     PREDSPAL          ALARM IF DEC DISP WITH OCTAL ONLY NOUN
 1131    REF   1              41,2630   62615 1           CADR     DSPDCEND
 1132    REF   1              41,2631   60604 0           CADR     DEGOUTSF
 1133    REF   1              41,2632   60726 1           CADR     ARTOUTSF
 1134    REF   1              41,2633   60737 1           CADR     DP1OUTSF
 1135    REF   1              41,2634   60744 0           CADR     DP2OUTSF
 1136    REF   1              41,2635   60624 1           CADR     LRPOSOUT
 1137    REF   1              41,2636   60746 1           CADR     DP3OUTSF
 1138    REF   1              41,2637   65241 0           CADR     HMSOUT
 1139    REF   1              41,2640   65314 1           CADR     M/SOUT
 1140    REF   2  LAST  430   41,2641   60744 0           CADR     DP2OUTSF
 11401   REF   1              41,2642   60733 0           CADR     AROUT1SF
 11402   REF   1              41,2643   60761 1           CADR     2INTOUT
 11403   REF   1              41,2644   60612 1           CADR     360-CDUO
 11404   REF   1              41,2645   60634 0           CADR     RRANGOUT
 11405   REF   1              41,2646   60651 0           CADR     RRDOTOUT
 1141                         41,2647            ENDRTOUT EQUALS
```

```
R1142           THE FOLLOWING IS ATYPICAL SF ROUTINE . IT USES MPAC. LEAVES RESU
R1143    LTS IN MPAC, MPAC+1. ENDS WITH TC DSPDCEND


 1144    REF   2  LAST  417    40,2604                      SETLOC BLANKCON +1

 11445   REF   2 LAST  410 TO  419:    341   341*           COUNT* $$/PIN
R1145       DEGOUTSF SCALES BY .18 THE LOW 14 BITS OF ANGLE , ADDING .18 FOR
R1146    NUMBERS IN THE NEGATIVE (AGC) RANGE.

 1147    REF  66  LAST  429    40,2604  3 4746 0  DEGOUTSF CAF     ZERO
 1148    REF  94  LAST  429    40,2605  54 156 1           TS      MPAC     +2      SET INDEX FOR FULL SCALE
 1149    REF   1               40,2606  0 2701 0           TC      FIXRANGE
 1150                          40,2607  0 2611 0           TC      +2               NO AUGMENT NEEDED (SFTEMP1 AND 2 ARE 0)
 1151    REF   1               40,2610  0 2674 0           TC      SETAUG           SET AUGMENTER ACCORDING TO C(MPAC +2)
 11511   REF   1               40,2611  0 2712 1           TC      DEGCOM

R1152    360-CDUO COMPUTES 360 - CDU ANGLE IN MPAC, STORES RESULT IN MPAC AND
R11521   GOES TO DEGOUTSF.

 11522   REF   1               40,2612  0 2614 0  360-CDUO TC      360-CDU
 11523   REF   2  LAST  430    40,2613  0 2604 1           TC .    DEGOUTSF

 11524   REF  95  LAST  431    40,2614. 3 0154 1  360-CDU  CA      MPAC
 11525   REF   6  LAST  393    40,2615  7 4724 0           MASK    POSMAX           IF ANGLE IS 0 OR 180 DEGREES, DO NOTHING
 11526                         40,2616  0 0006 1           EXTEND
 11527   REF   1               40,2617  1 2623 0           BZF     360-CDUE
 11528   REF  96  LAST  431    40,2620  4 0154 0           CS      MPAC             COMPUTE 360 DEGREES MINUS ANGLE
 11529   REF  38  LAST  428    40,2621  6 4744 1           AD      ONE
 115291  REF  97  LAST  431    40,2622  54 154 0           TS      MPAC
 115292  REF  73  LAST  429    40,2623  0 0002 0  360-CDUE TC      Q

R1153    LRPOSOUT DISPLAYS +0,1,2,OR 3 (WHOLE) FOR CHANNEL 33,BITS 7-6 = 11,10,
R1154    01,00 RESPECTIVELY.

 1155                          40,2624  0 0006 1  LRPOSOUT EXTEND
 1156    REF   6  LAST  289    40,2625  00 033 1           READ    CHAN33
 1157                          40,2626  0 0006 1           EXTEND
 1158    REF  18  LAST  387    40,2627  7 4733 0           MP      BIT10            BITS 7-6 TO BITS 2-1
 1159                          40,2630  4 0000 0           COM
 1160    REF  12  LAST  429    40,2631  7 6266 1           MASK    THREE
 1161    REF  98  LAST  431    40,2632  54 154 0           TS      MPAC
 1162    REF   2  LAST  430    40,2633  0 2726 0           TC      ARTOUTSF         DISPLAY AS WHOLE

R1163    RRANGOUT AND RRDOTOUT CONVERT RR RANGE AND RANGE RATE FROM SP 15 BIT
R11633   MAGNITUDE TO DP AND THEN SCALE FOR DISPLAY.

 11638   REF   1               40,2634  0 2664 1  RRANGOUT TC      RRSPTODP         CONVERT TO DP.
 11639   REF  27  LAST  335    40,2635  4 0110 0           CS      RADMODES         BIT 3 OF FLAG12 = HI SCALE
 11643   REF  22  LAST  311    40,2636  7 4742 0           MASK    BIT3
 11646  REF 120  LAST  430    40,2637  10 000 0            CCS      A
 11649  REF   1               40,2640  0 2646 1            TC       SCALELO            DATA IS IN LO SCALE.
 11653  REF  99  LAST  431   .40,2641  52 155 1            DXCH     MPAC               DATA IS IN HI SCALE, MP BY B.
 11656  REF 121  LAST  432    40,2642  20 001 1            DAS      A
 11659  REF 122  LAST  432    40,2643  20 001 1            DAS      A
 11663  REF 123  LAST  432    40,2644  20 001 1            DAS      A
 11666  REF 100  LAST  432    40,2645  52 155 1            DXCH     MPAC
 11669  REF   2  LAST  412    40,2646  0 7124 1  SCALELO   TC       DMP                SCALE FOR DISPLAY,
 11673  REF   8  LAST  430    40,2647   00123 1            ADRES    SFTEMP1
 11676  REF   1               40,2650  0 2740 0            TC       L14/OUT            AND GO TO ARITHDP1.

 11679  REF   2  LAST  431    40,2651  0 2664 1  RRDOTOUT  TC       RRSPTODP           CONVERT TO DP.
 11683                        40,2652  0 0006 1            EXTEND
 11686  REF   1               40,2653  4 2663 1            DCS      BIASRDOT           SUBTRACT BIAS OF 17000 COUNTS.
 11689  REF 101  LAST  432    40,2654  20 155 1            DAS      MPAC
 1169   REF   5  LAST  412    40,2655  3 4354 1            CAF      TEN                MULTIPLY DATA BY TEN TO DISPLAY TENTHS
 11691  REF   2  LAST  412    40,2656  0 7330 0            TC       SHORTMP              FPS - (ATTEMPT TO MULTIPLY DISPLAY
 11692  REF 102  LAST  432    40,2657  52 156 1            DXCH     MPAC +1                     SF BY TEN PRODUCED SF GREATER
 116921 REF 103  LAST  432    40,2660  52 155 1            DXCH     MPAC                        THAN 16383)
 11693  REF   2  LAST  432    40,2661  0 2646 1            TC       SCALELO            SCALE FOR DISPLAY.
 11696                        40,2662   00001 0  BIASRDOT  2DEC     17000
 11696                        40,2663   01150 1

 11699  REF   7  LAST  431    40,2664  3 4724 1  RRSPTODP  CAF      POSMAX             CONVERT SP 15 BIT MAG TO DP.
 1171   REF 104  LAST  432    40,2665  7 0154 0            MASK     MPAC
 11713  REF 105  LAST  432    40,2666  54 155 1            TS       MPAC +1
 11716  REF 106  LAST  432    40,2667 .3 0154 1            CA       MPAC
 11719                        40,2670  6 0000 1            DOUBLE
 11723  REF  20  LAST  308    40,2671  7 4744 0            MASK     BIT1
 11726  REF 107  LAST  432    40,2672  54 154 0            TS       MPAC
 11729  REF  74  LAST  431    40,2673  0 0002 0            TC       Q

 1174                         40,2674  0 0006 1  SFTAUG    EXTEND                      LOADS SFTEMP1 AND SFTEMP2 WITH THE
 1175   REF 108  LAST  432    40,2675  5 0156 0            INDEX    MPAC      +2        DP AUGMENTER CONSTANT
 1176   REF   1               40,2676  3 2723 0            DCA      DEGTAB
 1177   REF   9  LAST  432    40,2677  52 124 1            DXCH     SFTEMP1
 1178   REF  75  LAST  432    40,2700  0 0002 0            TC       Q

 1179   REF 109  LAST  432    40,2701  10 154 0  FIXRANGE  CCS      MPAC               IF MPAC IS + RETURN TO L+1
 1180   REF  76  LAST  432    40,2702  0 0002 0            TC       Q                  IF MPAC IS - RETURN TO L+2 AFTER
 1181   REF  77  LAST  432    40,2703  0 0002 0            TC       Q                  MASKING OUT THE SIGN BIT
 1182                         40,2704  1 2705 0            TCF      +1
 1183   REF  25  LAST  420    40,2705  4 4726 1            CS       BIT15
 1184   REF 110  LAST  432    40,2706  7 0154 0            MASK     MPAC
 1185   REF 111  LAST  432    40,2707  54 154 0            TS       MPAC
 1186   REF  78  LAST  432    40,2710  50 002 0            INDEX    Q
 1187                         40,2711  0 0001 0            TC       1

 1188                         40,2712  0 0006 1  DEGCOM    EXTEND                      LOADS MULTIPLIER , DOES SHORTMP, AND
 1189   REF 112  LAST  432    40,2713  5 0156 0            INDEX    MPAC      +2        ADDS AUGMENTER.
 1190   REF   2  LAST  432    40,2714  3 2723 0             DCA    DEGTAB
 1191   REF 113  LAST  432    40,2715  52 155 1             DXCH   MPAC                    ADJUSTED ANGLE IN A
 1192   REF   3  LAST  432    40,2716  0 7330 0             TC     SHORTMP
 1193   REF  10  LAST  432    40,2717  52 124 1             DXCH   SFTEMP1
 1194   REF 114  LAST  433    40,2720  20 155 1             DAS    MPAC
 1195   REF   1               40,2721  0 2731 0             TC     SCOUTEND


 1196                         40,2722   05605 1  DEGTAB     OCT    05605                   HI PART OF      .18
 1197                         40,2723   03656 1             OCT    03656                   LOW PART OF     .18
 1198                         40,2724   16314 0             OCT    16314                   HI PART OF      .45
 1199                         40,2725   31463 1             OCT    31463                   LO PART OF      .45

 1201   REF  11  LAST  433    40,2726  52 124 1  ARTOUTSF   DXCH   SFTEMP1                 ASSUMES POINT AT LEFT OF DP SFCON
 1202   REF 115  LAST  433    40,2727  52 155 1             DXCH   MPAC
 1203   REF   1               40,2730  0 4406 1             TC     PRSHRTMP                IF C(A) = -0, SHORTMP FAILS TO GIVE -0.
 1204   REF  22  LAST  425    40,2731  0 4626 1  SCOUTEND   TC     POSTJUMP
 1205   REF   2  LAST  430    40,2732   62615 1             CADR   DSPDCEND

 12051  REF  12  LAST  433    40,2733  52 124 1  AROUT1SF   DXCH   SFTEMP1                 ASSUMES POINT BETWEEN HI AND LO PARTS OF
 12052  REF 116  LAST  433    40,2734  52 155 1             DXCH   MPAC                    DP SFCON. SHIFTS RESULTS LEFT 14, BY
 12053  REF   2  LAST  433    40,2735  0 4406 1             TC     PRSHRTMP                TAKING RESULTS FROM MPAC+1, MPAC+2.
 12054  REF   2  LAST  432    40,2736  0 2740 0             TC     L14/OUT


 1206   REF   1               40,2737  0 2752 0  DP1OUTSF   TC     DPOUT                   SCALES MPAC, MPAC +1 BY DP SCALE FACTOR
 1207   REF 117  LAST  433    40,2740  56 156 0  L14/OUT    XCH    MPAC     +2             IN SFTEMP1, SFTEMP2. THEN SCALE RESULT
 1208   REF 118  LAST  433    40,2741  56 155 0             XCH    MPAC     +1             BY B14.
 1209   REF 119  LAST  433    40,2742  54 154 0             TS     MPAC
 1210   REF   2  LAST  433    40,2743  0 2731 0             TC     SCOUTEND


 1211   REF   2  LAST  433    40,2744  0 2752 0  DP2OUTSF   TC     DPOUT                   SCALES MPAC , MPAC +1 BY DP SCALE FACTOR
 1212   REF   3  LAST  433    40,2745  0 2731 0             TC     SCOUTEND


 1213   REF   3  LAST  433    40,2746  0 2752 0  DP3OUTSF   TC     DPOUT                   ASSUMES POINT BETWEEN BITS 7-8 OF HIGH
 1214   REF   9  LAST  423    40,2747  3 6263 0             CAF    SIX                     LEFT BY 7, ROUNDS MPAC+2 INTO MPAC+1.
 1215   REF   1               40,2750  0 3202 1             TC     TPLEFTN                 SHIFT LEFT 7.
 1216   REF   4  LAST  433    40,2751  0 2731 0             TC     SCOUTEND


 12165  REF 120  LAST  433       0162            MPAC+6     =      MPAC +6                 USE MPAC +6 INSTEAD OF OVFIND

 1217   REF  79  LAST  432    40,2752  56 002 0  DPOUT      XCH    Q
 1218   REF   1               40,2753  54 162 0             TS     MPAC+6
 1219   REF   1               40,2754  0 2776 0             TC     READLO                  GET FRESH DATA FOR BOTH HI AND LO.
 1220   REF   2  LAST  287    40,2755  0 7300 0             TC     TPAGREE                 MAKE DP DATA AGREE
 1221   REF   3  LAST  432    40,2756  0 7124 1             TC     DMP
 1222   REF  13  LAST  433    40,2757   00123 1             ADRES  SFTEMP1
 1223    REF   2  LAST  433   40,2760  0 C162 1            TC      MPAC+6
R12231   THE FCLLOWING ROUTINF OISPLAYS TWO CONTIGUOUS SP POSITIVE INTEGERS
R12232   AS TWO POSITIVE DECIMAL INTEGERS IN RXD1-RXD2 AND RXD4-RXD5 (RXD3 IS
R12233   BLANKED). THE INTEGER IN THE LOWER NUMBERED ADDRESS IS DISPLAYED IN
R12234   RXD1-RXD2.

 12235   REF   3  LAST  424   40,2761  0 2525 1  2INTOUT   TC      5BLANK          TO BLANK RXD3
 122355  REF   2  LAST  414   40,2762  0 2402 0            TC      +ON             TURN ON + SIGN
 12236   REF 121  LAST  433   40,2763  3 0154 1            CA      MPAC
 12237   REF   1              40,2764  0 3335 1            TC      DSPDECVN        DISPLAY 1ST INTEGER (LIKE VERB AND NOUN)
 122371  REF  13  LAST  431   40,2765  4 6266 1            CS      THREE
 122372  REF   9  LAST  430   40,2766  50 117 0            INDEX   DECOUNT
 122373  REF   6  LAST  429   40,2767  6 4310 1            AD      R1D1            RXD4
 122374  REF  30  LAST  430   40,2770  54 776 0            TS      DSPCOUNT
 122375  REF   2  LAST  433   40,2771 ·0 2776 0            TC      READLO          GET 2ND INTEGER
 122376  REF 122  LAST  434   40,2772  3 0155 0            CA      MPAC +1
 122377  REF   2  LAST  434   40,2773  0 3335 1            TC      DSPDECVN        DISPLAY 2ND INTEGER (LIKE VERB AND NOUN)
 122378  REF  23  LAST  433   40,2774  0 4626 1            TC      POSTJUMP
 122379  REF   3  LAST  433   40,2775   62617 0            CADR    DSPDCEND +2


R1224    READLC PICKS UP FRESH DATA FOR BOTH HI AND LO AND LEAVES IT IN
R1225    MPAC, MPAC+1. THIS IS NEEDED FOR·TIME DISPLAY. IT ZEROES MPAC+2, BUT
R1226    DOES NCT FORCE TPAGREF.

 1227    REF  80  LAST  433   40,2776  56 C02 0  READLO    XCH     Q
 1228    REF   6  LAST  100   40,2777  54 144 1            TS      TEM4
 1229    REF   7  LAST  430   40,3000  50 140 1            INDEX   MIXBR
 1230                         40,3001  0 3001 0            TC      +0
 1231    REF   1              40,3002  0 3016 0            TC      RDLONOR
 1232    REF  10  LAST  434   40,3003  50 117 0            INDEX   DECOUNT
 1233    REF   3  LAST  423   40,3004  3 C150 0            CA      IDAD1TEM        GET IDADDTAB ENTRY FOR COMP K OF NOUN.
 1234    REF   4  LAST  423   40,3005  7 4347 1            MASK    LOW11           E SUBK
 1235    REF   2  LAST  423   40,3006  0 4304 1            TC      SETEBANK        SET EB, LEAVE EADRES IN A.
 1236                         40,3007  0 C006 1  READLO1   EXTEND                  MIXED          NORMAL
 1237    REF 124  LAST  432   40,3010  5 0000 1            INDEX   A               C(ESUBK)       C(E)
 1238                         40,3011  3 0001 0            DCA     0               C((E SUBK)+1)      C(E+1)
 1239    REF 123  LAST  434   40,3012  52 155 1            DXCH    MPAC
 1240    REF  67  LAST  431   40,3013  3 4746 0            CAF     ZERO
 1241    REF 124  LAST  434   40,3014  54 156 1            TS      MPAC     +2
 1242    REF   7  LAST  434   40,3015  0 C144 0            TC      TEM4

 1243    REF  10  LAST  429   40,3016  3 C145 1  RDLONOR   CA      NOUNADD         F
 1244    REF   1              40,3017  0 3007 0  ENDRDLO   TC      READLO1


 1245                         42,3241                      BANK    42
 124501  REF   3  LAST  316   42,2000                      SETLOC  PINBALL3
 1245C2                       42,3241                      BANK
 12455 REF   1                                         COUNT* $$/PIN
 1246  REF  86  LAST  430   42,3241  0 4607 1  HMSOUT  TC     BANKCALL        READ FRESH DATA FOR HI AND LO INTO MPAC,
 1247  REF   3  LAST  434   42,3242   6C776 1          CADR   READLO          MPAC+1.
 1248  REF   3  LAST  433   42,3243  C 7300 0          TC     TPAGREF         MAKE DP DATA AGREE
 1249  REF   1              42,3244  0 3430 0          TC     SFPSECNR        LEAVE FRACT SEC/60 IN MPAC, MPAC+1.LEAVE
A1250                                                                         WHOLE MIN IN BIT13 OF LOTEMOUT AND ABOVE
 1251  REF   4  LAST  433   42,3245  0 7124 1          TC     DMP             USE ONLY FRACT SEC/60 MOD 60
 1252  REF   1              42,3246   03302 0          ADRES  SECON2          MULT BY .06
 1253  REF   4  LAST  424   42,3247  3 4312 0          CAF    R3D1            GIVES CENTI-SEC/10EXP5 MOD 60
 1254  REF  31  LAST  434   42,3250  54 776 0          TS     DSPCOUNT
 1255  REF  87  LAST  435   42,3251  C 4607 1          TC     BANKCALL        DISPLAY SEC MOD 60
 1256  REF   2  LAST  430   42,3252   61255 1          CADR   DSPDECWD
 1257  REF   1              42,3253  0 3446 1          TC     SEPMIN          REMOVE REST OF SECONDS
 1258  REF   1              42,3254  3 3304 0          CAF    MINCON2         LEAVE FRACT MIN/60 IN MPAC+1. LEAVE
 1259  REF 125  LAST  434   42,3255  56 154 1          XCH    MPAC            WHOLE HOURS IN MPAC.
 1260  REF   1              42,3256  55'006 1          TS     HITEMOUT        SAVE WHOLE HOURS.
 1261  REF   2  LAST  435   42,3257  3 3305 1          CAF    MINCON2 +1
 1262  REF 126  LAST  435   42,3260  56 155 0          XCH    MPAC     +1     USE ONLY FRACT MIN/60 MOD 60
 1263  REF   3  LAST  433   42,3261  0 4406 1          TC     PRSHRTMP        IF C(A) = -0, SHORTMP FAILS TO GIVE -0.
A1264                                                                         MULT BY .0006
 1265  REF   3  LAST  424   42,3262  3 4311 0          CAF    R2D1            GIVES MIN/10EXP5 MOD 60
 1266  REF  32  LAST  435   42,3263  54 776 0          TS     DSPCOUNT
 1267  REF  88  LAST  435   42,3264  C 4607 1          TC     BANKCALL        DISPLAY MIN MOD 60
 1268  REF   3  LAST  435   42,3265   61255 1          CADR   DSPDECWD
 1269                       42,3266  C 0006 1          EXTEND                 MINUTES, SECONDS HAVE BEEN REMOVED
 1270  REF   1              42,3267  3 3311 1          DCA    HRCON1
 1271  REF 127  LAST  435   42,3270  52 155 1          DXCH   MPAC
 1272  REF   2  LAST  435   42,3271  3 1006 0          CA     HITEMOUT        USE WHOLE HOURS
 1273  REF   4  LAST  435   42,3272  0 4406 1          TC     PRSHRTMP        IF C(A) = -0, SHORTMP FAILS TO GIVE -0.
A1274                                                                         MULT BY .16384
 1275  REF   7  LAST  434   42,3273  3 4310 1          CAF    R1D1            GIVES HOURS/10EXP5
 1276  REF  33  LAST  435   42,3274  54 776 0          TS     DSPCOUNT
 1277  REF  89  LAST  435   42,3275  C 4607 1          TC     8ANKCALL        USE REGULAR DSPDECWD, WITH ROUND OFF.
 1278  REF   4  LAST  435   42,3276   61255 1          CADR   DSPDECWD
 1279  REF   5  LAST  430   42,3277  0 0136 0          TC     ENTEXIT

 1280                       42,3300   25660 0  SECON1  2DEC*  1.666666666 E-4 812*  2EXP12/6000
 1280                       42,3301   31742 1
 1281                       42,3302   01727 1  SECON2  OCT    01727           .06 FOR SECONDS DISPLAY
 1282                       42,3303   01217 1          OCT    01217
 1283                       42,3304   00C11 1  MINCON2 OCT    00011           .0006 FOR MINUTES DISLPAY
 1284                       42,3305   32445 0          OCT    32445
 1285                       42,3306   02104 0  MINCON1 OCT    02104           .066..66 UPPED BY 2EXP-28
 1286                       42,3307   10422 1          OCT    10422
 1287                       42,3310   05174 0  HRCON1  2DEC   .16384
 1287                       42,3311   13261 0
 1288                       42,3312   CCC00 1          OCT    00000
 1289                       42,3313   00062 0  RNDCON  OCT    00062           .5 SEC
 1290   REF  90  LAST  435    42,3314   0 4607 1  M/SOUT    TC      BANKCALL           READ FRESH DATA FOR HI AND LO INTO MPAC,
 1291   REF   4  LAST  435    42,3315    60776 1            CADR    READLO             MPAC+1.
 1292   REF   4  LAST  435    42,3316   0 7300 0            TC      TPAGREE            MAKE DP DATA AGREE
 1293   REF 128  LAST  435    42,3317  10 154 0             CCS     MPAC               IF MAG OF (MPAC, MPAC+1) G/ 59 M 59 S,
 1294                         42,3320   0 3322 1            TC      +2                 DISPLAY 59B59, WITH PROPER SIGN.
 1295   REF   1               42,3321   0 3353 1            TC      M/SNORM            MPAC = +0. L/ 59M58.5S
 1296   REF   1               42,3322   6 3410 1            AD      M/SCON1            - HI PART OF (59M58.5S) +1  FOR CCS
 1297   REF 125  LAST  434    42,3323  10 000 0             CCS     A                  MAG OF MPAC - HI PART OF (59M58.5S)
 1298   REF   1               42,3324   0 3337 0            TC      M/SLIMIT           G/ 59M58.5S
 1299   REF   2  LAST  436    42,3325   0 3353 1            TC      M/SNORM            ORIGINAL MPAC = -0. L/ 59M58.5S
 1300   REF   3  LAST  436    42,3326   0 3353 1            TC      M/SNORM            L/ 59M58.5S
 1301   REF 129  LAST  436    42,3327  10 155 1             CCS     MPAC      +1       MAG OF MPAC = HI PART OF 59M58.5S
 1302                         42,3330   0 3332 0            TC      +2
 1303   REF   4  LAST  436    42,3331   0 3353 1            TC      M/SNORM            MPAC+1 = +0. L/ 59M58.5S
 1304   REF   1               42,3332   6 3411 0            AD      M/SCON2            - LO PART OF (59M58.5S) +1  FOR CCS
 1305   REF 126  LAST  436    42,3333  10 000 0             CCS     A                  MAG OF MPAC+1 - LO PART OF (59M58.5S)
 1306   REF   2  LAST  436    42,3334   0 3337 0            TC      M/SLIMIT           G/ 59M58.5S
 1307   REF   5  LAST  436    42,3335   0 3353 1            TC      M/SNORM            ORIGINAL MPAC+1 = -0. L/ 59M58.5S
 1308   REF   6  LAST  436    42,3336   0 3353 1            TC      M/SNORM            L/ 59M58.5S
 1309   REF 130  LAST  436    42,3337  10 154 0   M/SLIMIT  CCS     MPAC               = 59M58.5S    LIMIT
 1310   REF   1               42,3340   3 3413 1            CAF     M/SCON3            MPAC CANNOT BE +/- 0 AT THIS POINT.
 1311   REF   1               42,3341   0 3350 1            TC      +LIMIT             FORCE MPAC, MPAC+1 TO +/- 59M59.5S
 1312   REF   2  LAST  436    42,3342   4 3413 0            CS      M/SCON3
 1313   REF 131  LAST  436    42,3343  54 154 0             TS      MPAC               WILL DISPLAY 59M59S IN DSPDECNR
 1314   REF   3  LAST  436    42,3344   4 3414 1            CS      M/SCON3  +1
 1315   REF 132  LAST  436    42,3345  54 155 1   LIMITCOM  TS      MPAC      +1
 1316   REF   1               42,3346   3 3412 0            CAF     NORMADR            SET RETURN TO M/SNORM+1.
 1317   REF   2  LAST  435    42,3347   0 3431 1            TC      SEPSECNR +1
 1318   REF 133  LAST  436    42,3350  54 154 0   +LIMIT    TS      MPAC
 1319   REF   4  LAST  436    42,3351   3 3414 0            CAF     M/SCON3  +1
 1320   REF   1               42,3352   0 3345 0            TC      LIMITCOM
 1321   REF   1               42,3353   0 3415 1  M/SNORM   TC      SEPSEC             LEAVE FRACT SEC/60 IN MPAC,MPAC+1. LEAVE
A1322                                                                                  WHOLE MIN IN BIT13 OF LOTEMOUT AND ABOVE
 1323   REF   1               42,3354   3 3406 0            CAF     HISECON            USE ONLY FRACT SEC/60 MOD 60
 1324   REF   4  LAST  433    42,3355   0 7330 0            TC      SHORTMP            MULT BY .6 + 2EXP-14
 1325   REF  14  LAST  434    42,3356   4 6266 1            CS      THREE              GIVES SEC/100 MOD 60
 1326   REF  34  LAST  435    42,3357  26 776 0             ADS     DSPCOUNT           DSPCOUNT ALREADY SET TO RXD1
 1327   REF  91  LAST  436    42,3360   0 4607 1            TC      BANKCALL           DISPLAY SEC MOD 60 IN D4D5.
 1328   REF   1               42,3361    61315 1            CADR    DSPDC2NR
 1329   REF  68  LAST  434    42,3362   3 4746 0            CAF     ZERO
 1330   REF   5  LAST  417    42,3363  54 124 1             TS      CODE
 1331   REF  24  LAST  427    42,3364   4 4743 1            CS      TWO
 1332   REF  11  LAST  434    42,3365  50 117 0             INDEX   DECOUNT
 1333   REF   8  LAST  435    42,3366   6 4310 1            AD      R1D1               RXD3
 1334   REF   3  LAST  417    42,3367  54 143 0             TS      COUNT
 1335   REF  92  LAST  436    42,3370   0 4607 1            TC      BANKCALL           BLANK MIDDLE CHAR
 1336   REF   3  LAST  417    42,3371    61351 1            CADR    DSPIN
 1337   REF   2  LAST  435    42,3372   0 3446 1            TC      SEPMIN             REMOVE REST OF SECONDS
 1338   REF 134  LAST  436    42,3373  56 155 0             XCH     MPAC      +1       LEAVE FRACT MIN/60 IN MPAC+1
 1339                         42,3374   0 0006 1            EXTEND                     USE ONLY FRACT MIN/60 MOD 60
```

```
1340  REF   1               42,3375  7 3407 0            MP      HIMINCON          MULT BY .6 + 2EXP-7
1341  REF 135  LAST  436    42,3376  52 155 1            DXCH    MPAC              GIVES MIN/100 MOD 60
1342  REF  12  LAST  436    42,3377  50 117 0            INDEX   DECOUNT
1343  REF   9  LAST  436    42,3400  3 4310 1            CAF     R1D1              RXD1
1344  REF  35  LAST  436    42,3401  54 776 0            TS      DSPCOUNT
1345  REF  93  LAST  436    42,3402  0 4607 1            TC      BANKCALL          DISPLAY MIN MOD 60 IN D1D2.
1346  REF   2  LAST  436    42,3403   61315 1            CADR    DSPDC2NR
1347  REF  24  LAST  434    42,3404  0 4626 1            TC      POSTJUMP
1348  REF   4  LAST  434    42,3405   62617 0            CADR    DSPDCEND +2

1349                        42,3406   23147 1  HISECON   OCT     23147             .6 + 2EXP-14
1350                        42,3407   23346 1  HIMINCON  OCT     23346             .6 + 2EXP-7

1351                        42,3410   77753 0  M/SCON1   OCT     77753             - HI PART OF (59M58.5S) +1
1352                        42,3411   41126 1  M/SCON2   OCT     41126             - LO PART OF (59M58.5S) +1
1353  REF   7  LAST  436    42,3412   03354 0  NORMADR   ADRES   M/SNORM +1
1354                        42,3413   00025 0  M/SCON3   OCT     00025             59M 59.5S
1355                        42,3414   37016 1            OCT     37016


1356  REF 136  LAST  437    42,3415  10 155 1  SEPSEC    CCS     MPAC      +1      IF +, ROUND BY ADDING .5 SEC
1357  REF   1               42,3416  1 3425 0            TCF     POSEC             IF -, ROUND BY SUBTRACTING .5 SEC
1358  REF   2  LAST  437    42,3417  1 3425 0            TCF     POSEC             FINDS TIME IN MPAC, MPAC+1
1359                        42,3420  1 3421 1            TCF     +1                ROUNDS OFF BY +/- .5 SEC
1360                        42,3421  0 0006 1            EXTEND                    LEAVES WHOLE MIN IN BIT13 OF
1361  REF   1               42,3422  4 3313 1            DCS     RNDCON    -1      LOTEMOUT AND ABOVE.
1362  REF 137  LAST  437    42,3423  20 155 1  SEPSEC1   DAS     MPAC              LEAVES FRACT SEC/60 IN MPAC, MPAC+1.
1363  REF   3  LAST  436    42,3424  1 3430 1            TCF     SEPSECNR
1364                        42,3425  0 0006 1  POSEC     EXTEND
1365  REF   2  LAST  437    42,3426  3 3313 0            DCA     RNDCON    -1
1366  REF   1               42,3427  1 3423 0            TCF     SEPSEC1
1367  REF  81  LAST  434    42,3430  56 002 0  SEPSECNR  XCH     Q                 THIS ENTRY AVOIDS ROUNDING BY .5 SEC
1368  REF   1               42,3431  54 144 1            TS      SEPSCRET
1369  REF   5  LAST  435    42,3432  0 7124 1            TC      DMP               MULT BY 2EXP12/6000
1370  REF   1               42,3433   03300 1            ADRES   SECON1            GIVES FRACT SEC/60 IN BIT12 OF MPAC+1
1371                        42,3434  0 0006 1            EXTEND                    AND BELOW.
1372  REF 138  LAST  437    42,3435  3 0155 0            DCA     MPAC              SAVE MINUTES AND HOURS
1373  REF   3  LAST  435    42,3436  53 007 0            DXCH    HITEMOUT
1374  REF   1               42,3437  0 4375 1            TC      TPSL1
1375  REF   2  LAST  437    42,3440  0 4375 1            TC      TPSL1             GIVES FRACT SEC/60 IN MPAC+1, MPAC+2.
1376  REF  69  LAST  436    42,3441  3 4746 0            CAF     ZERO
1377  REF 139  LAST  437    42,3442  56 156 0            XCH     MPAC      +2      LEAVE FRACT SEC/60 IN MPAC, MPAC+1.
1378  REF 140  LAST  437    42,3443  56 155 0            XCH     MPAC      +1
1379  REF 141  LAST  437    42,3444  56 154 1            XCH     MPAC
1380  REF   2  LAST  437    42,3445  0 0144 0            TC      SEPSCRET


1381  REF  82  LAST  437    42,3446  56 002 0  SEPMIN    XCH     Q                 FINDS WHOLE MINUTES IN BIT13
1382  REF   1               42,3447  54 144 1            TS      SEPMNRET          OF LOTEMOUT AND ABOVE.
1383  REF   1               42,3450  3 1007 1            CA      LOTEMOUT          REMOVES REST OF SECONDS.
```

```
 1384                          42,3451  0 0006 1           EXTEND                    LEAVES FRACT MIN/60 IN MPAC+1.
 1385   REF  23  LAST  431     42,3452  7 4742 0           MP      BIT3              LEAVES WHOLE HOURS IN MPAC.
 1386                          42,3453  0 0006 1           EXTEND                    SR 12, THROW AWAY LP.
 1387   REF  21  LAST  305     42,3454  7 4730 0           MP      BIT13             SR 2, TAKE FROM LP. = SL 12.
 1388   REF 142  LAST  437     42,3455  22 155 0           LXCH    MPAC     +1       THIS FORCES BITS 12-1 TO 0 IF +,
A1389                                                                                FORCES BITS 12-1 TO 1 IF -.
 1390   REF   4  LAST  437     42,3456  3 1006 0           CA      HITEMOUT
 1391   REF 143  LAST  438     42,3457  54 154 0           TS      MPAC
 1392   REF   6  LAST  437     42,3460  0 7124 1           TC      DMP               MULT BY 1/15
 1393   REF   1                42,3461   03306 1           ADRES   MINCON1           GIVES FRACT MIN/60 IN MPAC+1.
 1394   REF   2  LAST  437     42,3462  0 0144 0  ENDSPMIN TC      SEPMNRET          GIVES WHOLE HOURS IN MPAC.

R1395   THIS IS A SPECIAL PURPOSE VERB FOR DISPLAYING A DOUBLE PRECISION AGC
R1396   WORD AS 10 DECIMAL DIGITS ON THE AGC DISPLAY PANEL.  IT CAN BE USED WITH
R1397   ANY NOUN, EXCEPT MIXED NOUNS. IT DISPLAYS THE CONTENTS
R1398   OF THE REGISTER NOUNADD IS POINTING TO .  IF USED WITH NOUNS WHICH ARE
R1399   INHERENTLY NOT DP SUCH AS THE CDU COUNTERS THE DISPLAY WILL BE GARBAGE.
R1400   DISPLAY IS IN R1 AND R2 ONLY WITH THE SIGN IN R1.

 1401   REF   1                40,3020                     SETLOC ENDRDLO  +1

 14015  REF   3 LAST  431 TO  435:   140   481*            COUNT* $$/PIN
 1402   REF   8  LAST  434     40,3020  50 140 1  DSPDPDEC INDEX   MIXBR
 1403                          40,3021  0 3021 1           TC      +0
 1404                          40,3022  0 3024 1           TC      +2                NORMAL NOUN
 1405   REF   3  LAST  425     40,3023  0 3447 0           TC      DSPALARM
 1406                          40,3024  0 0006 1           EXTEND
 1407   REF  11  LAST  434     40,3025  5 0145 1           INDEX   NOUNADD
 1408                          40,3026  3 0001 0           DCA     0
 1409   REF 144  LAST  438     40,3027  52 155 1           DXCH    MPAC
 1410   REF  10  LAST  437     40,3030  3 4310 1           CAF     R1D1
 1411   REF  36  LAST  437     40,3031  54 776 0           TS      DSPCOUNT
 1412   REF  70  LAST  437     40,3032  3 4746 0           CAF     ZERO
 1413   REF 145  LAST  438     40,3033  54 156 1           TS      MPAC  +2
 1414   REF   5  LAST  436     40,3034  0 7300 0           TC      TPAGREE
 1415   REF   1                40,3035  0 3322 1           TC      DSP2DEC
 1416   REF   6  LAST  435     40,3036  0 0136 0  ENDDPDEC TC      ENTEXIT
```

```
P1417   LOAD VERBS              IF ALARM CONDITION IS DETECTED DURING EXECUTE,
R1418   CHECK FAIL LIGHT IS TURNED ON AND ENDOFJOB. IF ALARM CONDITION IS
R1419   DETECTED DURING ENTER OF DATA, CHECK FAIL IS TURNED ON AND IT RECYCLES
R1420   TO EXECUTE  OF ORIGINAL LOAD VERB. RECYCLE CAUSED BY  1) DECIMAL MACHINE
R1421   CADR  2) MIXTURE OF OCTAL/DECIMAL DATA  3) OCTAL DATA INTO DECIMAL
R1422   ONLY NOUN  4) DEC DATA INTO OCT ONLY NOUN  5) DATA TOO LARGE FOR SCALE
R1423   6) FEWER THAN 3 DATA WORDS LOADED FOR HRS, MIN, SEC NOUN.8(2)-(6) ALARM
R1424   AND RECYCLE OCCUR AT FINAL ENTER OF SET. (1) ALARM AND RECYCLE OCCUR AT
R1425   ENTER OF CADR.

 1426   REF   1                41,2647                            SETLOC ENDRTOUT

 14265  REF   2 LAST  419 TO  431:    407    407*                 COUNT* $$/PIN
 1427   REF  25  LAST  436   41,2647  4 4743 1  ABCLOAD   CS      TWO
 1428   REF   3  LAST  427   41,2650  0 2453 1            TC      COMPTEST
 1429   REF   1              41,2651  0 2507 1            TC      NOUNTEST           TEST IF NOUN CAN BE LOADED.
 1430   REF   1              41,2652  3 3056 1            CAF     VBSP1LD
 1431   REF   2  LAST  416   41,2653  0 2366 0            TC      UPDATVB  -1
 1432   REF   1              41,2654  0 2332 1            TC      REQDATX
 1433   REF   1              41,2655  3 3057 0            CAF     VBSP2LD
 1434   REF   3  LAST  439   41,2656  0 2366 0            TC      UPDATVB  -1
 1435   REF   1              41,2657  0 2334 1            TC      REQDATY
 1436   REF   1              41,2660  3 3060 1            CAF     VBSP3LD
 1437   REF   4  LAST  439   41,2661  0 2366 0            TC      UPDATVB -1
 1438   REF   2  LAST  420   41,2662  0 2336 0            TC      REQDATZ


 1439   REF  10  LAST  433   41,2663  4 6263 1  PUTXYZ    CS      SIX                TEST THAT THE 3 DATA WORDS LOADED ARE
 1440   REF   1              41,2664  0 3061 0            TC      ALLDC/OC           ALL DEC OR ALL OCT.
 1441                        41,2665  0 0006 1            EXTEND
 1442   REF   4  LAST  424   41,2666  3 2141 1            DCA     LODNNLOC           SWITCH BANKS TO NOUN TABLE READING
 1443   REF   7  LAST  430   41,2667  52 006 0            DXCH    Z                  ROUTINE.
 1444   REF  71  LAST  438   41,2670  3 4746 0            CAF     ZERO               X COMP
 1445   REF   1              41,2671  0 3145 1            TC      PUTCOM
 1446   REF  12  LAST  438   41,2672  50 145 1            INDEX   NOUNADD
 1447                        41,2673  54 000 0            TS      0
 1448   REF  39  LAST  431   41,2674  3 4744 1            CAF     ONE                Y COMP
 1449   REF   2  LAST  439   41,2675  0 3145 1            TC      PUTCOM
 1450   REF  13  LAST  439   41,2676  50 145 1            INDEX    NOUNADD
 1451                        41,2677  54 001 1            TS      1
 1452   REF  26  LAST  439   41,2700  3 4743 0            CAF     TWO                Z COMP
 1453   REF   3  LAST  439   41,2701  0 3145 1            TC      PUTCOM
 1454   REF  14  LAST  439   41,2702  50 145 1            INDEX   NOUNADD
 1455                        41,2703  54 002 1            TS      2
 145501 REF   3  LAST  272   41,2704  4 4750 0            CS      SEVEN              IF NOUN 7 HAS JUST BEEN LOADED, SET
 145502 REF  10  LAST  424   41,2705  6 1001 1            AD      NOUNREG             FLAG BITS AS SPECIFIED.
 145503                      41,2706  0 0006 1            EXTEND
 145504                      41,2707  1 2711 0            BZF     +2
 145505 REF   2  LAST  419   41,2710  0 3045 0            TC      LOADLV
```

```
145506                         41,2711  0 0004 0                INHINT
145508 REF    1                41,2712  4 4754 1                CS      OCT30               IS IT A CHANNEL (30 OR UNDER)
14551  REF    4  LAST  429     41,2713  6 1002 1                AD      XREG
145512                         41,2714  0 0006 1                EXTEND
145514 REF    1                41,2715  6 2725 0                BZMF    CHANBITS            YES

145516 REF    5  LAST  440     41,2716  3 1002 1                CA      XREG                ECADR OF ERASABLE CELL
145518 REF    5  LAST  424     41,2717  0 4275 0                TC      SETNCADR +1         SET FBANK, NOUNADD

14552  REF   15  LAST  439     41,2720  50 145 1                INDEX   NOUNADD
145522                         41,2721  3 0000 1                CA      0
145524 REF   54  LAST  429     41,2722  54 001 1                TS      L
145526 REF   40  LAST  439     41,2723  3 4744 1                CAF     ONE
145528 REF    6  LAST  440     41,2724  55'002 0                TS      XREG                MAKE IT LOOK LIKE A CHANNEL FOR A WHILE

14553  REF    1                41,2725  6 4352 1  CHANBITS AD      OCT21
145532                         41,2726  0 0006 1                EXTEND
145534 REF    1                41,2727  1 2751 1                BZF     BITSOFF2            DONT TOUCH CHAN7 (SUPERBANK)

145536 REF    2  LAST  420     41,2730  3 1004 1                CA      ZREG
145538                         41,2731  0 0006 1                EXTEND
14554  REF    1                41,2732  6 2740 0                BZMF    BITSOFF             R3 IS ZERO FOR OFF, NONZERO FOR ON

145542 REF    1                41,2733  3 1003 0                CA      YREG
145544                         41,2734  0 0006 1                EXTEND
145546 REF    7  LAST  440     41,2735  5 1002 1                INDEX   XREG
145548                         41,2736  05 000 1                WOR     0
14555  REF    1                41,2737  1 2744 0                TCF     BITSOFF1

145552 REF    2  LAST  440     41,2740  4 1003 1  BITSOFF  CS      YREG
145553                         41,2741  0 0006 1                EXTEND
145554 REF    8  LAST  440     41,2742  5 1002 1                INDEX   XREG
145556                         41,2743  03 000 1                WAND    0

145558 REF    9  LAST  440     41,2744  11'002 0  BITSOFF1 CCS     XREG                WAS IT REALLY A CHANNEL
14556  REF  127  LAST  436     41,2745  10 000 0                CCS     A
145562 REF    2  LAST  440     41,2746  1 2751 1                TCF     BITSOFF2            YES

145564 REF   16  LAST  440     41,2747  50 145 1                INDEX   NOUNADD
145566                         41,2750  22 000 1                LXCH    0

145568                         41,2751  0 0003 1  BITSOFF2 RELINT
1456   REF    3  LAST  439     41,2752  0 3045 0                TC      LOADLV

14565  REF    4  LAST  293         4754           OCT30    =       BITS4&5
1457   REF   41  LAST  440     41,2753  4 4744 0  ABLOAD   CS      ONE
1458   REF    4  LAST  439     41,2754  0 2453 1                TC      COMPTEST
1459   REF    2  LAST  439     41,2755  0 2507 1                TC      NOUNTEST            TEST IF NOUN CAN BE LOADED.
1460   REF    2  LAST  439     41,2756  3 3056 1                CAF     VBSPLLD
1461   REF    5  LAST  439     41,2757  0 2366 0                TC      UPDATVB -1
```

```
 1462   REF   2  LAST  439    41,2760  0 2332 1            TC      REQDATX
 1463   REF   2  LAST  439    41,2761  3 3057 0            CAF     VBSP2LD
 1464   REF   6  LAST  440    41,2762  0 2366 0            TC      UPDATVB -1
 1465   REF   2  LAST  439    41,2763  0 2334 1            TC      REQDATY
 1466   REF   9  LAST  421    41,2764  4 4747 0  PUTXY     CS      FIVE                TEST THAT THE 2 DATA WORDS LOADED ARE
 1467   REF   2  LAST  439    41,2765  0 3061 0            TC      ALLDC/OC            ALL DEC OR ALL OCT.
 1468                         41,2766  0 C006 1            EXTEND
 1469   REF   5  LAST  439    41,2767  3 2141 1            DCA     LODNNLOC            SWITCH BANKS TO NOUN TABLE READING
 1470   REF   8  LAST  439    41,2770  52 C06 0            DXCH    Z                   ROUTINE.
 1471   REF  72  LAST  439    41,2771  3 4746 0            CAF     ZERO                X COMP
 1472   REF   4  LAST  439    41,2772  0 3145 1            TC      PUTCOM
 1473   REF  17  LAST  440    41,2773  50 145 1            INDEX   NOUNADD
 1474                         41,2774  54 C00 0            TS      0
 1475   REF  42  LAST  440    41,2775  3 4744 1            CAF     ONE                 Y COMP
 1476   REF   5  LAST  441    41,2776  0 3145 1            TC      PUTCOM
 1477   REF  18  LAST  441    41,2777  50 145 1            INDEX   NOUNADD
 1478                         41,3000  54 001 1            TS      1
 1479   REF   4  LAST  440    41,3001  0 3045 0            TC      LOADLV

 1481   REF   3  LAST  441    41,3002  0 2332 1  ALOAD     TC      REQDATX
 1482                         41,3003  0 0C06 1            EXTEND
 1483   REF   6  LAST  441    41,3004  3 2141 1            DCA     LODNNLOC            SWITCH BANKS TO NOUN TABLE READING
 1484   REF   9  LAST  441    41,3005  52 006 0            DXCH    Z                   ROUTINE.
 1485   REF  73  LAST  441    41,3006  3 4746 0            CAF     ZERO                X COMP
 1486   REF   6  LAST  441    41,3007  0 3145 1            TC      PUTCOM
 1487   REF  19  LAST  441    41,3010  50 145 1            INDEX   NOUNADD
 1488                         41,3011  54 000 0            TS      0
 1489   REF   5  LAST  441    41,3012  0 3045 0            TC      LOADLV

 1490   REF  43  LAST  441    41,3013  4 4744 0  BLOAD     CS      ONE
 1491   REF   5  LAST  440    41,3014  0 2453 1            TC      COMPTEST
 1493   REF  26  LAST  432    41,3015  3 4726 0            CAF     BIT15               SET CLPASS FOR PASSO ONLY
 1494   REF  10  LAST  420    41,3016  55'014 1            TS      CLPASS
 1495   REF   3  LAST  441    41,3017  0 2334 1            TC      REQDATY
 1496                         41,3020  0 0006 1            EXTEND
 1497   REF   7  LAST  441    41,3021  3 2141 1            DCA     LODNNLOC            SWITCH BANKS TO NOUN TABLE READING
 1498   REF  10  LAST  441    41,3022  52 006 0            DXCH    Z                   ROUTINE.
 1499   REF  44  LAST  441    41,3023  3 4744 1            CAF     ONE
 1500   REF   7  LAST  441    41,3024  0 3145 1            TC      PUTCOM
 1501   REF  20  LAST  441    41,3025  50 145 1            INDEX   NOUNADD
 1502                         41,3026  54 C01 1            TS      1
 1503   REF   6  LAST  441    41,3027  0 3045 0            TC      LOADLV

 1504   REF  27  LAST  439    41,3030  4 4743 1  CLOAD     CS      TWO
 1505   REF   6  LAST  441    41,3031  0 2453 1            TC      COMPTEST
 1507   REF  27  LAST  441    41,3032  3 4726 0            CAF     BIT15               SET CLPASS FOR PASSO ONLY
 1508   REF  11  LAST  441    41,3033  55'C14 1            TS      CLPASS
 1509   REF   3  LAST  439    41,3034  0 2336 0            TC      REQDATZ
 1510                         41,3035  0 0C06 1            EXTEND
 1511   REF   8  LAST  441    41,3036  3 2141 1            DCA     LODNNLOC            SWITCH BANKS TO NOUN TABLE READING
```

```
1512    REF  11  LAST  441   41,3037  52 006 0             DXCH    Z               ROUTINE.
1513    REF  28  LAST  441   41,3040  3 4743 0             CAF     TWO
1514    REF   9  LAST  441   41,3041  0 3145 1             TC      PUTCOM
1515    REF  21  LAST  441   41,3042  50 145 1             INDEX   NOUNADD
1516                         41,3043  54 002 1             TS      2
1517    REF   7  LAST  441   41,3044  0 3045 0             TC      LOADLV

1518    REF  74  LAST  441   41,3045  3 4746 0  LOADLV     CAF     ZERO
1519    REF  13  LAST  420   41,3046  54 777 1             TS      DECBRNCH
1520    REF  75  LAST  442   41,3047  4 4746 1             CS      ZERO
1521    REF   1              41,3050  55 013 0             TS      LOADSTAT
15215   REF   5  LAST  421   41,3051  0 4450 1             TC      RELDSP          RELEASE FOR PRIORITY DISPLAY PROBLEM.
1522    REF   6  LAST  425   41,3052  4 4351 0             CS      VD1             TO BLOCK NUMERICAL CHARACTERS AND
1523    REF  37  LAST  438   41,3053  54 776 0             TS      DSPCOUNT        CLEARS AFTER A COMPLETED LOAD
1524    REF  25  LAST  437   41,3054  0 4626 1             TC      POSTJUMP        AFTER COMPLETED LOAD, GO TO RECALTST
1525    REF   1              41,3055   61605 0             CADR    RECALTST        TO SEE IF THERE IS RECALL FROM ENDIDLE.

15252   REF   4  LAST  424      4352            OCT21      EQUALS  ND1


1526                         41,3056   00025 0  VBSP1LD    DEC     21              VB21 = ALOAD
1527                         41,3057   00026 0  VBSP2LD    DEC     22              VB22 = BLOAD
1528                         41,3060   00027 1  VBSP3LD    DEC     23              VB23 = CLOAD


1529    REF  13  LAST  437   41,3061  54 117 1  ALLDC/OC   TS      DECOUNT         TESTS THAT DATA WORDS LOADED ARE EITHER
1530    REF  14  LAST  442   41,3062  4 0777 1             CS      DECBRNCH        ALL DEC OR ALL OCT. ALARMS IF NOT.
1531    REF   3  LAST  417   41,3063  54 021 0             TS      SR
1532    REF   4  LAST  442   41,3064  4 0021 0             CS      SR
1533    REF   5  LAST  442   41,3065  4 0021 0             CS      SR              SHIFTED RIGHT 2
1534    REF 128  LAST  440   41,3066  10 000 0             CCS     A               DEC COMP BITS IN LOW 3
1535                         41,3067  1 3071 0             TCF     +2              SOME ONES IN LOW 3
1536    REF  63  LAST  437   41,3070  0 0002 0             TC      Q               ALL ZEROS. ALL OCTAL.  OK
1537    REF  14  LAST  442   41,3071  6 0117 0             AD      DECOUNT         DEC COMP = 7 FOR 3COMP, =6 FOR 2COMP
1538                         41,3072  0 0006 1             EXTEND                  (BUT IT HAS BEEN DECREMENTED BY CCS)
1539                         41,3073  1 3075 1             BZF     +2              MUST MATCH 6 FOR 3COMP, 5 FOR 2COMP.
1540    REF   4  LAST  428   41,3074  0 6020 0             TC      ALMCYCLE        ALARM AND RECYCLE.
1541    REF  84  LAST  442   41,3075  0 0002 0  GOQ        TC      Q               ALL REQUIRED ARE DEC. OK


1542    REF  85  LAST  442   41,3076  56 002 0  SFRUTNOR   XCH     Q               GETS SF ROUTINE NUMBER FOR NORMAL CASE
1543    REF   1              41,3077  54 114 1             TS      EXITEM          CANT USE L FOR RETURN. TSTFORDP USES L.
1544    REF   1              41,3100  3 4340 1             CAF     MID5
1545    REF   3  LAST  429   41,3101  7 0147 1             MASK    NNTYPTEM
1546    REF   1              41,3102  0 4313 1             TC      RIGHT5
1547    REF   2  LAST  442   41,3103  0 0114 0             TC      EXITEM          SF ROUTINE NUMBER IN A

1548    REF  86  LAST  442   41,3104  56 002 0  SFRUTMIX   XCH     Q               GETS SF ROUTINE NUMBER FOR MIXED CASE
1549    REF   3  LAST  442   41,3105  54 114 1             TS      EXITEM
1550    REF  15  LAST  442   41,3106  50 117 0             INDEX   DECOUNT
```

```
 1551   REF    1                 41,3107  3 3136 0           CAF      DISPLACE         PUT TC GOQ, TC RIGHT5, OR TC LEFT5 IN L
 1552   REF   55   LAST   440    41,3110  54 001 1           TS       L
 1553   REF   16   LAST   442    41,3111  50 117 0           INDEX    DECOUNT
 1554   REF    2   LAST   411    41,3112  3 4337 1           CAF      LOW5             LOW5, MID5, OR HI5 IN A
 1555   REF    2   LAST   316    41,3113  7 0153 1           MASK     RUTMXTEM         GET HI5, MID5, OR LOW5 OF RUTMXTAB ENTRY
 1556   REF   56   LAST   443    41,3114  50 001 0           INDEX    L
 1557                            41,3115  0 0000 1           TC       0
R1558   DO TC GOQ(DECOUNT=0), DO TC RIGHT5(DECOUNT=1), DO TC LEFT5(DECOUNT=2).
 1559   REF    4   LAST   442    41,3116  0 0114 0  SFRET1   TC       EXITEM           SF ROUTINE NUMBER IN A

 1560   REF   87   LAST   442    41,3117  56 002 0  SFCONUM  XCH      Q                GETS 2X( SF CONSTANT NUMBER)
 1561   REF    5   LAST   443    41,3120  54 114 1           TS       EXITEM
 1562   REF    9   LAST   438    41,3121  50 140 1           INDEX    MIXBR
 1563                            41,3122  0 3122 0           TC       +0
 1564   REF    1                 41,3123  0 3141 0           TC       CONUMNOR         NORMAL NOUN
 1565   REF   17   LAST   443    41,3124  50 117 0           INDEX    DECOUNT          MIXED NOUN
 1566   REF    2   LAST   443    41,3125  3 3136 0           CAF      DISPLACE
 1567   REF   57   LAST   443    41,3126  54 001 1           TS       L                PUT TC GOQ, TC RIGHT5, OR TC LEFT5 IN L
 1568   REF   18   LAST   443    41,3127  50 117 0           INDEX    DECOUNT
 1569   REF    3   LAST   443    41,3130  3 4337 1           CAF      LOW5
 1570   REF    4   LAST   442    41,3131  7 0147 1           MASK     NNTYPTEM
 1571   REF   58   LAST   443    41,3132  50 001 0           INDEX    L
 1572                            41,3133  0 0000 1           TC       0
R1573   DO TC GOQ(DECOUNT=0), DO TC RIGHT5(DECOUNT=1), DO TC LEFT5(DECOUNT=2).
 1574                            41,3134  6 0000 1  SFRET    DOUBLE                    2X(SF CONSTANT NUMBER ) IN A
 1575   REF    6   LAST   443    41,3135  0 0114 0           TC       EXITEM

 1576   REF    1                 41,3136  0 3075 0  DISPLACE TC       GOQ
 1577   REF    2   LAST   442    41,3137  0 4313 1           TC       RIGHT5
 1578   REF    3   LAST   429    41,3140  0 4322 0           TC       LEFT5

 1579   REF    4   LAST   443    41,3141  3 4337 1  CONUMNOR CAF      LOW5             NORMAL NOUN ALWAYS GETS LOW 5 OF
 1580   REF    5   LAST   443    41,3142  7 0147 1           MASK     NNTYPTEM         NNTYPTAB FOR SF CONUM.
 1581                            41,3143  6 0000 1           DOUBLE
 1582   REF    7   LAST   443    41,3144  0 0114 0           TC       EXITEM           2X( SF CONSTANT NUMBER) IN A


 1583   REF   19   LAST   443    41,3145  54 117 1  PUTCOM   TS       DECOUNT
 1584   REF   88   LAST   443    41,3146  56 002 0           XCH      Q
 1585   REF    1                 41,3147  54 115 0           TS       DECRET
 1586   REF   76   LAST   442    41,3150  3 4746 0           CAF      ZERO
 1587   REF    3   LAST   434    41,3151  54 162 0           TS       MPAC+6
 1588   REF   20   LAST   443    41,3152  50 117 0           INDEX    DECOUNT
 1589   REF    3   LAST   417    41,3153  57'005 0           XCH      XREGLP
 1590   REF  146   LAST   438    41,3154  54 155 1           TS       MPAC   +1
 1591   REF   21   LAST   443    41,3155  50 117 0           INDEX    DECOUNT
 1592   REF   10   LAST   440    41,3156  57'002 1           XCH      XREG
 1593   REF  147   LAST   443    41,3157  54 154 0           TS       MPAC
 1594   REF   10   LAST   443    41,3160  50 140 1           INDEX    MIXBR
 1595                            41,3161  0 3161 1           TC       +0
 1596   REF   1                41,3162  0 3207 1            TC      PUTNORM          NORMAL NOUN
R1597   IF MIXNOUN, PLACE ADDRESS FOR COMPONENT K INTO NOUNADD, SET EBANK BITS.
 1598   REF  22  LAST  443     41,3163  50 117 0            INDEX   DECOUNT          GET IDADDTAB ENTRY FOR COMPONENT K
 1599   REF   4  LAST  434     41,3164  3 0150 0            CA      IDADITEM                OF NOUN.
 1600   REF   5  LAST  434     41,3165  7 4347 1            MASK    LOW11            (ECADR)SUBK FOR CURRENT COMP OF NOUN
 1601   REF   6  LAST  440     41,3166  0 4274 1            TC      SETNCADR         ECADR INTO NOUNCADR. SETS EB, NOUNADD.
 1602                          41,3167  0 0006 1            EXTEND                   C(NOUNADD) IN A UPON RETURN
 1603   REF  23  LAST  444     41,3170  60 117 0            SU      DECOUNT          PLACE (ESUBK)-K INTO NOUNADD
 1604   REF  22  LAST  442     41,3171  54 145 0            TS      NOUNADD
 1605   REF  15  LAST  442     41,3172  10 777 1            CCS     DECBRNCH
 1606   REF   1                41,3173  0 3244 0            TC      PUTDECSF           +  DEC
 1607   REF   1                41,3174  0 2501 1            TC      OCTSTCYC         +0 OCTAL
 1608   REF   3  LAST  430     41,3175  0 3104 1            TC      SFRUTMIX         TEST IF DEC ONLY BIT = 1. IF SO,
 1609   REF   3  LAST  429     41,3176  0 2306 0            TC      DPTEST           ALARM AND RECYCLE. IF NOT, CONTINUE.
 1610   REF   1                41,3177  0 3225 1            TC      PUTCOM2          NO DP
A1611                                                                                TEST FOR DP SCALE FOR OCT LOAD. IF SO,
A1612                                                                                +0 INTO MAJOR PART. SET NOUNADD FOR
A1613                                                                                LOADING OCTAL WORD INTO MINOR PART.
 1614   REF  23  LAST  444     41,3200  24 145 1  PUTDPCOM  INCR    NOUNADD          DP  (ESUBK)-K+1  OR  E+1
 1615   REF  24  LAST  444     41,3201  3 0145 1            CA      NOUNADD          NOUNADD NOW SET FOR MINOR PART
 1616   REF  24  LAST  444     41,3202  26 117 1            ADS     DECOUNT          (ESUBK)+1  OR  E+1  INTO DECOUNT
 1617   REF  77  LAST  443     41,3203  3 4746 0            CAF     ZERO             NOUNADD SET FOR MINOR PART
 1618   REF  25  LAST  444     41,3204  50 117 0            INDEX   DECOUNT
 1619                          41,3205  53 777 0            TS      0         -1     ZERO MAJOR PART(ESUBK OR E)
 1620   REF   2  LAST  444     41,3206  0 3225 1            TC      PUTCOM2

 1621   REF   2  LAST  420     41,3207  0 4302 1  PUTNORM   TC      SETNADD          ECADR FROM NOUNCADR. SETS EB, NOUNADD.
 1622   REF  16  LAST  444     41,3210  10 777 1            CCS     DECBRNCH
 1623   REF   2  LAST  444     41,3211  0 3244 0            TC      PUTDECSF           +  DEC
 1624   REF   2  LAST  444     41,3212  0 2501 1            TC      OCTSTCYC         +0 OCTAL
 1625   REF   3  LAST  430     41,3213  0 3076 0            TC      SFRUTNOR         TEST IF DEC ONLY BIT = 1. IF SO,
 1626   REF   4  LAST  444     41,3214  0 2306 0            TC      DPTEST           ALARM AND RECYCLE. IF NOT, CONTINUE.
 1627   REF   3  LAST  444     41,3215  0 3221 0            TC      PUTCOM2 -4       NO DP
 1628   REF  78  LAST  444     41,3216  3 4746 0            CAF     ZERO             DP
 1629   REF  26  LAST  444     41,3217  54 117 1            TS      DECOUNT
 1630   REF   1                41,3220  0 3200 0            TC      PUTDPCOM

 1631   REF   8  LAST  429     41,3221  3 0146 1            CA      NNADTEM
 1632   REF  45  LAST  441     41,3222  6 4744 1            AD      ONE              IF NNADTEM = -1, CHANNEL TO BE SPECIFIED
 1633                          41,3223  0 0006 1            EXTEND
 1634   REF   1                41,3224  1 3231 0            BZF     CHANLOAD
 1635   REF 148  LAST  443     41,3225  56 154 1  PUTCOM2   XCH     MPAC
 1636   REF   2  LAST  443     41,3226  0 0115 1            TC      DECRET

 1637   REF  38  LAST  442         0776                     EBANK=  DSPCOUNT
 1638   REF   1                41,3227   02154 0  GTSFINLC  2CADR   GTSFIN
 1638   REF   1                41,3230   64101 0


 1639   REF   4  LAST  439     41,3231  4 4750 0  CHANLOAD  CS      SEVEN            DONT LOAD CHAN 7. (IT = SUPERBANK).
 16391  REF   4  LAST  429    41,3232  6 1C16 1             AD      NOUNCADR
 16392                        41,3233  0 C006 1             EXTEND
 16393  REF   8  LAST  442    41,3234  1 3045 1             BZF     LOADLV
 16394  REF   5  LAST  445    41,3235  3 1016 1             CA      NOUNCADR
 1640   REF   8  LAST  429    41,3236  7 4775 1             MASK    LOW9
 1641   REF 149  LAST  444    41,3237  56 154 1             XCH     MPAC
 16411                        41,3240  0 C006 1             EXTEND
 16412  REF 150  LAST  445    41,3241  5 C154 1             INDEX   MPAC
 1642                         41,3242  01 C00 0             WRITE   0
 1643   REF   9  LAST  445    41,3243  0 3C45 0             TC      LOADLV


R1644   PUTDECSF FINDS MIXBR AND DECOUNT STILL SET FROM PUTCOM

 1645   REF   2  LAST  429    41,3244  C 3117 0   PUTDECSF  TC      SFCONUM         2X(SF CON NUMB) IN A
 1646   REF  14  LAST  433    41,3245  54 123 0             TS      SFTEMP1
 1647                         41,3246  0 C006 1             EXTEND                  SWITCH BANKS TO SF CONSTANT TABLE
 1648   REF   1               41,3247  3 3230 0             DCA     GTSFINLC        READING ROUTINE.
 1649   REF  12  LAST  442    41,3250  52 006 0             DXCH    Z               LOADS SFTEMP1, SFTEMP2.
 1650   REF  11  LAST  443    41,3251  50 140 1             INDEX   MIXBR
 1651                         41,3252  0 3252 1             TC      +0
 1652   REF   1               41,3253  0 3256 0             TC      PUTSFNOR
 1653   REF   4  LAST  444    41,3254  0 3104 1             TC      SFRUTMIX
 1654   REF   1               41,3255  0 3257 1             TC      PUTDCSF2
 1655   REF   4  LAST  444    41,3256  0 3C76 0   PUTSFNOR  TC      SFRUTNOR

 1656   REF 129  LAST  442    41,3257  50 000 1   PUTDCSF2  INDEX   A
 1657   REF   1               41,3260  3 3262 1             CAF     SFINTABR
 1658   REF   4  LAST  430    41,3261  0 4631 1             TC      BANKJUMP        SWITCH BANKS FOR EXPANSHION ROOM
 1659   REF   1               41,3262    62377 0  SFINTABR  CADR    GOALMCYC        ALARM AND RECYCLE IF DEC LOAD
A1660                                                                               WITH OCTAL ONLY NOUN.
 1661   REF   1               41,3263    61135 1            CADR    BINROUND
 1662   REF   1               41,3264    61037 1            CADR    DEGINSF
 1663   REF   1               41,3265    61125 0            CADR    ARTHINSF
 1664   REF   1               41,3266    61143 0            CADR    DPINSF
 1665   REF   1               41,3267    61170 0            CADR    DPINSF2
 1666   REF   4  LAST  438    41,3270    61447 1            CADR    DSPALARM        LRPOSOUT CANT BE LOADED.
 1667   REF   2  LAST  445    41,3271    61143 0            CADR    DPINSF          SAME AS ARITHDP1
 1668   REF   1               41,3272    65463 0            CADR    HMSIN
 1669   REF   5  LAST  445    41,3273    61447 1            CADR    DSPALARM        MIN/SEC CANT BE LOADED.
 1671   REF   1               41,3274    61175 0            CADR    DPINSF4
 16711  REF   1               41,3275    61140 0            CADR    ARTINISF
 16712  REF   6  LAST  445    41,3276    61447 1            CADR    DSPALARM        2INTOUT CANT BE LOADED.
 16714  REF   2  LAST  445    41,3277    61037 1            CADR    DEGINSF         TESTS AT END FOR 360-CDU
 16715  REF   7  LAST  445    41,3300    61447 1            CADR    DSPALARM        RRANGOUT CANT BE LOADED.
 16716  REF   8  LAST  445    41,3301    61447 1            CADR    DSPALARM        RRDOTOUT CANT BE LOADED.
 1672                         41,3302             ENDRUTIN  EQUALS


R1673   SCALE FACTORS FOR THOSE ROUTINES NEEDING THEM ARE AVAILABLE IN SFTEMP1.
```

```
R1674    ALL SFIN ROUTINES USE MPAC MPAC+1. LEAVE RESULT IN A. END WITH TC DECRET


 1675    REF    1                40,3037                     SETLOC ENDDPDEC +1

 16755   REF    4 LAST  438 TO  439:    15   496*            COUNT* $$/PIN
R1676    DEGINSF APPLIES 1000/180 =5.55555(10) = 5.43434(8)

 1677    REF    7  LAST  438    40,3037  0 7124 1  DEGINSF   TC      DMP                SF ROUTINE FOR DEC DEGREES
 1678    REF    1               40,3040   03123 1            ADRES   DEGCON1            MULT BY 5.5  5(10)X2EXP-3
 1679    REF  151  LAST  445    40,3041  10 155 1            CCS     MPAC     +1        THIS ROUNDS OFF MPAC+1 BEFORE SHIFT
 1680    REF   19  LAST  415    40,3042  3 4732 0            CAF     BIT11              LEFT 3, AND CAUSES 360.00 TO OF/UF
 1681                           40,3043  0 3045 0            TC      +2                 WHEN SHIFTED LEFT AND ALARM.
 1682    REF   20  LAST  446    40,3044  4 4732 1            CS      BIT11
 1683    REF  152  LAST  446    40,3045  6 0155 0            AD      MPAC     +1
 1684    REF    1               40,3046  0 3214 0            TC      2ROUND   +2
 1685    REF    3  LAST  437    40,3047  0 4375 1            TC      TPSL1              LEFT 1
 1686    REF    4  LAST  446    40,3050  0 4375 1  DEGINSF2  TC      TPSL1              LEFT 2
 1687    REF    1               40,3051  0 3223 1            TC      TESTOFUF
 1688    REF    5  LAST  446    40,3052  0 4375 1            TC      TPSL1              RETURNS IF NO OF/UF (LEFT3)
 1689    REF  153  LAST  446    40,3053  10 154 0            CCS     MPAC
 1690    REF    1               40,3054  0 3060 1            TC      SIGNFIX            IF+, GO TO SIGNFIX
 1691    REF    2  LAST  446    40,3055  0 3060 1            TC      SIGNFIX            IF +0, GO TO SIGNFIX
 1692                           40,3056  4 0000 0            COM                        IF - , USE -MAGNITUDE +1
 1693    REF  154  LAST  446    40,3057  54 154 0            TS      MPAC               IF -0, USE +0
 1694    REF    4  LAST  443    40,3060  10 162 0  SIGNFIX   CCS     MPAC+6
 1695    REF    1               40,3061  0 3117 0            TC      SGNTO1             IF OVERFLOW
 1696    REF    1               40,3062  0 3072 1            TC      ENDSCALE           NO OVERFLOW/UNDERFLOW
 1697    REF  155  LAST  446    40,3063  10 154 0            CCS     MPAC               IF UF FORCE SIGN TO 0 EXCEPT -180
 1698    REF    5  LAST  428    40,3064  0 5701 1            TC      CCSHOLE
 1699    REF    1               40,3065  0 3115 1            TC      NEG180
 1700                           40,3066  0 3067 0            TC      +1
 1701    REF  156  LAST  446    40,3067  56 154 1            XCH     MPAC
 1702    REF    8  LAST  432    40,3070  7 4724 0            MASK    POSMAX
 1703    REF  157  LAST  446    40,3071  54 154 0            TS      MPAC
 1704    REF   12  LAST  445    40,3072  50 140 1  ENDSCALE  INDEX   MIXBR              IF ROUTINE NO. IS NOT CDU DEGREES,
 170405                         40,3073  0 3073 0            TC      +0                  THEN THIS IS 360 - CDU DEGREES
 17041                          40,3074  0 3077 1            TC      +3                  AND ANGLE IN MPAC MUST BE REPLACED
 17042   REF    1               40,3075  0 3107 1            TC      SFMIXCAL            BY 360 DEGREES MINUS ITSELF.
 17043                          40,3076  0 3100 0  MIXBACK   TC      +2
 17044   REF    1               40,3077  0 3112 0            TC      SFNORCAL
 1705    REF  130  LAST  445    40,3100  4 0000 0  NORBACK   CS      A
 17051   REF   25  LAST  295    40,3101  6 4743 0            AD      BIT2
 17052                          40,3102  0 0006 1            EXTEND
 17053                          40,3103  1 3105 1            BZF     +2
 17054   REF    2  LAST  431    40,3104  0 2614 0            TC      360-CDU
 17055   REF   26  LAST  442    40,3105  0 4626 1  ENDSCAL1  TC      POSTJUMP
 17056   REF    4  LAST  444    40,3106   63225 1            CADR    PUTCOM2

 17057   REF   94  LAST  437    40,3107  0 4607 1  SFMIXCAL  TC      BANKCALL
```

```
17058   REF   5  LAST  445    40,3110      63104 1            CADR    SFRUTMIX
17059   REF   1               40,3111     0 3076 0            TC      MIXBACK

170591  REF  95  LAST  446    40,3112     0 4607 1  SFNORCAL  TC      BANKCALL
170592  REF   5  LAST  445    40,3113      63C76 0            CADR    SFRUTNOR
170593  REF   1               40,3114     0 3100 0            TC      NORBACK

1706    REF   9  LAST  446    40,3115     4 4724 0  NEG180    CS      POSMAX
1707    REF   2  LAST  446    40,3116     0 3071 1            TC      ENOSCALE  -1

1708    REF 158  LAST  446    40,3117     4 C154 0  SGNTO1    CS      MPAC                IF OF FORCE SIGN TO 1
1709    REF  10  LAST  447    40,3120     7 4724 0            MASK    POSMAX
1710    REF 131  LAST  446    40,3121     4 0000 0            CS      A
1711    REF   3  LAST  447    40,3122     0 3C71 1            TC      ENDSCALE  -1

1712                          40,3123      26161 0  DEGCON1   2DEC    5.555555555 B-3
1712                          40,3124      30707 1

1715    REF   8  LAST  446    40,3125     0 7124 1  ARTHINSF  TC      OMP                 SCALES MPAC, +1 BY SFTEMP1, SFTEMP2.
1716    REF  15  LAST  445    40,3126      00123 1            ADRFS   SFTEMP1             ASSUMES POINT BETWEEN HI AND LO PARTS
1717    REF 159  LAST  447    40,3127     56 156 0            XCH     MPAC      +2        OF SFCON. SHIFTS RESULTS LEFT BY 14.
1718    REF 160  LAST  447    40,3130     56 155 0            XCH     MPAC      +1        (BY TAKING RESULTS FROM MPAC+1, MPAC+2)
1719    REF 161  LAST  447    40,3131     56 154 1            XCH     MPAC
1720                          40,3132     0 0006 1            EXTENO
1721    REF   2  LAST  445    40,3133     1 3135 1            BZF     BINROUND
1722    REF   5  LAST  442    40,3134     0 6020 0            TC      ALMCYCLE            TOO LARGE A LOAD. ALARM AND RECYCLE.
1723    REF   2  LAST  446    40,3135     0 3212 0  BINROUNO  TC      2ROUND
1724    REF   2  LAST  446    40,3136     0 3223 1            TC      TESTOFUF
1725    REF   1               40,3137     0 3105 0            TC      ENOSCAL1            RETURNS IF NO OF/UF

17251   REF   9  LAST  447    40,3140     0 7124 1  ARTIN1SF  TC      DMP                 SCALES MPAC, +1 BY SFTEMP1, SFTEMP2.
17252   REF  16  LAST  447    40,3141      0C123 1            ADRES   SFTEMP1             ROUNDS MPAC+1 INTO MPAC.
17253   RFF   3  LAST  447    40,3142     0 3135 0            TC      BINROUND


1739    REF  10  LAST  447    40,3143     0 7124 1  OPINSF    TC      OMP                 SCALES MPAC, MPAC +1 BY SFTEMP1,
1740    REF  17  LAST  447    40,3144      00123 1            ADRES   SFTFMP1             SFTEMP2.  STORES LOW PART OF RESULT
1741    REF 162  LAST  447    40,3145     56 156 0            XCH     MPAC      +2        1N (E SUBK) +1 OR E+1
1742                          40,3146     6 0000 1            DOUBLE
1743    REF 163  LAST  447    40,3147     54 156 1            TS      MPAC      +2
1744    REF  79  LAST  444    40,3150     3 4746 0            CAF     ZERO
1745    REF 164  LAST  447    40,3151     6 0155 0            AO      MPAC      +1
1746    RFF   3  LAST  447    40,3152     0 3214 0            TC      2ROUND    +2
1747    REF   3  LAST  447    40,3153     0 3223 1            TC      TESTOFUF
1748    REF  13  LAST  446    40,3154     50 140 1            INDEX   MIXBR               RETURNS IF NO OF/UF
1749                          40,3155     0 3155 0            TC      +0
1750    REF   1               40,3156     0 3166 0            TC      DPINORM
1751    REF  27  LAST  444    40,3157     3 0117 0            CA      DECOUNT             MIXEDNOUN
1752    REF  25  LAST  444    40,3160     6 C145 1  UPINCOM   AD      NOUNADO                 MIXED                   NORMAL
1753    REF  39  LAST  443    40,3161     54 002 1            TS      Q                     E SUBK            E
```

```
 1754   REF 165  LAST  447   40,3162  56 155 0            XCH     MPAC      +1
 1755   REF  90  LAST  447   40,3163  50 002 0            INDEX   Q
 1756                        40,3164  54 001 1            TS      1                    PLACE LOW PART IN
 1757   REF   2  LAST  447   40,3165  0 3105 0            TC      ENDSCAL1             (E SUBK) +1    MIXED

 1758   REF  80  LAST  447   40,3166  3 4746 0  DPINORM   CAF     ZERO                 E +1          NORMAL
 1759   REF   1              40,3167  0 3160 0            TC      DPINCOM


 1760   REF  11  LAST  447   40,3170  0 7124 1  DPINSF2   TC      DMP                  ASSUMES POINT BETWEEN BITS 7-8 OF HIGH
 1761   REF  18  LAST  447   40,3171   00123 1            ADRES   SFTEMP1              PART OF SF CONST. DPINSF2 SHIFTS RESULTS
 1762   REF  11  LAST  439   40,3172  3 6263 0            CAF     SIX                  LEFT BY 7, ROUNDS MPAC+2 INTO MPAC+1
 1763   REF   2  LAST  433   40,3173  0 3202 1            TC      TPLEFTN              SHIFT LEFT 7.
 1764   REF   3  LAST  445   40,3174  0 3145 1            TC      DPINSF  +2


 1765   REF  12  LAST  448   40,3175  0 7124 1  DPINSF4   TC      DMP                  ASSUMES POINT BETWEEN BITS 11-12 OF HIGH
 1766   REF  19  LAST  448   40,3176   00123 1            ADRES   SFTEMP1              PART OF SF CONST. DPINSF4 SHIFTS RESULTS
 1767   REF  29  LAST  442   40,3177  3 4743 0            CAF     TWO                  LEFT BY 3, ROUNDS MPAC+2 INTO MPAC+1.
 1768   REF   3  LAST  448   40,3200  0 3202 1            TC      TPLEFTN              SHIFT LEFT 3.
 1769   REF   4  LAST  448   40,3201  0 3145 1            TC      DPINSF  +2


 1770   REF  91  LAST  448   40,3202  56 002 0  TPLEFTN   XCH     Q                    SHIFTS MPAC, +1, +2 LEFT N. SETS OVFIND
 1771   REF   1              40,3203  54 124 1            TS      SFTEMP2              TO +1 FOR OF, -1 FOR UF.
 1772   REF  92  LAST  448   40,3204  56 002 0            XCH     Q                    CALL WITH N-1 IN A.
 1773   REF  20  LAST  448   40,3205  54 123 0  LEFTNCOM  TS      SFTEMP1                  LOOP TIME .37 MSEC.
 1774   REF   6  LAST  446   40,3206  0 4375 1            TC      TPSL1
 1775   REF  21  LAST  448   40,3207  10 123 0            CCS     SFTEMP1
 1776   REF   1              40,3210  0 3205 0            TC      LEFTNCOM
 1777   REF   2  LAST  448   40,3211  0 0124 0            TC      SFTEMP2


 1778   REF 166  LAST  448   40,3212  56 155 0  2ROUND    XCH     MPAC      +1
 1779                        40,3213  6 0000 1            DOUBLE
 1780   REF 167  LAST  448   40,3214  54 155 1            TS      MPAC      +1
 1781   REF  93  LAST  448   40,3215  0 0002 0            TC      Q                    IF MPAC+1 DOES NOT OF/UF
 1782   REF 168  LAST  448   40,3216  6 0154 1            AD      MPAC
 1783   REF 169  LAST  448   40,3217  54 154 0            TS      MPAC
 1784   REF  94  LAST  448   40,3220  0 0002 0            TC      Q                    IF MPAC DOES NOT OF/UF
 1785   REF   5  LAST  446   40,3221  54 162 0            TS      MPAC+6
 1786   REF  95  LAST  448   40,3222  0 0002 0  2RNDEND   TC      Q


 1787   REF   6  LAST  448   40,3223  10 162 0  TESTOFUF  CCS     MPAC+6               RETURNS IF NO OF/UF
 1788   REF   6  LAST  447   40,3224  0 6020 0            TC      ALMCYCLE             OF    ALARM AND RECYCLE.
 1789   REF  96  LAST  448   40,3225  0 0002 0            TC      Q
 1790   REF   7  LAST  448   40,3226  0 6020 0            TC      ALMCYCLE             UF    ALARM AND RECYCLE.
 1791   REF   1                 42,3463                         SETLOC ENDSPMIN +1

 17915  REF   2 LAST  435 TO  438:    146     146*              COUNT* $$/PIN
 1792   REF   1                 42,3463   0 3604 0   HMSIN      TC     ALL3DEC           IF ALL 3 WORDS WERE NOT LOADED, ALARM.
 1793   REF  13   LAST  448     42,3464   0 7124 1              TC     DMP               XREG, XREGLP (=HOURS) WERE ALREADY PUT
 1794   REF   1                 42,3465    03545 0              ADRES  WHOLECON          INTO MPAC, MPAC+1.
 1795   REF   1                 42,3466   0 3554 0              TC     RND/TST           ROUND OFF TO WHOLE HRS IN MPAC+1.
 1796   REF  81   LAST  448     42,3467   3 4746 0              CAF    ZERO              ALARM IF MPAC NON ZERO (G/ 16383 ).
 1797   REF 170   LAST  448     42,3470   54 156 1              TS     MPAC     +2
 1798   REF   1                 42,3471   3 3547 1              CAF    HRCON
 1799   REF 171   LAST  449     42,3472   54 154 0              TS     MPAC
 1800   REF   2   LAST  449     42,3473   3 3550 1              CAF    HRCON    +1
 1801   REF 172   LAST  449     42,3474   56 155 0              XCH    MPAC     +1
 1802   REF   5   LAST  436     42,3475   0 7330 0              TC     SHORTMP
 1803   REF   1                 42,3476   0 3565 1              TC     MPACTST           ALARM IF MPAC NON ZERO (G/ 745)
 1804   REF 173   LAST  449     42,3477   52 156 1              DXCH   MPAC     +1       STORE HOURS CONTRIBUTION
 1805   REF   1                 42,3500   52 124 1              DXCH   HITEMIN
 1806   REF   3   LAST  440     42,3501   3 1003 0              CA     YREG              PUT YREG, YREGLP INTO MPAC, +1.
 1807   REF   2   LAST  104     42,3502   23'006 0              LXCH   YREGLP
 1808   REF 174   LAST  449     42,3503   52 155 1              DXCH   MPAC
 1809   REF  14   LAST  449     42,3504   0 7124 1              TC     DMP
 1810   REF   2   LAST  449     42,3505    03545 0              ADRES  WHOLECON
 1811   REF   2   LAST  449     42,3506   0 3554 0              TC     RND/TST           ROUND OFF TO WHOLE MIN IN MPAC+1
 1812   REF   1                 42,3507   4 3552 1              CS     59MIN             ALARM IF MPAC NON ZERO (G/16383)
 1813   REF   1                 42,3510   0 3572 1              TC     SIZETST           ALARM IF MPAC+1 G/ 59MIN
 1814   REF 175   LAST  449     42,3511   56 155 0              XCH    MPAC     +1
 1815                           42,3512   C 0006 1              EXTEND
 1816   REF   1                 42,3513   7 3551 1              MP     MINCON            LEAVES MINUTES CONTRIBUTION IN A,L
 1817   REF   2   LAST  449     42,3514   20 124 1              DAS    HITEMIN           ADD IN MINUTES CONTRIBUTION
 1818                           42,3515   C 0006 1              EXTEND                   IF THIS DAS OVERFLOWS, G/ 745HR,39MIN
 1819                           42,3516   1 3520 1              BZF    +2
 1820   REF   8   LAST  448     42,3517   0 6020 0              TC     ALMCYCLE
 1821   REF   3   LAST  440     42,3520   3 1004 1              CA     ZREG              PUT ZREG, ZREGLP INTO MPAC, +1.
 1822   REF   2   LAST  104     42,3521   23'007 1              LXCH   ZREGLP
 1823   REF 176   LAST  449     42,3522   52 155 1              DXCH   MPAC
 1824   REF  15   LAST  449     42,3523   0 7124 1              TC     DMP
 1825   REF   3   LAST  449     42,3524    03545 0              ADRES  WHOLECON
 1826   REF   3   LAST  449     42,3525   0 3554 0              TC     RND/TST           ROUND OFF TO WHOLE CENTI-SEC IN MPAC+1
 1827   REF   1                 42,3526   4 3553 0              CS     59.99SEC          ALARM IF MPAC NON ZERO (G/163.83 SEC)
 1828   REF   2   LAST  449     42,3527   0 3572 1              TC     SIZETST           ALARM IF MPAC+1 G/59.99 SEC
 1829   REF   3   LAST  449     42,3530   52 124 1              DXCH   HITEMIN           ADD IN SECONDS CONTRIBUTION
 1830   REF 177   LAST  449     42,3531   20 155 1              DAS    MPAC              IF THIS DAS OVERFLOWS,
 1831                           42,3532   0 0006 1              EXTEND                   G/ 745 HR, 39 MIN, 14.55 SEC.
 1832                           42,3533   1 3535 0              BZF    +2
 1833   REF   9   LAST  449     42,3534   0 6020 0              TC     ALMCYCLE          ALARM AND RECYCLE
 1834   REF  82   LAST  449     42,3535   3 4746 0              CAF    ZERO
 1835   REF 178   LAST  449     42,3536   54 156 1              TS     MPAC     +2
 1836   REF   6   LAST  438     42,3537   0 7300 0              TC     TPAGREE
 1837   REF 179   LAST  449     42,3540   52 155 1              DXCH   MPAC
 1838   REF  26   LAST  447     42,3541   50 145 1              INDEX  NOUNADD
 1839                             42,3542   52 001 1             DXCH     0
 1840  REF  27  LAST  446         42,3543   0 4626 1             TC       POSTJUMP
 1841  REF  10  LAST  445         42,3544    63045 0             CADR     LOADLV

 1842                             42,3545    00006 1  WHOLECON   OCT      00006              (10EXP5/2EXP14)2EXP14
 1843                             42,3546    03240 1             OCT      03240
 1844                             42,3547    00025 0  HRCON      OCT      00025              1 HOUR IN CENTI-SEC
 1845                             42,3550    37100 1             OCT      37100
 1846                             42,3551    13560 0  MINCON     OCT      13560              1 MINUTE IN CENTI-SEC
 1847                             42,3552    00073 0  59MIN      OCT      00073              59 AS WHOLE
 1848                             42,3553    13557 1  59.99SEC   OCT      13557              5999 CENTI-SEC


 1849  REF 180  LAST  449         42,3554   56 156 0  RND/TST    XCH      MPAC      +2       ROUNDS MPAC+2 INTO MPAC+1.
 1850                             42,3555   6 0000 1             DOUBLE                      ALARMS IF MPAC NOT 0
 1851  REF 181  LAST  450         42,3556   54 156 1             TS       MPAC      +2
 1852  REF  83  LAST  449         42,3557   3 4746 0             CAF      ZERO
 1853  REF 182  LAST  450         42,3560   6 0155 0             AD       MPAC      +1
 1854  REF 183  LAST  450         42,3561   54 155 1             TS       MPAC      +1
 1855  REF  84  LAST  450         42,3562   3 4746 0             CAF      ZERO
 1856  REF 184  LAST  450         42,3563   6 0154 1             AD       MPAC               CANT OVFLOW
 1857  REF 185  LAST  450         42,3564   56 154 1             XCH      MPAC
 1858  REF 186  LAST  450         42,3565   10 154 0  MPACTST    CCS      MPAC               ALARM IF MPAC NON ZERO
 1859  REF  10  LAST  449         42,3566   0 6020 0             TC       ALMCYCLE           ALARM AND RECYCLE.
 1860  REF  97  LAST  448         42,3567   0 0002 0             TC       Q
 1861  REF  11  LAST  450         42,3570   0 6020 0             TC       ALMCYCLE           ALARM AND RECYCLE.
 1862  REF  98  LAST  450         42,3571   0 0002 0             TC       Q

 1863  REF 187  LAST  450         42,3572   54 156 1  SIZETST    TS       MPAC      +2       CALLED WITH - CON IN A
 1864  REF 188  LAST  450         42,3573   10 155 1             CCS      MPAC      +1       GET MAG OF MPAC+1
 1865  REF  46  LAST  444         42,3574   6 4744 1             AD       ONE
 1866                             42,3575   1 3577 0             TCF      +2
 1867  REF  47  LAST  450         42,3576   6 4744 1             AD       ONE
 1868  REF 189  LAST  450         42,3577   6 0156 0             AD       MPAC      +2
 1869                             42,3600   0 0006 1             EXTEND                      MAG OF MPAC+1 - CON
 1870                             42,3601   6 3603 1             BZMF     +2
 1871  REF  12  LAST  450         42,3602   0 6020 0             TC       ALMCYCLE           MAG OF MPAC+1 G/ CON. ALARM AND RECYCLE.
 1872  REF  99  LAST  450         42,3603   0 0002 0             TC       Q                  MAG OF MPAC+1 L/= CON

R1873  ALL3DEC TESTS THAT ALL 3 WORDS ARE LOADED IN DEC (FOR HMSIN).
R1874  ALARM IF NOT.( TEST THAT BITS 3,4,5 OF DECBRNCH ARE ALL = 1)
 1875  REF   1                    42,3604   4 3611 0  ALL3DEC    CS       OCT34BAR           GET BITS 3,4,5 IN A
 1876  REF  17  LAST  444         42,3605   7 0777 1             MASK     DECBRNCH           GET BITS 3,4,5 OF DECBRNCH IN A
 1877  REF   2  LAST  450         42,3606   6 3611 1             AD       OCT34BAR           BITS 3,4,5 OF DECBRNCH MUST ALL = 1
 1878  REF 132  LAST  447         42,3607   10 000 0             CCS      A
 1879  REF   1                    42,3610   0 3614 1             TC       FORCEV25
 1880                             42,3611    77743 1  OCT34BAR   OCT      77743
 1881  REF   2  LAST  450         42,3612   0 3614 1             TC       FORCEV25
 1882  REF 100  LAST  450         42,3613   0 0002 0             TC       Q
 18825  REF   2  LAST  221    42,3614  4 6010 1  FORCEV25 CS      OCT31            FORCE VERB 25 TO BE EXECUTED BY RECYCLE
 18826  REF   2  LAST  420    42,3615  55'C40 0           TS      VERBSAVE          IN CASE OPERATOR EXECUTED A LOWER LOAD
 18827  REF  13  LAST  450    42,3616  0 6020 0           TC      ALMCYCLE          VERB.  ALARM AND RECYCLE.
 1883                         42,3617            ENDHMSS  EQUALS
```

```
P1884   MONITOR ALLOWS OTHER KEYBOARD ACTIVITY. IT IS ENDED BY VERB TERMINATE,
R1885   VERB PROCEED WITHOUT DATA, VERB RESEQUENCE,
R1886   ANOTHER MONITOR, OR ANY NVSUB CALL THAT PASSES THE DSPLOCK (PROVIDED
R18861  THAT THE OPERATOR HAS SOMEHOW ALLOWED THE ENDING OF A MONITOR WHICH
R18862  HE HAS INITIATED THROUGH THE KEYBOARD).

R1887   MONITOR ACTION IS SUSPENDED, BUT NOT ENDED, BY ANY KEYBOARD ACTION,
R1888   EXCEPT ERROR LIGHT RESET. IT BEGINS AGAIN WHEN KEY RELEASE IS PERFORMED.
P1889   MONITOR SAVES THE NOUN AND APPROPRIATE DISPLAY VERB IN MONSAVE. IT SAVES
R1890   NOUNCADR IN MONSAVE1, IF NOUN = MACHINE CADR TO BE SPECIFIED. BIT 15 OF
R1891   MONSAVE1 IS THE KILL MONITOR SIGNAL (KILLER BIT). BIT 14 OF MONSAVE1
R18911  INDICATES THE CURRENT MONITOR WAS EXTERNALLY INITIATED (EXTERNAL
R18912  MONITOR BIT). IT IS TURNED OFF BY RELDSP AND KILMONON.

R1892   MONSAVE INDICATES IF MONITOR IS ON(+=ON, +0=OFF)
R1893   IF MONSAVE IS +, MONITOR ENTERS NO REQUEST, BUT TURNS KILLER BIT OFF.
R1894   IF MONSAVE IS +0, MONITOR ENTERS REQUEST AND TURNS KILLER BIT OFF.

R1895   NVSUB (IF EXTERNAL MONITOR BIT IS OFF), VB=PROCEED WITHOUT DATA,
R1896   VB=RESEQUENCE, AND VB=TERMINATE TURN KILL MONITOR BIT ON.

R1897   IF KILLER BIT IS ON, MONREQ ENTERS NO FURTHER REQUESTS, ZEROS MONSAVE
R1898   AND MONSAVE1 (TURNING OFF KILLER BIT AND EXTERNAL MONITOR BIT).

R1899   MONITOR DOSENT TEST FOR MATBS SINCE NVSUB CAN HANDLE INTERNAL MATBS NOW
 1900   REF    1                  41,3302                        SETLOC ENDRUTIN

 19005  REF    3 LAST  439 TO  446:    283    690*             COUNT* $$/PIN
 1901   REF    1                  41,3302  4 3311 0  MONITOR   CS     BIT15/14
 1902   REF    6  LAST  445       41,3303  7 1016 0            MASK   NOUNCADR
 1903   REF  190  LAST  450       41,3304  54 155 1  MONIT1    TS     MPAC     +1      TEMP STORAGE
 19031  REF    7  LAST  438       41,3305  4 0136 1            CS     ENTEXIT
 19032  REF    4  LAST  420       41,3306  6 4210 0            AD     ENDINST
 19033  REF  133  LAST  450       41,3307  10 000 0            CCS    A
 19034  REF    1                  41,3310  0 3317 1            TC     MONIT2
 19035                            41,3311   60000 1  BIT15/14  OCT    60000
 19036  REF    2  LAST  452       41,3312  0 3317 1            TC     MONIT2
 19037  REF   37  LAST  428       41,3313  3 4727 1            CAF    BIT14            EXTERNALLY INITIATED MONITOR,
 19038  REF  191  LAST  452       41,3314  26 155 1            ADS    MPAC +1          SET BIT 14 FOR MONSAVE1.
 190381 REF   85  LAST  450       41,3315  3 4746 0            CAF    ZERO
 190382 REF    1                  41,3316  55'021 1            TS     MONSAVE2         ZERO NVMONOPT OPTIONS
 1904   REF    3  LAST  244       41,3317  3 6115 1  MONIT2    CAF    LOW7
 1905   REF   18  LAST  427       41,3320  7 1000 1            MASK   VERBREG
 1906   REF    4  LAST  443       41,3321  0 4322 0            TC     LEFT5
 1907   REF    5  LAST  412       41,3322  54 022 0            TS     CYL
 1908   REF    6  LAST  452       41,3323  4 0022 0            CS     CYL
 1909   REF    7  LAST  452       41,3324  56 022 1            XCH    CYL
 1910   REF   11  LAST  439       41,3325  6 1001 1            AD     NOUNREG
 1911   REF  192  LAST  452       41,3326  54 154 0            TS     MPAC             TEMP STORAGE
 1912   REF   86  LAST  452       41,3327  3 4746 0            CAF    ZERO
 1913   REF   3  LAST  410   41,3330  55'011 1             TS      DSPLOCK          +0 INTO DSPLOCK SO MONITOR CAN RUN.
 1914   REF   4  LAST  420   41,3331  11'041 1             CCS     CADRSTOR         TURN OFF KR LITE IF CADRSTOR AND DSPLIST
 1915                        41,3332  0 3334 0             TC      +2               ARE BOTH EMPTY. (LITE COMES ON IF NEW
 1916   REF   1              41,3333  0 4473 0             TC      RELDSP1          MONITOR IS KEYED IN OVER OLD MONITOR.)
 1917                        41,3334  0 0004 0             INHINT
 1918   REF   2  LAST  233   41,3335  11'017 1             CCS     MONSAVE
 1919                        41,3336  0 3343 0             TC      +5               IF MONSAVE WAS +, NO REQUEST
 1920   REF  48  LAST  450   41,3337  3 4744 1             CAF     ONE              IF MONSAVE WAS 0, REQUEST MONREQ
 1921   REF  15  LAST  379   41,3340  0 5205 0             TC      WAITLIST
 1922   REF  39  LAST  444      0776                       EBANK=  DSPCOUNT
 1923   REF   1              41,3341   03347 1             2CADR   MONREQ
 1923   REF   1              41,3342   62101 0
 1924   REF 193  LAST  452   41,3343  52 155 1             DXCH    MPAC             PLACE MONITOR VERB AND NOUN INTO MONSAVE
 1925   REF   3  LAST  453   41,3344  53'020 0             DXCH    MONSAVE          ZERO THE KILL MONITOR BIT
 1926                        41,3345  0 0003 1             RELINT                   SET UP EXTERNAL MONITOR BIT
 1927   REF   4  LAST  420   41,3346  0 0136 0             TC      ENTRET


 1928   REF   1              41,3347  0 4371 0   MONREQ    TC      LODSAMPT         CALLED BY WAITLIST
 1929   REF   2  LAST  233   41,3350  11'020 0             CCS     MONSAVE1         TIME IS SNATCHED IN RUPT FOR NOUN 65
 1930                        41,3351  0 3355 1             TC      +4               IF KILLER BIT = 0, ENTER REQUESTS
 1931                        41,3352  0 3355 1             TC      +3               IF KILLER BIT = 0, ENTER REQUESTS
 1932   REF   1              41,3353  0 3366 1             TC      KILLMON          IF KILLER BIT = 1, NO REQUESTS
 1933   REF   2  LAST  453   41,3354  0 3366 1             TC      KILLMON          IF KILLER BIT = 1, NO REQUESTS
 1934   REF   1              41,3355  3 3372 1             CAF     MONDEL
 1935   REF  16  LAST  453   41,3356  0 5205 0             TC      WAITLIST         ENTER WAITLIST REQUEST FOR MONREQ
 1936   REF  40  LAST  453      0776                       EBANK=  DSPCOUNT
 1937   REF   2  LAST  453   41,3357   03347 1             2CADR   MONREQ
 1937                        41,3360   62101 0
 1938   REF   2  LAST  168   41,3361  3 4346 1             CAF     CHRPRIO
 1939   REF   8  LAST  340   41,3362  0 5063 1             TC      NOVAC            ENTER EXEC REQUEST FOR MONDO
 1940   REF  41  LAST  453      0776                       EBANK=  DSPCOUNT
 1941   REF   1              41,3363   03373 0             2CADR   MONDO
 1941   REF   1              41,3364   62101 0
 1942   REF  11  LAST  396   41,3365  0 5263 0             TC      TASKOVER

 1943   REF  87  LAST  452   41,3366  3 4746 0   KILLMON   CAF     ZERO             ZERO MONSAVE AND TURN KILLER BIT OFF
 1944   REF   4  LAST  453   41,3367  55'017 1             TS      MONSAVE
 1945   REF   3  LAST  453   41,3370  55'020 0             TS      MONSAVE1         TURN OFF KILL MONITOR BIT.
 1946   REF  12  LAST  453   41,3371  0 5263 0             TC      TASKOVER         TURN OFF EXTERNAL MONITOR BIT.
 1947                        41,3372   00144 0   MONDEL    OCT     144              FOR 1 SEC MONITOR INTERVALS


 1948   REF   4  LAST  453   41,3373  11'020 0   MONDO     CCS     MONSAVE1         CALLED BY EXEC
 1949                        41,3374  0 3400 0             TC      +4               IF KILLER BIT = 0, CONTINUE
 1950                        41,3375  0 3400 0             TC      +3               IF KILLER BIT = 0, CONTINUE
 1951   REF  49  LAST  416   41,3376  0 5146 1             TC      ENDOFJOB         IN CASE TERMINATE CAME SINCE LAST MONREQ
 1952   REF  50  LAST  453   41,3377  0 5146 1             TC      ENDOFJOB         IN CASE TERMINATE CAME SINCE LAST MONREQ
 1953   REF   4  LAST  453   41,3400  11'011 1             CCS     DSPLOCK
 1954   REF   1              41,3401  0 3423 1             TC      MONBUSY          NVSUB IS BUSY
```

```
1955    REF   4  LAST  452   41,3402  3 6115 1              CAF     LOW7
1956    REF   5  LAST  453   41,3403  7 1017 1              MASK    MONSAVE
1958    REF   1              41,3404  0 2346 1              TC      UPDATNN -1       PLACE NOUN INTO NOUNREG AND DISPLAY IT
1960    REF   1              41,3405  3 4144 1              CAF     MID7
1961    REF   6  LAST  454   41,3406  7 1017 1              MASK    MONSAVE          CHANGE MONITOR VERB TO DISPLAY VERB
1962    REF   1              41,3407  6 3421 0              AD      MONREF           -DEC10, STARTING IN BIT8
1963    REF   1              41,3410  54 023 1              TS      EDOP             RIGHT 7
1964    REF   2  LAST  454   41,3411  3 0023 0              CA      EDOP
1965    REF  19  LAST  452   41,3412  55'000 1              TS      VERBREG
1966    REF   1              41,3413  3 3422 0              CAF     MONBACK          SET RETURN TO PASTEVB AFTER DATA DISPLAY
1967    REF   5  LAST  453   41,3414  54 136 1              TS      ENTRET
1968    REF   2  LAST  452   41,3415  4 3311 0              CS      BIT15/14
1969    REF   5  LAST  453   41,3416  7 1020 0              MASK    MONSAVE1         PUT ECADR INTO MPAC +2. INTMCTBS WILL
1970    REF 194  LAST  453   41,3417  54 156 1              TS      MPAC     +2      DISPLAY IT AND SET NOUNCADR, NOUNADD,
1971    REF   1              41,3420  0 2073 1    ENDMONDO  TC      TESTNN           EBANK.

1972                            4124                        BLOCK   2

197201  REF   1                 4000                        SETLOC  FFTAG8
197202                          4124                        BANK

19725   REF   1                                             COUNT*  $$/PIN
1973    REF   2  LAST  454      4124  3 4144 1    PASTEVB   CAF     MID7
1974    REF   2  LAST  452      4125  7 1021 1              MASK    MONSAVE2         NVMONOPT PASTE OPTION
1975                            4126  0 0006 1              EXTEND
1976                            4127  1 4131 1              BZF     +2
1977    REF   1                 4130  0 4132 0              TC      PASTEOPT         PASTE PLEASE VERB FOR NVMONOPT
1978    REF   7  LAST  454      4131  3 1017 0              CA      MONSAVE          PASTE MONITOR VERB - PASTE OPTION IS 0
19782   REF   3  LAST  454      4132  54 023 1    PASTEOPT  TS      EDOP             RIGHT 7
19783   REF   4  LAST  454      4133  3 0023 0              CA      EDOP             PLACE MONITOR VERB OR PLEASE VERB INTO
197832  REF  96  LAST  447      4134  0 4607 1              TC      BANKCALL          VERBREG AND DISPLAY IT.
197833  REF   7  LAST  441      4135   62366 0              CADR    UPDATVB -1
197835  REF  88  LAST  453      4136  3 4746 0              CAF     ZERO             ZERO REQRET SO THAT PASTED VERBS CAN
197838  REF  10  LAST  424      4137  55'012 1              TS      REQRET            BE EXECUTED BY OPERATOR.
19784   REF   3  LAST  454      4140  3 1021 0              CA      MONSAVE2
19785   REF   1                 4141  0 4246 0              TC      BLANKSUB         PROCESS NVMONOPT BLANK OPTION IF ANY
19786                           4142  0 4143 0              TC      +1
19787   REF  51  LAST  453      4143  0 5146 1    ENDPASTE  TC      ENDOFJOB

1979                            4144   37600 0    MID7      OCT     37600


1980    REF   1              41,3421                        SETLOC  ENDMONDO +1
19805   REF   4 LAST  452 TO  454:     79   769*            COUNT*  $$/PIN
1981                         41,3421   75377 0    MONREF    OCT     75377            -DEC10, STARTING IN BIT8
1982    REF   1              41,3422   04124 1    MONBACK   ADRES   PASTEVB

1983    REF   2  LAST  410   41,3423  0 4365 0    MCNBUSY   TC      RELDSPON         TURN KEY RELEASE LIGHT
1984    REF  52  LAST  454   41,3424  0 5146 1              TC      ENDOFJOB
```

```
R1985    DSPFMEM IS USED TO DISPLAY (IN OCTAL) ANY FIXED REGISTER.
R1986    IT IS USED WITH NOUN = MACHINE CADR TO BE SPECIFIED. THE FCADR OF THE
R1987    DESIRED LOCATION IS THEN PUNCHED IN. IT HANDLES F/F ( FCADR 4000-7777)

R19871   FOR BANKS L/E 27, THIS IS ENOUGH.

R19872   FOR BANKS G/E 30, THE THIRD COMPONENT OF NOUN 26 (PRIO, ADRES, BBCON)
R19873   MUST BE PRELOADED WITH THE DESIRED SUPERBANK BITS (BITS 5,6,7).
R19874            V23N26 SHOULD BE USED.

R19875   SUMMARY
R19876   FOR BANKS L/E 27,                             V27N01E(FCADR)E
R19877   FOR BANKS G/E 30,     V23N26E(SUPERBITS)E     V27N01E(FCADR)E

 1988    REF  11  LAST  438   41,3425  3 4310 1  DSPFMEM  CAF    R1D1            IF F/F, DATACALL USES BANK 02 OR 03.
 1989    REF  42  LAST  453   41,3426  54 776 0           TS     DSPCOUNT
 19891   REF  18  LAST  386   41,3427  3 1046 1           CA     DSPTEM1 +2      SUPERBANK BITS WERE PRELOADED INTO
 19892   REF  59  LAST  443   41,3430  54 001 1           TS     L               3RD COMPONENT OF NOUN 26.
 1990    REF   7  LAST  452   41,3431  3 1016 1           CA     NOUNCADR        ORIGINAL FCADR LOADED STILL IN NOUNCADR.
 1991    REF   1              41,3432  0 4642 0           TC     SUPDACAL        CALL WITH FCADR IN A, SUPERBITS IN L.
 1992    REF   3  LAST  427   41,3433  0 3435 0           TC     DSPOCTWD
 1993    REF  53  LAST  454   41,3434  0 5146 1  ENDSPF   TC     ENDOFJOB
```

```
P1994   WORD DISPLAY ROUTINES

 1995   REF   4  LAST  447    40,3227                        SETLOC TESTOFUF +4
 19955  REF   5 LAST  446 TO  449:   120   616*              COUNT* $$/PIN
 1996   REF 101  LAST  450    40,3227  56 002 0  DSPSIGN   XCH    Q
 1997   REF   1               40,3230  54 144 1            TS     DSPWDRET
 1998   REF 155  LAST  454    40,3231  10 154 0            CCS    MPAC
 1999                         40,3232  0 3242 0            TC     +8D
 2000                         40,3233  0 3242 0            TC     +7
 2001   REF  49  LAST  453    40,3234  6 4744 1            AD     ONE
 2002   REF 156  LAST  456    40,3235  54 154 0            TS     MPAC
 2003   REF   2  LAST  414    40,3236  0 2422 1            TC     -ON
 2004   REF 197  LAST  456    40,3237  4 0155 1            CS     MPAC  +1
 2005   REF 198  LAST  456    40,3240  54 155 1            TS     MPAC     +1
 2006   REF   2  LAST  456    40,3241  0 0144 0            TC     DSPWDRET
 2007   REF   3  LAST  434    40,3242  0 2402 0            TC     +ON
 2008   REF   3  LAST  456    40,3243  0 0144 0            TC     DSPWDRET

 2009                         40,3244  0 0006 1  DSPRND    EXTEND                   ROUND BY 5 EXP-6
 2010   REF   1               40,3245  3 3310 0            DCA    DECROUND -1
 2011   REF 199  LAST  456    40,3246  20 155 1            DAS    MPAC
 2012                         40,3247  0 0006 1            EXTEND
 2013                         40,3250  1 3254 0            BZF    +4
 2014                         40,3251  0 0006 1            EXTEND
 2015   REF   1               40,3252  3 4724 1            DCA    DPOSMAX
 2016   REF 200  LAST  456    40,3253  52 155 1            DXCH   MPAC
 2017   REF 102  LAST  456    40,3254  0 0002 0            TC     Q

R2018   DSPDECWD CONVERTS C( MPAC, MPAC+1) INTO A SIGN AND 5 CHAR DECIMAL
R2019   STARTING IN LOC SPECIFIED IN DSPCOUNT. IT ROUNDS BY 5 EXP-6.

 2020   REF 103  LAST  456    40,3255  56 002 0  DSPDECWD XCH    Q
 2021   REF   1               40,3256  54 115 0            TS     WDRET
 2022   REF   1               40,3257  0 3227 0            TC     DSPSIGN
 2023   REF   1               40,3260  0 3244 0            TC     DSPRND
 2024   REF   5  LAST  345    40,3261  3 4742 1            CAF    FOUR
 2025   REF   1               40,3262  54 137 0  DSPDCWD1  TS     WDCNT
 2026   REF   1               40,3263  3 4354 1            CAF    BINCON
 2027   REF   6  LAST  449    40,3264  0 7330 0            TC     SHORTMP
 2028   REF 201  LAST  456    40,3265  50 154 1  TRACE1    INDEX  MPAC
 2029   REF   3  LAST  411    40,3266  3 4066 0            CAF    RELTAB
 2030   REF   5  LAST  443    40,3267  7 4337 0            MASK   LOW5
 2031   REF   6  LAST  436    40,3270  54 124 1            TS     CODE
 2032   REF  89  LAST  454    40,3271  3 4746 0            CAF    ZERO
 2033   REF 202  LAST  456    40,3272  56 156 0            XCH    MPAC     +2
 2034   REF 203  LAST  456    40,3273  56 155 0            XCH    MPAC     +1
 2035   REF 204  LAST  456    40,3274  54 154 0            TS     MPAC
 2036   REF  43  LAST  455    40,3275  56 776 1            XCH    DSPCOUNT
 2037   REF   4  LAST  436    40,3276  54 143 0  TRACE1S   TS     COUNT
 2038   REF 134  LAST  452    40,3277  10 000 0            CCS    A                 DECREMENT DSPCOUNT EXCEPT AT +0
 2039   REF  44  LAST  456   40,3300  54 776 0             TS       DSPCOUNT
 2040   REF   4  LAST  436   40,3301  0 3351 0             TC       DSPIN
 2041   REF   2  LAST  456   40,3302  10 137 0             CCS      WDCNT
 2042   REF   1              40,3303  0 3262 1             TC       DSPDCWD1
 2043   REF   7  LAST  442   40,3304  4 4351 0             CS       VD1
 2044   REF  45  LAST  457   40,3305  54 776 0             TS       DSPCOUNT
 2045   REF   2  LAST  456   40,3306  0 0115 1             TC       WDRET

 2046                        40,3307   00000 1             OCT      00000
 2047                        40,3310   02476 0  DECROUND   OCT      02476

R2048   DSPDECNR CONVERTS C( MPAC,MPAC+1) INTO A SIGN AND 5 CHAR DECIMAL
R2049   STARTING IN LOC SPECIFIED IN DSPCOUNT. IT DOES NOT ROUND

 2050   REF 104  LAST  456   40,3311  56 002 0  DSPDECNR   XCH      Q
 2051   REF   3  LAST  457   40,3312  54 115 0             TS       WDRET
 2052   REF   2  LAST  456   40,3313  0 3227 0             TC       DSPSIGN
 2053   REF   2  LAST  457   40,3314  0 3261 1             TC       DSPDCWD1 -1

R2054   DSPDC2NR CONVERTS C( MPAC,MPAC+1) INTO A SIGN AND 2 CHAR DECIMAL
R2055   STARTING IN LOC SPECIFIED IN DSPCOUNT. IT DOES NOT ROUND

 2056   REF 105  LAST  457   40,3315  56 002 0  DSPDC2NR   XCH      Q
 2057   REF   4  LAST  457   40,3316  54 115 0             TS       WDRET
 2058   REF   3  LAST  457   40,3317  0 3227 0             TC       DSPSIGN
 2059   REF  50  LAST  456   40,3320  3 4744 1             CAF      ONE
 2060   REF   3  LAST  457   40,3321  0 3262 1             TC       DSPDCWD1


R2061   DSP2DEC CONVERTS C(MPAC) AND C(MPAC+1) INTO A SIGN AND 10 CHAR DECIMAL
R2062   STARTING IN THE LOC SPECIFIED IN DSPCOUNT.

 2063   REF 106  LAST  457   40,3322  56 002 0  DSP2DEC    XCH      Q
 2064   REF   5  LAST  457   40,3323  54 115 0             TS       WDRET
 2065   REF  90  LAST  456   40,3324  3 4746 0             CAF      ZERO
 2066   REF   7  LAST  456   40,3325  54 124 1             TS       CODE
 2067   REF  15  LAST  436   40,3326  3 6266 0             CAF      THREE
 2068   REF   3  LAST  415   40,3327  0 3433 0             TC       11DSPIN            -R2 OFF
 2069   REF   6  LAST  456   40,3330  3 4742 1             CAF      FOUR
 2070   REF   4  LAST  457   40,3331  0 3433 0             TC       11DSPIN            +R2 OFF
 2071   REF   4  LAST  457   40,3332  0 3227 0             TC       DSPSIGN
 2072   REF   4  LAST  435   40,3333  3 4311 0             CAF      R2D1
 2073   REF   4  LAST  457   40,3334  0 3262 1  END2DEC    TC       DSPDCWD1


R2074   DSPDECVN DISPLAYS C(A) UPON ENTRY AS A 2 CHAR DECIMAL BEGINNING IN THE
R2075   DSP LOC SPECIFIED IN DSPCOUNT.
R2076   C(A) SHOULD BE IN FORM N X 2EXP-14. THIS IS SCALED TO FORM N/100 BEFORE
R2077   DISPLAY CONVERSION.
```

```
 2078                          40,3335  0 CC06 1  DSPDECVN EXTEND
 2079    REF   1               40,3336  7 3345 1           MP       VNDSPCON          MULT BY .01
 2080    REF 205  LAST  456    40,3337  22 154 1           LXCH     MPAC              TAKE RESULTS FROM L.(MULT BY 2EXP14).
 2081    REF  91  LAST  457    40,3340  3 4746 0           CAF      ZERO
 2082    REF 206  LAST  458    40,3341  54 155 1           TS       MPAC     +1
 2083    REF 107  LAST  457    40,3342  56 C02 0           XCH      Q
 2084    REF   6  LAST  457    40,3343  54 115 0           TS       WDRET
 2085    REF   3  LAST  437    40,3344  0 3320 0           TC       DSPDC2NR +3       NO SIGN, NO ROUND, 2 CHAR

 2086                          40,3345   00244 0  VNDSPCON OCT      00244             .01 ROUNDED UP


 2087    REF   3  LAST  434    40,3346  0 3335 1  GOVNUPDT TC       DSPDECVN          THIS IS NOT FOR GENERAL USE. REALLY PART
 2088    REF  28  LAST  450    40,3347  0 4626 1           TC       POSTJUMP          OF UPDATVB.
 2089    REF   2  LAST  424    40,3350   62376 1           CADR     UPDAT1   +2

 2090                          40,3351            ENDECVN  EQUALS


 2091    REF   1               41,3435                     SETLOC ENDSPF   +1
 20915   REF   5 LAST  454 TO  456:     12   781*          COUNT* $$/PIN
R2092    DSPOCTWD DISPLAYS C(A) UPON ENTRY AS A 5 CHAR OCT STARTING IN THE DSP
R2093    CHAR SPECIFIED IN DSPCOUNT. IT STOPS AFTER 5 CHAR HAVE BEEN DISPLAYED.

 2094    REF   8  LAST  452    41,3435  54 022 0  DSPOCTWD TS       CYL
 2095    REF 108  LAST  458    41,3436  56 002 0           XCH      Q
 2096    REF   7  LAST  458    41,3437  54 115 0           TS       WDRET             MUST USE SAME RETURN AS DSP2BIT.
 2097    REF  38  LAST  452    41,3440  3 4727 1           CAF      BIT14             TO BLANK SIGNS
 2098    REF  46  LAST  457    41,3441  26 776 0           ADS      DSPCOUNT
 2099    REF   7  LAST  457    41,3442  3 4742 1           CAF      FOUR
 2100    REF   3  LAST  457    41,3443  54 137 0  WDAGAIN  TS       WDCNT
 2101    REF   9  LAST  458    41,3444  4 0022 0           CS       CYL
 2102    REF  10  LAST  458    41,3445  4 0022 0           CS       CYL
 2103    REF  11  LAST  458    41,3446  4 C022 0           CS       CYL
 2104    REF 135  LAST  456    41,3447  4 0000 0           CS       A
 2105    REF   1               41,3450  7 4750 0           MASK     DSPMSK
 2106    REF 136  LAST  458    41,3451  50 C00 1           INDEX    A
 2107    REF   4  LAST  456    41,3452  3 4066 0           CAF      RELTAB
 2108    REF   6  LAST  456    41,3453  7 4337 0           MASK     LOW5
 2109    REF   8  LAST  457    41,3454  54 124 1           TS       CODE
 2110    REF  47  LAST  458    41,3455  56 776 1           XCH      DSPCOUNT
 2111    REF   5  LAST  456    41,3456  54 143 0           TS       COUNT
 2112    REF 137  LAST  458    41,3457  10 000 0           CCS      A                 DECREMENT DSPCOUNT EXCEPT AT +0
 2113    REF  48  LAST  458    41,3460  54 776 0           TS       DSPCOUNT
 2114    REF  29  LAST  458    41,3461  0 4626 1           TC       POSTJUMP
 2115    REF   1               41,3462   61441 1           CADR     DSPOCTIN
 2116    REF   4  LAST  458    41,3463  10 137 0  OCTBACK  CCS      WDCNT
 2117    REF   1               41,3464  0 3443 1           TC       WDAGAIN           +
 2118    REF   8  LAST  457    41,3465  4 4351 0  DSPLV    CS       VD1               TO BLOCK NUMERICAL CHARACTERS, CLEARS,
 2119    REF  49  LAST  458    41,3466  54 776 0           TS       DSPCOUNT          AND SIGNS AFTER A COMPLETED DISPLAY.
 2120   REF    8  LAST  458    41,3467  0 0115 1             TC      WDRET

 2121   REF    5  LAST  444       4750              DSPMSK   =       SEVEN


R2135   FOR DSPIN PLACE 0/25 OCT INTO COUNT, 5 BIT RELAY CODE INTO CODE. BOTH
R2136   ARE DESTROYED. IF BIT14 OF COUNT IS 1, SIGN IS BLANKED WITH LEFT CHAR.
R2137   FOR DSPIN1 PLACE 0,1 INTO BIT11 OF CODE, 2 INTO COUNT, REL ADDRESS OF
R2138   DSPTAB ENTRY INTO DSREL.

 2139   REF    1               40,3351                       SETLOC ENDECVN

 21395  REF    6 LAST  456 TO  458:     82    698*           COUNT* $$/PIN
 2140   REF 109  LAST  458     40,3351  56 002 0  DSPIN      XCH     Q                    CANT USE L FOR RETURN, SINCE MANY OF THE
 2141   REF    1               40,3352  54 114 1             TS      DSEXIT               ROUTINES CALLING DSPIN USE L AS RETURN.
 2142   REF    7  LAST  458    40,3353  3 4337 1             CAF     LOW5
 2143   REF    6  LAST  458    40,3354  7 0143 0             MASK    COUNT
 2144   REF    6  LAST  442    40,3355  54 021 0             TS      SR
 2145   REF    7  LAST  459    40,3356  56 021 1             XCH     SR
 2146   REF    1               40,3357  54 141 1             TS      DSREL
 2147   REF   21  LAST  432    40,3360  3 4744 1             CAF     BIT1
 2148   REF    7  LAST  459    40,3361  7 0143 0             MASK    COUNT
 2149   REF  138  LAST  458    40,3362  10 000 0             CCS     A
 2150                          40,3363  0 3365 1             TC      +2                   LEFT IF COUNT IS ODD
 2151   REF    1               40,3364  0 3375 0             TC      DSPIN1  -1           RIGHT IF COUNT IS EVEN
 2152   REF    9  LAST  458    40,3365  56 124 0             XCH     CODE
 2153   REF    1               40,3366  0 4331 1             TC      SLEFT5               DOES NOT USE CYL
 2154   REF   10  LAST  459    40,3367  54 124 1             TS      CODE
 2155   REF   39  LAST  458    40,3370  3 4727 1             CAF     BIT14
 2156   REF    8  LAST  459    40,3371  7 0143 0             MASK    COUNT
 2157   REF  139  LAST  459    40,3372  10 000 0             CCS     A
 2158   REF   30  LAST  448    40,3373  3 4743 0             CAF     TWO                  BIT14 = 1, BLANK SIGN
 2159   REF   51  LAST  457    40,3374  6 4744 1             AD      ONE                  BIT14 = 0, LEAVE SIGN ALONE
 2160   REF    9  LAST  459    40,3375  54 143 0             TS      COUNT                +0 INTO COUNT FOR RIGHT
A2161                                                                                     +1 INTO COUNT FOR LEFT(SIGN LEFT ALONE)
A2162                                                                                     +3 INTO COUNT FOR LEFT(TO BLANK SIGN)
 2163                          40,3376  0 0004 0  DSPIN1     INHINT
 2164   REF    2  LAST  459    40,3377  50 141 0             INDEX   DSREL
 2165   REF   31  LAST  417    40,3400  11'022 1             CCS     DSPTAB
 2166                          40,3401  0 3403 0             TC      +2                   IF +
 2167   REF    6  LAST  446    40,3402  0 5701 1             TC      CCSHOLE
 2168   REF   52  LAST  459    40,3403  6 4744 1             AD      ONE                  IF-
 2169   REF    1               40,3404  54 142 1             TS      DSMAG
 2170   REF   10  LAST  459    40,3405  50 143 1             INDEX   COUNT
 2171   REF    1               40,3406  7 3427 1             MASK    DSMSK
 2172                          40,3407  0 0006 1             EXTEND
 2173   REF   11  LAST  459    40,3410  60 124 0             SU      CODE
 2174                          40,3411  0 0006 1             EXTEND
 2175   REF    1               40,3412  1 3425 0             BZF     DSLV                 SAME
 2176   REF   11  LAST  459    40,3413  50 143 1  DFRNT      INDEX   COUNT
 2177   REF   2  LAST  459   40,3414  4 3427 1            CS        DSMSK            MASK WITH 77740,76037,75777, OR 74037
 2178   REF   2  LAST  459   40,3415  7 0142 1            MASK      DSMAG
 2179   REF  12  LAST  459   40,3416  6 0124 0            AD        CODE
 2180   REF 140  LAST  459   40,3417  4 0000 0            CS        A
 2181   REF   3  LAST  459   40,3420  50 141 0            INDEX     DSREL
 2182   REF  32  LAST  459   40,3421  57'022 0            XCH       DSPTAB
 2183                        40,3422  0 0006 1            EXTEND
 2184   REF   2  LAST  459   40,3423  6 3425 1            BZMF      DSLV             DSPTAB ENTRY WAS -
 2185   REF   7  LAST  418   40,3424  25'015 1            INCR      NOUT             DSPTA8 ENTRY WAS +
 2186                        40,3425  0 0003 1  DSLV      RELINT
 2187   REF   2  LAST  459   40,3426  0 0114 0            TC        DSEXIT

 2188                        40,3427   00037 0  DSMSK     OCT       37
 2189                        40,3430   01740 0            OCT       1740
 2190                        40,3431   02000 0            OCT       2000
 2191                        40,3432   03740 1            OCT       3740


R2192   FOR 11DSPIN, PUT REL ADDRESSS OF DSPTAB ENTRY INTO A, 1 IN BIT11 OR 0 IN
R2193   BIT11 OF CODE.

 2194   REF   4  LAST  460   40,3433  54 141 1  11DSPIN   TS        DSREL
 2195   REF  31  LAST  459   40,3434  3 4743 0            CAF       TWO
 2196   REF  12  LAST  459   40,3435  54 143 0            TS        COUNT
 2197   REF 110  LAST  459   40,3436  56 002 0            XCH       Q                MUST USE SAME RETURN AS DSPIN
 2198   REF   3  LAST  460   40,3437  54 114 1            TS        DSEXIT
 2199   REF   2  LAST  459   40,3440  0 3376 0            TC        DSPIN1


 2200   REF   5  LAST  457   40,3441  0 3351 0  DSPOCTIN  TC        DSPIN            SO DSPOCTWD DOESNT USF SWCALL
 2201                        40,3442  3 3444 0            CAF       +2
 2202   REF   5  LAST  445   40,3443  0 4631 1            TC        BANKJUMP
 2203   REF   1              40,3444   63463 0  ENDSPOCT  CADR      OCTBACK


R2204   DSPALARM FINDS TC NVSUBEND IN ENTRET FOR NVSUB INITIATED ROUTINES.
R2205   ABORT WITH 01501.
R2206   DSPALARM FINDS TC ENDOFJOB IN ENTRET FOR KEYBOARD INITIATED ROUTINES.
R2207   DO TC ENTRET.

 22075  REF   9  LAST  458   40,3445  4 4351 0  PREDSPAL  CS        VD1
 22076  REF  50  LAST  458   40,3446  54 776 0            TS        DSPCOUNT
 2208   REF   1              40,3447  4 3470 0  DSPALARM  CS        NVSBENDL
 2209   REF   8  LAST  452   40,3450  6 0136 0            AD        ENTEXIT
 2210                        40,3451  0 0006 1            EXTEND
 2211   REF  16  LAST  411   40,3452  1 3465 1            BZF       CHARALRM +2
 22111  REF   1              40,3453  4 3467 0            CS        MONADR           IF THIS IS A MONITOR, KILL IT
 22112  REF   9  LAST  460   40,3454  6 0136 0            AD        ENTEXIT
 22113                       40,3455  0 0006 1            EXTEND
 22114                       40,3456  1 3460 1            BZF       +2
 22115  REF  17  LAST  460    40,3457  0 3463 0            TC      CHARALRM
 22116  REF   1               40,3460  0 4175 0            TC      KILMONON
 22117  REF   3  LAST  277    40,3461  0 4355 0            TC      FALTON
 22118  REF   2  LAST  454    40,3462  0 4124 1            TC      PASTEVB          PUT MONITOR VERB BACK IN VERBREG
 2212   REF   4  LAST  461    40,3463  0 4355 0  CHARALRM  TC      FALTON           NOT NVSUB INITIATED. TURN ON OPR ERROR
 2213   REF  54  LAST  455    40,3464  0 5146 1            TC      ENDOFJOB
 2214   REF   1               40,3465  0 5644 1            TC      P00DOO
 2217                         40,3466   21501 0            OCT     21501
 22171  REF   3  LAST  461    40,3467   04124 1  MONADR    GENADR  PASTEVB
 2218   REF   1               40,3470  0 4173 0  NVSBENDL  TC      NVSUBEND


R2219   ALMCYCLE TURNS ON CHECK FAIL LIGHT, REDISPLAYS THE ORIGINAL VERB THAT
R2220   WAS EXECUTED, AND RECYCLES TO EXECUTE THE ORIGINAL VERB/NOUN COMBINATION
R2221   THAT WAS LAST EXECUTED. USED FOR BAD DATA DURING LOAD VERBS AND BY
R2222   MCTBS. ALSO BY MMCHANG IF 2 NUMERICAL CHARACTERS WERE NOT PUNCHED IN
R2223   FOR MM CODE.

 2224   REF   4  LAST  299       6000                      SETLOC  FFTAG5
 22242                           6020                      BANK
 22245  REF   1                                            COUNT*  $$/PIN
 2225   REF   5  LAST  461       6020  0 4355 0  ALMCYCLE  TC      FALTON           TURN ON CHECK FAIL LIGHT.
 2228   REF   3  LAST  451       6021  4 1040 0            CS      VERBSAVE         GET ORIGINAL VERB THAT WAS EXECUTED
 2229   REF  11  LAST  454       6022  55'012 1            TS      REQRET           SET FOR ENTPASO
 2230   REF  97  LAST  454       6023  0 4607 1            TC      BANKCALL         PUTS ORIGINAL VERB INTO VERBREG AND
 2231   REF   8  LAST  454       6024   62366 0            CADR    UPDATVB -1       DISPLAYS IT IN VERB LIGHTS.
 2232   REF  30  LAST  458       6025  0 4626 1            TC      POSTJUMP
 2233   REF   2  LAST  411       6026   62022 0  ENDALM    CADR    ENTER


R2234   MMCHANG USES NOUN DISPLAY UNTIL ENTER. THEN IT USES MODE DISP.
R2235   IT GOES TO MODROUT WITH THE NEW M M CODE IN A, BUT NOT DISPLAYED IN
R2236   MM LIGHTS.
R2237   IT DEMANDS 2 NUMERICAL CHARACTERS BE PUNCHED IN FOR NEW MM CODE.
R2238   IF NOT, IT RECYCLES.

 2239   REF   1               41,3470                      SETLOC  DSPLV +3
 22395  REF   6 LAST  458 TO  459:     27   808*           COUNT*  $$/PIN
 2240   REF   1               41,3470  0 3512 1  MMCHANG   TC      REQMM            ENTPASHI ASSUMES THE TC REQMM AT MMCHANG
A2241                                                                               IF THIS MOVES AT ALL, MUST CHANGE
A2242                                                                               MMADREF AT ENTPASHI.
 2243   REF  22  LAST  388    41,3471  3 4740 0            CAF     BIT5             OCT20 = ND2.
 2244   REF  51  LAST  460    41,3472  6 0776 1            AD      DSPCOUNT         DSPCOUNT MUST = -ND2.
 2245                         41,3473  0 0006 1            EXTEND                   DEMAND THAT 2 NUM CHAR WERE PUNCHED IN.
 2246                         41,3474  1 3476 0            BZF     +2
 2247   REF  14  LAST  451    41,3475  0 6020 0            TC      ALMCYCLE         DSPCOUNT NOT= -ND2. ALARM AND RECYCLE.
 2248   REF  92  LAST  458    41,3476  3 4746 0            CAF     ZERO             DSPCOUNT = -ND2.
 2249   REF  12  LAST  452    41,3477  57'001 1            XCH     NOUNREG
 2250   REF 207  LAST  458    41,3500  54 154 0            TS      MPAC
 2251   REF   5  LAST  442    41,3501  3 4352 1            CAF     ND1
 2252    REF  52  LAST  461    41,3502  54 776 0            TS      DSPCOUNT
 2253    REF  98  LAST  461    41,3503  0 4607 1            TC      BANKCALL
 2254    REF   4  LAST  417    41,3504   60570 0            CADR    2BLANK
 2255    REF  10  LAST  460    41,3505  4 4351 0            CS      VD1             BLOCK NUM CHAR IN
 2256    REF  53  LAST  462    41,3506  54 776 0            TS      DSPCOUNT
 2257    REF 208  LAST  461    41,3507  3 0154 1            CA      MPAC
 2258    REF  31  LAST  461    41,3510  0 4626 1            TC      POSTJUMP
 2259    REF   1               41,3511   10054 1            CADR    MODROUTB        GO THRU STANDARD LOC.


 2260    REF   2  LAST  310    04,2054           MODROUTB =         V37
 2261    REF 111  LAST  460    41,3512  4 0002 1 REQMM      CS      Q
 2262    REF  12  LAST  461    41,3513  55'012 1            TS      REQRET
 2263    REF   6  LAST  461    41,3514  3 4352 1            CAF     ND1
 2264    REF  54  LAST  462    41,3515  54 776 0            TS      DSPCOUNT
 2265    REF  93  LAST  461    41,3516  3 4746 0            CAF     ZERO
 2266    REF  13  LAST  461    41,3517  55'001 0            TS      NOUNREG
 2267    REF  99  LAST  462    41,3520  0 4607 1            TC      BANKCALL
 2268    REF   5  LAST  462    41,3521   60570 0            CADR    2BLANK
 2269    REF   3  LAST  424    41,3522  0 4420 0            TC      FLASHON
 2270    REF  53  LAST  459    41,3523  3 4744 1            CAF     ONE
 2271    REF  18  LAST  450    41,3524  54 777 1            TS      DECBRNCH        SET FOR DEC
 2272    REF  10  LAST  460    41,3525  0 0136 0            TC      ENTEXIT


R2273    VBRQEXEC ENTERS REQUEST TO EXEC     FOR ANY ADDRESS WITH ANY PRIORITY.
R2274    IT DOES ENDOFJOB AFTER ENTERING REQUEST. DISPLAY SYST IS RELEASED.
R2275    IT ASSUMES NOUN 26 HAS BEEN PRELOADED WITH
R2276    COMPONENT 1  PRIORITY(BITS 10-14) BIT1=0 FOR NOVAC, BIT1=1 FOR FINDVAC.
R2277    COMPONENT 2  JOB ADRES (12 BIT )
R2278    COMPONENT 3  BBCON

 2279    REF   3  LAST  291    41,3526  3 4732 0 VBRQEXEC CAF       EBANK4
 22795   REF  15  LAST  400    41,3527  54 003 0            TS      FBANK
 227955  REF   3  LAST  317    E4,1771                      EBANK=  N26/PRI

 22796   REF  22  LAST  459    41,3530  3 4744 1            CAF     BIT1
 2280    REF   4  LAST  462    41,3531  7 1771 0            MASK    N26/PRI
 2281    REF 141  LAST  460    41,3532  10 000 0            CCS     A
 2282    REF   1               41,3533  0 3555 1            TC      SETVAC          IF BIT1 = 1, FINDVAC
 2283    REF   1               41,3534  3 4342 0            CAF     TCNOVAC         IF BIT1 = 0, NOVAC
 2284    REF 209  LAST  462    41,3535  54 154 0 REQEX1     TS      MPAC            TC NOVAC  OR  TC FINDVAC INTO MPAC
 2285    REF  23  LAST  462    41,3536  4 4744 0            CS      BIT1
 2286    REF   5  LAST  462    41,3537  7 1771 0            MASK    N26/PRI
 2287    REF 210  LAST  462    41,3540  54 160 1            TS      MPAC     +4     PRIO INTO MPAC+4 AS A TEMP
 2288    REF   6  LAST  442    41,3541  0 4450 1 REQUESTC   TC      RELDSP
 22885   REF   6  LAST  462    41,3542  3 1771 1            CA      N26/PRI
 22886                         41,3543  0 0006 1            EXTEND
 22887   REF  17  LAST  428    41,3544  1 2400 0            BZF     GODSPALM        OP ERROR AND EOJ IF ZERO PRIO/DELAY
 2289    REF   5  LAST  452    41,3545  3 4210 0            CA      ENDINST
 2290   REF 211  LAST  462   41,3546  54 157 0            TS      MPAC      +3       TC ENDOFJOB INTO MPAC+3
 2291                        41,3547  0 0006 1            EXTEND
 2292   REF   1              41,3550  3 1773 0            DCA     N26/2CAD           JOB ADRES INTO MPAC +1
 2293   REF 212  LAST  463   41,3551  52 156 1            DXCH    MPAC      +1       BBCON INTO MPAC+2
 2294   REF 213  LAST  463   41,3552  3 0160 0            CA      MPAC      +4       PRIO IN A
 2295                        41,3553  0 0004 0            INHINT
 2296   REF 214  LAST  463   41,3554  0 0154 1            TC      MPAC

 2297   REF   1              41,3555  3 4345 1  SETVAC    CAF     TCFINDVC
 2298   REF   1              41,3556  0 3535 1            TC      REQEX1

R2299   VBRQWAIT ENTERS REQUEST TO WAITLIST FOR ANY ADDRESS WITH ANY DELAY.
R2300   IT DOES ENDOFJOB AFTER ENTERING REQUEST.DISPLAY SYST IS RELEASED.
R2301   IT ASSUMES NOUN 26 HAS BEEN PRELOADED WITH
R2302   COMPONENT 1  DELAY (LOW BITS)
R2303   COMPONENT 2  TASK ADRES (12 BIT)
R2304   COMPONENT 3  BBCON

 2305   REF   1              41,3557  3 4343 1  VBRQWAIT CAF     TCWAIT
 2306   REF 215  LAST  463   41,3560  54 154 0            TS      MPAC               TC WAITLIST INTO MPAC
 23065  REF   4  LAST  462   41,3561  3 4732 0            CAF     EBANK4
 23066  REF  16  LAST  462   41,3562  54 003 0            TS      EBANK
 2307   REF   7  LAST  462   41,3563  3 1771 1            CA      N26/PRI            TIME DELAY
 2308   REF   1              41,3564  0 3540 0  ENDRQWT   TC      REQUESTC -1

R2309   REQUESTC WILL PUT TASK ADRES INTO MPAC+1, BBCON INTO MPAC+2,
R2310   TC ENDOFJOB INTO MPAC+3. IT WILL TAKE TIME DELAY OUT OF MPAC+4 AND
R2311   LEAVE IT IN A, INHINT AND TC MPAC.


 2312   REF   2  LAST  460   40,3471                      SETLOC  NVSBENDL +1
 23125  REF   7 LAST  459 TO  461:     80    778*         COUNT*  $$/PIN
 2313   REF  54  LAST  462   40,3471  3 4744 1  VBPROC    CAF     ONE                PROCEED WITHOUT DATA
 2314   REF   2  LAST  442   40,3472  55'013 0            TS      LOADSTAT
 2315   REF   2  LAST  461   40,3473  0 4175 0            TC      KILMONON           TURN ON KILL MONITOR BIT
 2316   REF   7  LAST  462   40,3474  0 4450 1            TC      RELDSP
 2317   REF   3  LAST  419   40,3475  0 4424 1            TC      FLASHOFF
 2318   REF   2  LAST  442   40,3476  0 3605 1            TC      RECALTST           SEE IF THERE IS ANY RECALL FROM ENDIDLE


 2319   REF  55  LAST  463   40,3477  4 4744 0  VBTERM    CS      ONE
 2320   REF   2  LAST  422   40,3500  0 3472 0            TC      VBPROC   +1        TERM VERB SETS LOADSTAT NEG

R23201  PROCKEY PERFORMS THE SAME FUNCTION AS VBPROC.  IT MUST BE CALLED UNDER
R23202  EXECUTIVE CONTROL, WITH CHRPRIO.
 232033 REF  20  LAST  454   40,3501  4 1000 1  PROCKEY   CS      VERBREG            DONT ALLOW PROCEED DURING LOAD.
 232036 REF   1              40,3502  6 3516 0            AD      VBSP2LD*           DEC 22
 23204                       40,3503  0 0006 1            EXTEND
 232043 REF 142  LAST  462   40,3504  26 000 0            DIM     A
 232046                          40,3505  0 0006 1           EXTEND
 23205  REF   18  LAST  461     40,3506  1 3463 1           BZF      CHARALRM
 232053 REF   94  LAST  462     40,3507  3 4746 0  PROCKEY1 CAF      ZERO               SET REQRET FOR ENTER PASS 0.
 23206  REF   13  LAST  462     40,3510  55'012 1           TS       REQRET
 23207  REF   11  LAST  462     40,3511  4 4351 0           CS       VD1                BLOCK NUMERICAL CHARACTERS, SIGNS, CLEAR
 23208  REF   55  LAST  462     40,3512  54 776 0           TS       DSPCOUNT
 23209  REF    3  LAST  463     40,3513  0 3471 0           TC       VBPROC


R2321   VBRESEQ WAKES ENDIDLE AT SAME LINE AS FINAL ENTER OF LOAD (L+3).
R2322   (MAIN USE IS INTENDED AS RESPONSE TO INTERNALLY INITIATED FLASHING
R2323    DISPLAYS IN ENDIDLE. SHOULD NOT BE USED WITH LOAD VERBS,PLEASE PERFORM,
R2324    OR PLEASE MARK VERBS BECAUSE THEY ALREADY USE L+3 IN ANOTHER CONTEXT.)

 2325   REF   95  LAST  464     40,3514  4 4746 1  VBRESEQ  CS       ZERO               MAKE IT LOOK LIKE DATA IN.
 2326   REF    4  LAST  464     40,3515  0 3472 0           TC       VBPROC +1


 23265                           40,3516   00026 0  VBSP2LD* DEC      22                 VB22 = BLOAD

R2327   FLASH IS TURNED OFF BY PROCEED WITHOUT DATA, TERMINATE, RESEQUENCE,
R2328   END OF LOAD.
```

```
P2329   KEY RELEASE ROUTINE

R2330   THIS ROUTINE ALWAYS TURNS OFF THE UPACT LIGHT AND ALWAYS CLEARS DSPLOCK.

R2331   THE HIGHEST PRIORITY FUNCTION OF THE KEY RELEASE BUTTON IS THE
R2332   UNSUSPENDING OF A SUSPENDED MCNITOR WHICH WAS EXTERNALLY INITIATED.
R2333   THIS FUNCTION IS ACCOMPLISHED BY CLEARING DSPLOCK AND TURNING OFF
R2334   THE KEY RELEASE LIGHT IF BOTH DSPLIST AND CADRSTOR ARE EMPTY.

R2335   IF NO SUCH MONITOR EXISTS, THEN RELDSP IS EXECUTED TO CLEAR DSPLOCK
R2336   AND THE EXTERNAL MONITOR BIT (FREEING THE DISPLAY SYSTEM FOR INTERNAL
R2337   USE), TURN OFF THE KEY RELEASE LIGHT, AND WAKE UP ANY JOB IN DSPLIST.

R2338   IN ADDITION IF THERE IS A JOB IN ENDIDLE, THEN CONTROL IS TRANSFERRED
R2339   TO PINBRNCH (IN DISPLAY INTERFACE ROUTINE) TO RE-EXECUTE THE SERIES OF
R23391  NVSUB CALLS ETC. THAT PRECEDED THE ENDIDLE CALL STILL AWAITING RESPONSE.
R2340   THIS FEATURE IS INTENDED FOR USE WHEN THE OPERATOR HAS BEEN REQUESTED TO
R2341   RESPOND TO SOME INTERNAL ACTICN THAT USED ENDIDLE, BUT HE HAS WRITTEN
R2342   OVER THE INFORMATION ON THE DISPLAY PANEL BY SOME DISPLAYS OF HIS OWN
R2343   INITIATION WHICH DO NOT SERVE AS RESPONSES. HITTING KEY RLSE WILL
R2344   RE-ESTABLISH THE DISPLAYS TO THE STATE THEY WERE IN BEFORE HE OBSCURED
R2345   THEM, SO THAT HE CAN SEE THE WAITING REQUEST.  THIS WORKS ONLY FOR
R2346   INTERNAL PROGRAMS THAT USED ENDIDLE THROUGH MARGARETS DISPLAY
R2347   SUBRCUTINES.

 2348   REF  24  LAST  438    4D,3517  4 4742 D  VBRELDSP CS      BIT3
 2349                         40,352D  D CCD6 1           EXTEND
 2350   REF  11  LAST  231    4D,3521  D3 011 1           WAND    DSALMOUT          TURN OFF UPACT LITE
 2351   REF   2  LAST  410    40,3522  1D 115 D           CCS     21/22REG          OLD DSPLOCK
 2352   REF  40  LAST  459    4D,3523  3 4727 1           CAF     BIT14
 2353   REF   6  LAST  454    4D,3524  7 1D2D D           MASK    MONSAVE1          EXTERNAL MONITOR BIT (EMB)
 2354   REF 143  LAST  463    40,3525  1D DD0 D           CCS     A
 2355   REF   1               40,3526  D 3535 1           TC      UNSUSPEN          OLD DSPLOCK AND EMB BOTH 1, UNSUSPEND.
 2356   REF   8  LAST  463    40,3527  D 4450 1  TSTLTS4  TC      RELDSP            NOT UNSUSPENDING EXTERNAL MONITOR,
 2357   REF   5  LAST  453    4D,353D  11'D41 1           CCS     CADRSTOR           RELEASE DISPLAY SYSTEM AND
 2358                         4D,3531  D 3533 1           TC      +2                 DO RE-ESTABLISH IF CADRSTOR IS FULL.
 2359   REF  55  LAST  461    4D,3532  D 5146 1           TC      ENDOFJOB
 236D   REF  32  LAST  462    4D,3533  D 4626 1           TC      POSTJUMP
 2361   REF   4  LAST  31D    40,3534   21D62 D           CADR    PINBRNCH
 2362   REF  96  LAST  464    40,3535  3 4746 D  UNSUSPEN CAF     ZERO              EXTERNAL MONITOR IS SUSPENDED,
 2363   REF   5  LAST  453    40,3536  55'D11 1           TS      DSPLOCK            JUST UNSUSPEND IT BY CLEARING DSPLOCK.
 2364   REF   6  LAST  465    4D,3537  11'041 1           CCS     CADRSTOR           TURN KEY RELEASE LIGHT OFF IF BOTH
 2365   REF  56  LAST  465    40,3540  D 5146 1           TC      ENDOFJOB           CADRSTOR AND DSPLIST ARE EMPTY.
 2366   REF   2  LAST  453    40,3541  D 4473 0           TC      RELDSP1
 23661  RFF  57  LAST  465    40,3542  D 5146 1           TC      ENDOFJOB

 2367                         4D,3543            ENDRELDS EQUALS
```

```
R2368    NVSUB IS USED FOR SUB ROUTINE CALLS FROM WITHIN COMPUTER. IT CAN BE
R2369    USED TO CALL THE COMBINATION OF ANY DISPLAY, LOAD, OR MONITOR VERB
R2370    TOGETHER WITH ANY NOUN AVAILABLE TO THE KEYBOARD.
R23701   PLACE 0VVVVVVVNNNNNNN INTO A.
R23702   V-S ARE THE 7 BIT VERB CODE.  N-S ARE THE 7 BIT NOUN CODE.

R23703   IF NVSUB IS CALLED WITH THE FOLLOWING NEGATIVE NUMBERS (RATHER THAN THE
R23704   VERB-NOUN CODE) IN A, THEN THE DISPLAY IS BLANKED AS FOLLOWS-
R23705    -4 FULL BLANK, -3 LEAVE MODE, -2 LEAVE MODE AND VERB, -1 BLANK R-S ONLY

R2371    NVSUB CAN BE USED WITH MACH CADR TO BE SPEC BY PLACING THE CADR INTO
R2372    MPAC+2 BEFORE THE STANDARD NVSUB CALL.

R2373     NVSUB RETURNS TO 2+ CALLING LOC AFTER PERFORMING TASK, IF DISPLAY
R2374    SYSTEM IS AVAILABLE. THE NEW NOUN AND VERB CODES ARE DISPLAYED.
R2375    IF V:S =0, THE NEW NOUN CODE IS DISPLAYED ONLY(RETURN WITH NO FURTHER
R2376    ACTION). IF N-S =0, THE NEW VERB CODE IS DISPLAYED ONLY(RETURN WITH NO
R2377    FURTHER ACTION).

R2378    IT RETURNS TO 1+ CALLING LOC WITHOUT PERFORMING TASK, IF DISPLAY
R2379    SYSTEM IS BLOCKED (NOTHING IS DISPLAYED IN THIS CASE).
R2380    IT DOES TC ABORT (WITH OCT 01501) IF IT ENCOUNTERS A DISPLAY PROGRAM
R2381    ALARM CONDITION BEFORE RETURN TO CALLER.

R2382    THE DISPLAY SYSTEM IS BLOCKED BY THE DEPRESSION OF ANY
R2383    KEY, EXCEPT ERROR LIGHT RESET
R2384    IT IS RELEASED BY THE KEY RELEASE BUTTON, ALL EXTENDED VERBS,
R2385    PROCEED WITHOUT DATA, TERMINATE, RESEQUENCE, INITIALIZE EXECUTIVE,
R2386    RECALL PART OF RECALTST IF ENDIDLE WAS USED,
R2387    VB = REQUEST EXECUTIVE, VB = REQUEST WAITLIST,
R2388    MONITOR SET UP.

R23881   THE DISPLAY SYSTEM IS ALSO BLOCKED BY THE EXTERNAL MONITOR BIT, WHICH
R23882   INDICATES AN EXTERNALLY INITIATED MONITOR IS RUNNING (SEE MONITOR)

R2389    A NVSUB CALL THAT PASSES DSPLOCK AND THE EXTERNAL MONITOR BIT ENDS OLD
R23891   MONITOR.

R2390    DSPLOCK IS THE INTERLOCK FOR USE OF KEYBOARD AND DISPLAY SYSTEM WHICH
R2391    LOCKS OUT INTERNAL USE WHENEVER THERE IS EXTERNAL KEYBOARD ACTION.

R23911   NVSUB SHOULD BE USED TWICE IN SUCCESSION FOR :PLEASE PERFORM: SITUATIONS
R23912   (SIMILARLY FOR PLEASE MARK). FIRST PLACE THE CODED NUMBER FOR WHAT
R23913   ACTION IS DESIRED OF OPERATOR INTO THE REGISTERS REFERRED TO BY THE
R23914   :CHECKLIST: NOUN. GO TO NVSUB WITH A DISPLAY VERB AND THE :CHECKLIST:
R23915   NOUN. GO TO NVSUB AGAIN WITH THE :PLEASE PERFORM: VERB AND ZEROS IN THE
R23916   LOW 7 BITS. THIS :PASTES UP: THE :PLEASE PERFORM: VERB INTO THE VERB
R23917   LIGHTS.

R23918   NVMONOPT IS AN ENTRY SIMILAR TO NVSUB, BUT REQUIRING AN ADDITIONAL
```

```
R239181 PARAMETER IN L. IT SHOULD BE USED ONLY WITH A MONITOR VERB-NOUN CODE IN
R239182 A. AFTER EACH MONITOR DISPLAY A *PLEASE* VERB WILL BE PASTED IN THE VERB
R239183 LIGHTS OR DATA WILL BE BLANKED (OR BOTH) ACCORDING TO THE OPTIONS
R239184 SPECIFIED IN L. IF BITS 8-14 OF L ARE OTHER THAN ZERO, THEN THEY WILL
R239185 BE INTERPRETED AS A VERB CODE AND PASTED IN THE VERB LIGHTS. (THIS VERB
R239186 CODE SHOULD DESIGNATE ONE OF THE *PLEASE* VERBS.) IF BITS 1-3 OF L ARE
R239187 OTHER THAN ZERO, THEN THEY WILL BE USED TO BLANK DATA BY BEING FED TO
R239188 BLANKSUB. IF NVMONOPT IS USED WITH A VERB OTHER THAN A MONITOR VERB,
R239189 THE PARAMETER IN L HAS NO EFFECT.

R2392   NVSUB IN FIXED-FIXED PLACES 2+CALLING LOC INTO NVQTEM, TC NVSUBEND INTO
R2393   ENTRET. (THIS WILL RESTORE OLD CALLING BANK BITS)

 2394    REF   3  LAST  454       4145                         SETLOC MID7 +1
 23945   REF   2 LAST  454 TO  454:     17     17*             COUNT* $$/PIN
 2395                             4145  22 007 0  NVSUB        LXCH    7                ZERO NVMONOPT OPTIONS
 2396    REF   1                  4146  54 123 0  NVMONOPT TS      NVTEMP
 2397    REF  41  LAST  465       4147  3 4727 1               CAF     BIT14
 23971   REF   7  LAST  465       4150  7 1020 0               MASK    MONSAVE1         EXTERNAL MONITOR BIT
 23972   REF   6  LAST  465       4151  6 1011 0               AD      DSPLOCK
 23973   REF 144  LAST  465       4152  10 000 0               CCS     A
 23974   REF 112  LAST  462       4153  0 0002 0               TC      Q                DSP SYST BLOCKED. RET TO 1+ CALLING LOC
 2398    REF  56  LAST  463       4154  3 4744 1               CAF     ONE              DSP SYST AVAILABLE
 2399    REF 113  LAST  467       4155  6 0002 0  NVSBCOM      AD      Q
 2400    REF   1                  4156  55'036 1               TS      NVQTEM           2+ CALLING LOC INTO NVQTEM
 24001   REF   4  LAST  454       4157  23'021 0               LXCH    MONSAVE2         STORE NVMONOPT OPTIONS
 2401    REF   3  LAST  463       4160  0 4175 0               TC      KILMONON         TURN ON KILL MONITOR BIT
 2402    REF   1                  4161  3 4172 1  NVSUBCOM CAF     NVSBBBNK

 2403    REF  12  LAST  382       4162  56 006 1               XCH     BBANK
 24031                            4163  0 0006 1               EXTEND                   SAVE OLD SUPERBITS
 24032   REF   4  LAST  286       4164  04 007 1               ROR     SUPERBNK
 2404    REF   1                  4165  55'037 0               TS      NVBNKTEM
 24041   REF   2  LAST  286       4166  3 4172 1               CAF     PINSUPBT
 24042                            4167  0 0006 1               EXTEND
 24043   REF   5  LAST  467       4170  01 007 1               WRITE   SUPERBNK
 2405    REF   1                  4171  0 2020 1               TC      NVSUBB           GO TO NVSUB1 THRU STANDARD LOC
 2406    REF  56  LAST  464       0776                         EBANK=  DSPCOUNT
 2407    REF   2  LAST  419       4172   62101 0  NVSBBBNK BBCON   NVSUB1

 24071   REF   2  LAST  467       4172            PINSUPBT =       NVSBBBNK         CONTAINS THE PINBALL SUPERBITS.

 2412    REF   2  LAST  467       4173  53'037 0  NVSUBEND DXCH    NVQTEM           NVBNKTEM MUST = NVQTEM+1
 2413    REF   2  LAST  295       4174  0 5167 1               TC      SUPDXCHZ         DTCB WITH SUPERBIT SWITCHING

 2414    REF   1               41,3565                         SETLOC ENDRQWT +1

 241405  REF   7 LAST  461 TO  463:     61    869*             COUNT* $$/PIN
R241412 BLANKDSP BLANKS DISPLAY ACCORDING TO OPTION NUMBER IN NVTEMP AS FOLLOWS
R241415  -4 FULL BLANK, -3 LEAVE MODE, -2 LEAVE MODE AND VERB, -1 BLANK R-S ONLY
```

```
 241419 REF   6  LAST  459    41,3565  6 4750 1  BLANKDSP AD     SEVEN            7,8,9,OR 10 (A HAD 0,1,2,OR 3)
 241422                       41,3566  0 0004 0           INHINT
 241425 REF  13  LAST  460    41,3567  54 124 1           TS     CODE             BLANK SPECIFIED DSPTABS
 241429 REF  20  LAST  272    41,3570  4 4731 1           CS     BIT12
 241432 REF  14  LAST  468    41,3571  50 124 0           INDEX  CODE
 241435 REF  33  LAST  460    41,3572  57'022 0           XCH    DSPTAB
 241439 REF 145  LAST  467    41,3573  10 000 0           CCS    A
 241442 REF   8  LAST  460    41,3574  25'015 1           INCR   NOUT
 241445                       41,3575  0 3576 0           TC     +1
 241449 REF  15  LAST  468    41,3576  10 124 1           CCS    CODE
 241452 REF   1               41,3577  0 3567 0           TC     BLANKDSP +2
 241455                       41,3600  0 0003 1           RELINT
 241459 REF   2  LAST  467    41,3601  50 123 1           INDEX  NVTEMP
 241462                       41,3602  0 3607 0           TC     +5
 241465                       41,3603  0 3604 0           TC     +1               NVTEMP HAS -4 (NEVER TOUCH MODREG)
 241469 REF  21  LAST  463    41,3604  55'000 1           TS     VERBREG                     -3
 241472 REF  14  LAST  462    41,3605  55'001 0           TS     NOUNREG                     -2
 241475 REF  12  LAST  441    41,3606  55'014 1           TS     CLPASS                      -1
 241479 REF  12  LAST  464    41,3607  4 4351 0           CS     VD1
 241482 REF  57  LAST  467    41,3610  54 776 0           TS     DSPCOUNT
 241485 REF   4  LAST  463    41,3611  0 4424 1           TC     FLASHOFF         PROTECT AGAINST INVISIBLE FLASH
 241489 REF   1               41,3612  0 3635 1           TC     ENTSET -2        ZEROS REQRET

 2415   REF   2  LAST  468    41,3613  3 3637 0  NVSUB1   CAF    ENTSET           IN BANK
 2416   REF   6  LAST  454    41,3614  54 136 1           TS     ENTRET           SET RETURN TO NVSUBEND
 24161  REF   3  LAST  468    41,3615  10 123 0           CCS    NVTEMP           WHAT NOW
 24162                        41,3616  0 3622 1           TC     +4               NORMAL NVSUB CALL (EXECUTE VN OR PASTE)
 24163  REF  18  LAST  462    41,3617  0 2400 1           TC     GODSPALM
 24164  REF   2  LAST  468    41,3620  0 3565 1           TC     BLANKDSP         BLANK DISPLAY AS SPECIFIED
 24165  REF  19  LAST  468    41,3621  0 2400 1           TC     GODSPALM
 2417   REF   5  LAST  454    41,3622  3 6115 1           CAF    LOW7
 2418   REF   4  LAST  468    41,3623  7 0123 0           MASK   NVTEMP
 2419   REF 216  LAST  463    41,3624  54 157 0           TS     MPAC     +3      TEMP FOR NOUN (CANT USE MPAC. DSPDECVN
 2420   REF   5  LAST  468    41,3625  3 0123 1           CA     NVTEMP                                 USES MPAC, +1, +2
 2422   REF   5  LAST  454    41,3626  54 023 1           TS     EDOP             RIGHT 7
 2423   REF   6  LAST  468    41,3627  3 0023 0           CA     EDOP
 2424   REF 217  LAST  468    41,3630  54 160 1           TS     MPAC     +4      TEMP FOR VERB (CANT USE MPAC+1. DSPDECVN
A2425                                                                                                   USES MPAC, +1, +2).
 2426   REF 218  LAST  468    41,3631  10 157 0           CCS    MPAC     +3      TEST NOUN
 2427   REF   1               41,3632  0 3640 0           TC     NVSUB2           IF NOUN NOT +0, GO ON
 2428   REF 219  LAST  468    41,3633  3 0160 0           CA     MPAC     +4
 2429   REF   9  LAST  461    41,3634  0 2366 0           TC     UPDATVB -1       IF NOUN = +0, DISPLAY VERB . THEN RETURN
 24291  REF  97  LAST  465    41,3635  3 4746 0           CAF    ZERO             ZERO REQRET SO THAT PASTED VERBS CAN
 24292  REF  14  LAST  464    41,3636  55'012 1           TS     REQRET           BE EXECUTED BY OPERATOR.
 2430   REF   2  LAST  461    41,3637  0 4173 0  ENTSET   TC     NVSUBEND
 2431   REF 220  LAST  468    41,3640  10 160 1  NVSUB2   CCS    MPAC +4          TEST VERB
 2432                         41,3641  0 3645 0           TC     +4               IF VERB NOT +0, GO ON
 2433   REF 221  LAST  468    41,3642  3 0157 1           CA     MPAC     +3
 2434   REF   2  LAST  454    41,3643  0 2346 1           TC     UPDATNN -1       IF VERB = +0, DISPLAY NOUN. THEN RETURN
 2435   REF   3  LAST  468    41,3644  0 4173 0           TC     NVSUBEND
 2436   REF 222  LAST  468    41,3645  3 0156 0             CA      MPAC     +2      TEMP FOR MACH CADR TO BE SPEC. (DSPDECVN
 2437   REF 223  LAST  469    41,3646  54 161 0             TS      MPAC     +5                 USES MPAC, +1, +2)
 2438   REF 224  LAST  469    41,3647  3 0160 0             CA      MPAC     +4
 2439   REF  10  LAST  468    41,3650  0 2366 0             TC      UPDATVB -1      IF BOTH NOUN AND VERB NOT +0, DISPLAY
 2440   REF 225  LAST  469    41,3651  3 0157 1             CA      MPAC     +3      BOTH AND GO TO ENTPASO.
 2441   REF   3  LAST  468    41,3652  0 2346 1             TC      UPDATNN -1
 2442   REF  98  LAST  468    41,3653  3 4746 0             CAF     ZERO
 2443   REF   3  LAST  463    41,3654  55'013 0             TS      LOADSTAT         SET FOR WAITING FOR DATA CONDITION
 2444   REF  13  LAST  468    41,3655  55'014 1             TS      CLPASS
 2445   REF  15  LAST  468    41,3656  55'012 1             TS      REQRET           SET REQRET FOR PASS 0.
 2446   REF 226  LAST  469    41,3657  3 0161 1             CA      MPAC     +5      RESTORES MACH CADR TO BE SPEC TO MPAC+2
 2447   REF 227  LAST  469    41,3660  54 156 1             TS      MPAC     +2      FOR USE IN INTMCTBS (IN ENTPASO).
 2448   REF   3  LAST  419    41,3661  0 2062 1  ENDNVSB1  TC      ENTPASO


R2449   IF INTERNAL MACH CADR TO BE SPECIFIED, MPAC+2 WILL BE PLACED INTO
R2450   NOUNCADR IN ENTPASO (INTMCTBS ).


 2451   REF   4  LAST  468       4175                       SETLOC NVSUBEND +2
 24515  REF   3 LAST  467 TO  467:     24    41*            COUNT* $$/PIN
A2452                                                                                  FORCE BIT 15 OF MONSAVE1 TO 1.
 2453   REF  28  LAST  441       4175  3 4726 0  KILMONON  CAF     BIT15                 THIS IS THE KILL MONITOR BIT.
 2454   REF   8  LAST  467       4176  55'020 0             TS      MONSAVE1         TURN OFF BIT 14, THE EXTERNAL
A2455                                                                                   MONITOR BIT.
 2458   REF 114  LAST  467       4177  0 0002 0             TC      Q


R2459   LOADSTAT  +0 INACTIVE(WAITING FOR DATA). SET BY NVSUB
R2460             +1  PROCEED NO DATA. SET BY SPECIAL VERB
R2461            -1 TERMINATE   SET BY SPECIAL VERB
R2462            -0    DATA IN      SET BY END OF LOAD ROUTINE
R2463               OR RESEQUENCE   SET BY VERB 32


R2464   L  TC ENDIDLE  (FIXED FIXED)
R2465   ROUTINES THAT REQUEST LOADS THROUGH NVSUB SHOULD USE ENDIDLE WHILE
R2466   WAITING FOR THE DATA TO BE LOADED. ENDIDLE PUTS CURRENT JOB TO SLEEP.
R2467   ENDIDLE CANNOT BE CALLED FROM ERASABLE OR F/F MEMORY,
R2468   SINCE JOBSLEEP AND JOBWAKE CAN HANDLE ONLY FIXED BANKS.
R2469   RECALTST TESTS LOADSTAT AND WAKES JOB UP TO,
R2470   L+1       FOR TERMINATE
R2471   L+2       FOR PROCEED WITHOUT DATA
R2472   L+3       FOR DATA IN, OR RESEQUENCE
R2473   IT DOES NOTHING IF LOADSTAT INDICATES WAITING FOR DATA.


R2474   ENDIDLE ABORTS (WITH CODE 01206) IF A SECOND JOB ATTEMPTS TO GO TO SLEEP
R2475   IN PINBALL. IN PARTICULAR, IF AN ATTEMPT IS MADE TO GO TO ENDIDLE WHEN
R2476   1) CADRSTOR NOT= +0. THIS IS THE CASE WHERE THE CAPACITY OF ENDIDLE IS
```

```
R2477   EXCEEDED. (+-NZ INDICATE A JOB IS ALREADY ASLEEP DUE TO ENDIDLE.)
R2478   2) DSPLIST NOT= +0. THIS INDICATES A JOB IS ALREADY ASLEEP DUE TO
R2479   NVSUBLSY.

 2480   REF 115  LAST  469       4200  22 C02 0  ENDIDLE   LXCH     Q                 RETURN ADDRESS INTO L.
 2481   REF   1                  4201  0 4211 1            TC       ISCADR+0          ABORT IF CADRSTOR NOT= +0
 2482   REF   1                  4202  0 4215 0            TC       ISLIST+0          ABORT IF DSPLIST NOT= +0
 2483   REF  60  LAST  455       4203  3 0C01 0            CA       L                 DONT SET DSPLOCK TO 1 SO CAN USE
 2484   REF   4  LAST  382       4204  7 5C03 0            MASK     LOW10             ENDIDLE WITH NVSUB INITIATED MONITOR.
 2485   REF   1                  4205  6 0C04 0            AD       FBANK             SAME STRATEGY FOR CADR AS MAKECADR.
 2486   REF   7  LAST  465       4206  55'041 1            TS       CADRSTOR
 2487   REF   2  LAST  386       4207  0 5124 0            TC       JOBSLEEP


 2488   REF  58  LAST  465       4210  0 5146 1  ENDINST   TC       ENDOFJOB


 2489   REF   8  LAST  470       4211  11'041 1  ISCADR+0  CCS      CADRSTOR          ABORTS (CODE 01206) IF CADRSTOR NOT= +0.
 2490   REF   1                  4212  0 4220 0            TC       DSPABORT          RETURNS IF CADRSTOR = +0.
 2491   REF 116  LAST  470       4213  0 0C02 0            TC       Q
 2492   REF   2  LAST  470       4214  0 4220 0            TC       DSPABORT

 2493   REF   2  LAST  233       4215  11'042 1  ISLIST+0  CCS      DSPLIST           ABORTS (CODE 01206) IF DSPLIST NOT= +0.
 2494   REF   3  LAST  470       4216  0 4220 0            TC       DSPABORT          RETURNS IF DSPLIST = +0.
 2495   REF 117  LAST  470       4217  0 CC02 0            TC       Q
 2496   REF   1                  4220  0 5626 0  DSPABORT  TC       BAILOUT
 2497                            4221   31206 1            OCT      31206

R2498   JAMTERM ALLOWS PROGRAMS TO PERFORM THE TERMINATE FUNCTION.
R2499   IT DOES ENDOFJOB.

 2500   REF   3  LAST  467       4222  3 4172 1  JAMTERM   CAF      PINSUPBT
 2501                            4223  0 0006 1            EXTEND
 25011  REF   6  LAST  467       4224  01 007 1            WRITE    SUPERBNK
 25012  REF   2  LAST  221       4225  3 4233 1            CAF      34DEC
 25013  REF  16  LAST  469       4226  55'012 1            TS       REQRET            LEAVE ENTER SET FOR ENTPASS0.
 2502   REF  13  LAST  468       4227  4 4351 0            CS       VD1
 2503   REF  58  LAST  468       4230  54 776 0            TS       DSPCOUNT
 2504   REF  33  LAST  465       4231  0 4626 1            TC       POSTJUMP
 2505   REF   2  LAST  422       4232   61477 1            CADR     VBTERM

 2506                            4233   00042 1  34DEC     DEC      34


R2507   JAMPROC ALLOWS PROGRAMS TO PERFORM THE PROCEED/PROCEED WITHOUT DATA
R2508   FUNCTION. IT DOES ENDOFJOB.

 2509   REF   4  LAST  470       4234  3 4172 1  JAMPROC   CAF      PINSUPBT
 2510                            4235  0 0006 1            EXTEND
 25101  REF   7  LAST  470       4236  01 C07 1            WRITE    SUPERBNK
 25102 REF   1                 4237  3 4245 0              CAF     33DEC
 25103 REF  17  LAST  470      4240  55'C12 1              TS      REQRET           LEAVE ENTER SFT FOR FNTPASSO.
 2511  REF  14  LAST  470      4241  4 4351 0              CS      VD1
 2512  REF  59  LAST  470      4242  54 776 0              TS      DSPCOUNT
 2513  REF  34  LAST  470      4243  0 4626 1              TC      POSTJUMP
 2514  REF   5  LAST  464      4244   61471 1              CADR    V8PROC

 2515                          4245   00041 1  33DEC       DEC     33


R2532   BLANKSUB BLANKS ANY COMBINATICN OF R1, R2, R3.
R2533   CALL WITH BLANKING CODE IN A.
R2534   BIT1=1 BLANKS R1, BIT2=1 BLANKS R2, BIT3=1 BLANKS R3.
R2535   ANY CCMBINATION OF THFSE BITS IS ACCFPTED.

R2536   DSPCCUNT IS RESTORED TO STATE IT WAS IN BEFORE BLANKSUB WAS EXECUTED.

 2538  REF   7  LAST  468      4246  7 4750 0  BLANKSUB MASK    SEVEN
 25381 REF   6  LAST  468      4247  54 123 0              TS      NVTEMP           STORE BLANKING CODE IN NVTEMP.
 2539  REF  42  LAST  467      4250  3 4727 1              CAF     BIT14
 2540  REF   9  LAST  469      4251  7 1020 0              MASK    MONSAVE1         EXTERNAL MONITOR BIT
 25401 REF   7  LAST  467      4252  6 1011 0              AD      DSPLOCK
 25402 REF 146  LAST  468      4253  10 C00 0              CCS     A
 25403 REF 118  LAST  470      4254  0 0002 0              TC      Q                DSP SYST BLOCKED. RET TO 1+ CALLING LOC
 25404 RFF 119  LAST  471      4255  24 002 0              INCR    Q                DSP SYST AVAILABLE
A2541                                                                               SET RETURN FOR 2+ CALLING LOC
 25411 REF   7  LAST  471      4256  10 123 0              CCS     NVTEMP
 25412                         4257  1 4261 1              TCF     +2
 25413 REF 120  LAST  471      4260  0 0C02 0              TC      Q                NOTHING TO BLANK. RET TO 2+ CALLING LOC
 2542  REF 121  LAST  471      4261  22 002 0              LXCH    Q                SET RETURN FOR 2 + CALLING LOC
 2544  REF   1                 4262  3 4273 0              CAF     BLNKBBNK
 2545  REF  13  LAST  467      4263  56 006 1              XCH     BBANK
 25451                         4264  0 C006 1              EXTEND
 25452 REF   8  LAST  470      4265  04 007 1              ROR     SUPERBNK         SAVE OLD SUPFRBITS.
 2546  REF  45  LAST  427      4266  52 131 0              DXCH    BUF
 25461 REF   5  LAST  470      4267  3 4172 1              CAF     PINSUPBT
 25462                         4270  0 0006 1              EXTEND
 25463 REF   9  LAST  471      4271  01 007 1              WRITE   SUPERBNK
 2547  RFF   1                 4272  0 3543 0              TC      BLNKSUB1

 2548  REF  60  LAST  471      0776                        EBANK=  DSPCOUNT
 25481 REF   2  LAST  471      4273   6C101 1  BLNKBBNK    BBCON   BLNKSUB1
 2549                          4274            ENDBLFF     EQUALS

 2550  REF   1            40,3543                          SETLOC  ENDRELDS
 25505 REF   8 LAST  463 TO  467:     42    820*           COUNT*  $$/PIN
 2551  REF  61  LAST  471 40,3543  3 C776 1  BLNKSUB1    CA      DSPCOUNT         SAVE OLD DSPCOUNT FOR LATER RESTORATION
 25511 REF  46  LAST  471 40,3544  54 132 0              TS      BUF      +2
 25512 REF  24  LAST  462 40,3545  3 4744 1              CAF     BIT1             TEST BIT1. SEE IF R1 TO BE BLANKED.
 2552  RFF   1            40,3546  0 3565 1              TC      TESTBIT
 2553    REF  12  LAST  455   40,3547  3 4310 1            CAE    R1D1
 2554    REF   4  LAST  434   40,3550  0 2524 0            TC     5BLANK -1
 2555    REF  26  LAST  446   40,3551  3 4743 0            CAE    BIT2              TEST BIT 2. SEE IF R2 TO BE BLANKED.
 2556    REF   2  LAST  471   40,3552  0 3565 1            TC     TESTBIT
 2557    REF   5  LAST  457   40,3553  3 4311 0            CAF    R2D1
 2558    REF   5  LAST  472   40,3554  0 2524 0            TC     5BLANK -1
 2559    REF  25  LAST  465   40,3555  3 4742 1            CAF    BIT3              TEST BIT3. SEE IE R3 TO BE BLANKED.
 2560    REE   3  LAST  472   40,3556  0 3565 1            TC     TESTBIT
 2561    REF   5  LAST  435   40,3557  3 4312 0            CAF    R3D1
 2562    REF   6  LAST  472   40,3560  0 2524 0            TC     5BLANK -1
 2563    REF  47  LAST  471   40,3561  3 C132 1            CA     BUE     +2        RESTORE DSPCOUNT TO STATF IT HAD
 2564    REE  62  LAST  471   40,3562  54 776 0            TS     DSPCOUNT               BEFORE BLANKSUB.
 2565    REF  48  LAST  472   40,3563  52 131 0            DXCH   BUE               CALL L+2 DIRECTLY.
 2566    REE   3  LAST  467   40,3564  0 5170 1            TC     SUPDXCHZ +1       DTCB WITH SUPERBIT SWITCHING

 2567    REF   8  LAST  471   40,3565  7 0123 0  TESTBIT   MASK   NVTEMP            NVTEMP CONTAINS BLANKING CODE.
 2568    REF 147  LAST  471   40,3566  10 000 0            CCS    A
 2569    REF 122  LAST  471   40,3567  0 0002 0            TC     Q                 IF CURRENT BIT = 1, RETURN TO L+1.
 2570    REF 123  LAST  472   40,3570  50 002 0            INDEX  Q                 IF CURRENT BIT = 0, RETURN TO L+3.
 2571                         40,3571  0 C002 0            TC     2

 2572                         40,3572            ENDBSUB1  EQUALS


R257205 DSPMM DOES NOT DISPLAY MODREG DIRECTLY. IT PUTS IN EXEC REQUEST WITH
R257206 PRIO 30000 FOR DSPMMJB AND RETURNS TO CALLER.

R257207 IF MODREG CONTAINS -0, DSPMMJB BLANKS THE MODE LIGHTS.

R257209 DSPMM MUST BE IN BANK 27 OR LOWER, SO IT CAN BE CALLED VIA BANKCALL.

 25721                        07,2607                      BANK   7
 257215  REF   1              04,2000                      SETLOC PINBALL4
 257217                       04,2657                      BANK

 257218  REF   1                                           COUNT* $$/PIN
 25722   REE 124  LAST  472   04,2657  56 002 0  DSPMM     XCH    Q
 25723   REF 228  LAST  469   04,2660  54 154 0            TS     MPAC
 25724                        04,2661  0 0004 0            INHINT
 25725   REF   3  LAST  453   04,2662  3 4346 1            CAE    CHRPRIO
 25726   REF   9  LAST  453   04,2663  0 5063 1            TC     NOVAC
 25727   REF  63  LAST  472      0776                      EBANK= DSPCOUNT
 25728   REF   1              04,2664   03572 1            2CADR  DSPMMJB
 25728   REE   1              04,2665   60101 1
 257285                       04,2666  0 0003 1            RELINT
 25729   REF 229  LAST  472   04,2667  0 0154 1  ENDSPMM   TC     MPAC

R2573    DSPMM  PLACE MAJOR MODE CODE INTO MODREG

 25735   REE   1              40,3572                      SETLOC ENDBSUB1
 25736  REF   9 LAST  471 TO  472:      23   843*            COUNT* $$/PIN
  2574  REF   1                40,3572  3 4353 0  DSPMMJB  CAF     MD1                GETS HERE THRU DSPMM
  2575  REF  64  LAST  472     40,3573  56 776 1           XCH     DSPCOUNT
  2576  REF   1                40,3574  54 140 0           TS      DSPMMTEM           SAVE DSPCOUNT
  2579  REF   7  LAST  277     40,3575  11'010 0           CCS     MODREG
  2580  REF  57  LAST  467     40,3576  6 4744 1           AD      ONE
 25801  REF   4  LAST  458     40,3577  0 3335 1           TC      DSPDECVN           IF MODREG IS + OR +0, DISPLAY MODREG
 25802                         40,3600  0 3602 0           TC      +2                 IF MODREG IS -NZ, DO NOTHING
 25803  REF   6  LAST  462     40,3601  0 2570 1           TC      2BLANK             IF MODREG IS -0, BLANK MM
  2581  REF   2  LAST  473     40,3602  56 140 1           XCH     DSPMMTEM           RESTORE DSPCOUNT
  2582  REF  65  LAST  473     40,3603  54 776 0           TS      DSPCOUNT
  2583  REF  59  LAST  470     40,3604  0 5146 1           TC      ENDOFJOB

R2584   RECALTST IS ENTERED DIRECTLY AFTER DATA IS LOADED (OR RESEQUENCE VERB IS
R2585   EXECUTED), TERMINATE VERB IS EXECUTED, OR PROCEED WITHOUT DATA VERB IS
R2586   EXECUTED. IT WAKES UP JOB THAT DID TC ENDIDLE.

R2587   IF CADRSTOR NOT= +0, IT PUTS +0 INTO DSPLOCK, AND TURNS OFF KEY RLSE
R2588   LIGHT IF DSPLIST IS EMPTY (LEAVES KEY RLSE LIGHT ALONE IF NOT EMPTY).

  2589  REF   9  LAST  470     40,3605  11'041 1  RECALTST CCS     CADRSTOR
  2590  REF   1                40,3606  0 3610 0           TC      RECAL1
  2591  REF  60  LAST  473     40,3607  0 5146 1           TC      ENDOFJOB           NORMAL EXIT IF KEYBOARD INITIATED
  2592  REF  99  LAST  469     40,3610  3 4746 0  RECAL1   CAF     ZERO
  2593  REF  10  LAST  473     40,3611  57'041 0           XCH     CADRSTOR
  2594                         40,3612  0 0004 0           INHINT
  2595  REF   3  LAST  386     40,3613  0 5130 0           TC      JOBWAKE
  2596  REF   4  LAST  469     40,3614  11'013 0           CCS     LOADSTAT
  2597  REF   1                40,3615  0 3637 0           TC      DOPROC             + PROCEED WITHOUT DATA
  2598  REF  61  LAST  473     40,3616  0 5146 1           TC      ENDOFJOB           PATHALOGICAL CASE EXIT
  2599  REF   1                40,3617  0 3635 1           TC      DOTERM             -   TERMINATE
  2600  REF  32  LAST  460     40,3620  3 4743 0           CAF     TWO                -0 DATA IN OR RESEQUENCE
  2601  REF   2  LAST  384     40,3621  50 064 0  RECAL2   INDEX   LOCCTR
  2602  REF   3  LAST  384     40,3622  6 0164 1           AD      LOC                LOC IS + FOR BASIC JOBS
  2603  REF   3  LAST  473     40,3623  50 064 0           INDEX   LOCCTR
  2604  REF   4  LAST  473     40,3624  54 164 0           TS      LOC
 26041  REF  15  LAST  468     40,3625  3 1001 1           CA      NOUNREG            SAVE VERB IN MPAC, NOUN IN MPAC+1 AT
 26042  REF  61  LAST  470     40,3626  54 001 1           TS      L                  TIME OF RESPONSE TO ENDIDLE FOR
 26043  REF  22  LAST  468     40,3627  3 1000 0           CA      VERBREG            POSSIBLE LATER TESTING BY JOB THAT HAS
 26044  REF   4  LAST  473     40,3630  50 064 0           INDEX   LOCCTR             BEEN WAKED UP.
 26045  REF 230  LAST  472     40,3631  52 155 1           DXCH    MPAC
  2605                         40,3632  0 0003 1           RELINT
  2606  REF   9  LAST  465     40,3633  0 4450 1  RECAL3   TC      RELDSP
  2607  REF  62  LAST  473     40,3634  0 5146 1           TC      ENDOFJOB

  2608  REF 100  LAST  473     40,3635  3 4746 0  DOTERM   CAF     ZERO
  2609  REF   1                40,3636  0 3621 1           TC      RECAL2

  2610  REF  58  LAST  473     40,3637  3 4744 1  DOPROC   CAF     ONE
 2611   REF   2  LAST  473   40,3640  0 3621 1          TC      RECAL2
```

```
P2612   MISCELLANEOUS  SERVICE ROUTINES IN FIXED/FIXED

 2613   REF    1                   4274                         SETLOC ENDBLFF

 26135  REF    4 LAST  469 TO  471:     63   104*               COUNT* $$/PIN
R2614   SETNCADR           E CADR ARRIVES IN A. IT IS STORED IN NOUNCADR. EBANK BITS
R2615                      ARE SET. E ADRES IS DERIVED AND PUT INTO NOUNADD.

 2616   REF    8  LAST  455        4274  55'016 0  SETNCADR TS      NOUNCADR         STORE ECADR
 2617   REF   17  LAST  463        4275  54 003 0           TS      EBANK            SET EBANK BITS
 2618   REF    2  LAST  202        4276  7 4350 1           MASK    LOW8
 2619   REF    1                   4277  6 5000 1           AD      OCT1400
 2620   REF   27  LAST  449        4300  54 145 0           TS      NOUNADD          PUT E ADRES INTO NOUNADD
 2621   REF  125  LAST  472        4301  0 0002 0           TC      Q


R2622   SETNADD            GETS E CADR FROM NOUNCADR, SETS EBANK BITS, DERIVES
R2623                      E ADRES AND PUTS IT INTO NOUNADD.

 2624   REF    9  LAST  475        4302  3 1016 1  SETNADD  CA      NOUNCADR
 2625   REF    7  LAST  444        4303  1 4275 1           TCF     SETNCADR +1


R2626   SETEBANK           E CADR ARRIVES IN A. EBANK BITS ARE SET. E ADRES IS
R2627                      DERIVED AND LEFT IN A.

 2628   REF   18  LAST  475        4304  54 003 0  SETEBANK TS      EBANK            SET EBANK BITS
 2629   REF    3  LAST  475        4305  7 4350 1           MASK    LOW8
 2630   REF    2  LAST  475        4306  6 5000 1           AD      OCT1400          E ADRES LEFT IN A
 2631   REF  126  LAST  475        4307  0 0002 0           TC      Q


 2632                              4310   00016 0  R1D1     OCT     16               THESE 3 CONSTANTS FORM A PACKED TABLE.
 2633                              4311   00011 1  R2D1     OCT     11               DONT SEPARATE.
 2634                              4312   00004 0  R3D1     OCT     4

 2635   REF    3  LAST  243        4313  54 020 1  RIGHT5   TS      CYR
 2636   REF    4  LAST  475        4314  4 0020 1           CS      CYR
 2637   REF    5  LAST  475        4315  4 0020 1           CS      CYR
 2638   REF    6  LAST  475        4316  4 0020 1           CS      CYR
 2639   REF    7  LAST  475        4317  4 0020 1           CS      CYR
 2640   REF    8  LAST  475        4320  56 020 0           XCH     CYR
 2641   REF  127  LAST  475        4321  0 0002 0           TC      Q

 2642   REF   12  LAST  458        4322  54 022 0  LEFT5    TS      CYL
 2643   REF   13  LAST  475        4323  4 0022 0           CS      CYL
 2644   REF   14  LAST  475        4324  4 0022 0           CS      CYL
 2645   REF   15  LAST  475        4325  4 0022 0           CS      CYL
 2646   REF   16  LAST  475        4326  4 0022 0           CS      CYL
 2647   REF  17  LAST  475     4327  56 022 1             XCH     CYL
 2648   REF 128  LAST  475     4330  0 0002 0             TC      Q

 2649                          4331  6 0000 1  SLEFT5     DOUBLE
 2650                          4332  6 0000 1             DOUBLE
 2651                          4333  6 0000 1             DOUBLE
 2652                          4334  6 0000 1             DOUBLE
 2653                          4335  6 0000 1             DOUBLE
 2654   REF 129  LAST  476     4336  0 0002 0             TC      Q


 2655                          4337   00037 0  LOW5       OCT     37                 THESE 3 CONSTANTS FORM A PACKED TABLE.
 2656                          4340   01740 0  MID5       OCT     1740               DONT SEPARATE.
 2657                          4341   76000 0  HI5        OCT     76000              MUST STAY HERE

 2658   REF  10  LAST  472     4342  0 5063 1  TCNOVAC    TC      NOVAC
 2659   REF  17  LAST  453     4343  0 5205 0  TCWAIT     TC      WAITLIST
 2660   REF  13  LAST  453     4344  0 5263 0  TCTSKOVR   TC      TASKOVER
 2661   REF  16  LAST  396     4345  0 5076 0  TCFINDVC   TC      FINDVAC


 2662                          4346   30000 1  CHRPRIO    OCT     30000              EXEC PRIORITY OF CHARIN


 2663                          4347   03777 0  LOW11      OCT     3777
 2664   REF   6  LAST  444     4347            B12-1      EQUALS  LOW11
 2665                          4350   00377 1  LOW8       OCT     377


 2667                          4351   00023 0  VD1        OCT     23                 THESE 3 CONSTANTS FORM A PACKED TABLE.
 2668                          4352   00021 1  ND1        OCT     21                 DONT SEPARATE.
 2669                          4353   00025 0  MD1        OCT     25

 2670                          4354   00012 1  BINCON     DEC     10

 2671   REF  21  LAST  417     4355  3 4736 1  FALTON     CA      BIT7               TURN ON OPERATOR ERROR LIGHT
 2672                          4356  0 0006 1             EXTEND
 2673   REF  12  LAST  465     4357  05 011 1             WOR     DSALMOUT           BIT 7 OF CHANNEL 11
 2674   REF 130  LAST  476     4360  0 0002 0             TC      Q

 2675   REF  22  LAST  476     4361  4 4736 0  FALTOF     CS      BIT7               TURN OFF OPERATOR ERROR LIGHT
 2676                          4362  0 0006 1             EXTEND
 2677   REF  13  LAST  476     4363  03 011 1             WAND    DSALMOUT           BIT 7 OF CHANNEL 11
 2678   REF 131  LAST  476     4364  0 0002 0             TC      Q

 2679   REF  23  LAST  461     4365  3 4740 0  RELDSPON   CAF     BIT5               TURN ON KEY RELEASE LIGHT
 2680                          4366  0 0006 1             EXTEND
 2681   REF  14  LAST  476     4367  05 011 1             WOR     DSALMOUT           BIT 5 OF CHANNEL 11
 2682   REF 132  LAST  476     4370  0 0002 0             TC      Q
 2683                              4371  0 0006 1  LODSAMPT EXTEND
 2684    REF  14  LAST  378        4372  3 0025 0           DCA     TIME2
 2685    REF   5  LAST  328        4373  52 014 0           DXCH    SAMPTIME
 2686    REF 133  LAST  476        4374  0 0002 0           TC      Q


 2687                              4375  0 0006 1  TPSL1    EXTEND                      SHIFTS MPAC, +1, +2 LEFT 1
 2688    REF 231  LAST  473        4376  3 0156 0           DCA     MPAC     +1         LEAVES OVFIND SET TO +/- 1 FOR OF/UF
 2689    REF 232  LAST  477        4377  20 156 1           DAS     MPAC     +1
 2690    REF 233  LAST  477        4400  6 0154 1           AD      MPAC
 2691    REF 234  LAST  477        4401  26 154 0           ADS     MPAC
 2692                              4402  54 007 1           TS      7                   TS A DOES NOT CHANGE A ON OF/UF.
 2693    REF 134  LAST  477        4403  0 0002 0           TC      Q                   NO NET OF/UF
 2694    REF   7  LAST  448        4404  54 162 0           TS      MPAC+6              MPAC +6 SET TO +/-1 FOR OF/UF
 2695    REF 135  LAST  477        4405  0 0002 0           TC      Q


R2696    IF MPAC, +1 ARE EACH +NZ OR +0 AND C(A)=-0, SHORTMP WRONGLY GIVES +0.
R2697    IF MPAC, +1 ARE EACH -NZ OR -0 AND C(A)=+0, SHORTMP WRONGLY GIVES +0.
R2698    PRSHRTMP FIXES FIRST CASE ONLY, BY MERELY TESTING C(A) AND IF IT = -0,
R2699    SETTING RESULT TO -0.
R2700     (DO NOT USE PRSHRTMP UNLESS MPAC, +1 ARE EACH +NZ OR +0, AS THEY ARE
R2701     WHEN THEY CONTAIN TH E SF CONSTANTS.)

 2702    REF   2  LAST   99        4406  54 135 1  PRSHRTMP TS      MPTEMP
 2703    REF 148  LAST  472        4407  10 000 0           CCS     A
 2704    REF   3  LAST  477        4410  3 0135 0           CA      MPTEMP              C(A) +, DO REGULAR SHORTMP
 2705    REF   7  LAST  456        4411  1 7331 0           TCF     SHORTMP +1          C(A) +0, DO REGULAR SHORTMP
 2706                              4412  1 4410 1           TCF     -2                  C(A) -, DO REGULAR SHORTMP
 2707    REF 101  LAST  473        4413  4 4746 1           CS      ZERO                C(A) -0, FORCE RESULT TO -0 AND RETURN.
 2708    REF 235  LAST  477        4414  54 154 0           TS      MPAC
 2709    REF 236  LAST  477        4415  54 155 1           TS      MPAC     +1
 2710    REF 237  LAST  477        4416  54 156 1           TS      MPAC     +2
 2711    REF 136  LAST  477        4417  0 0002 0           TC      Q


 2712    REF  33  LAST  338        4420  3 4737 0  FLASHON  CAF     BIT6                TURN ON V/N FLASH
 2713                              4421  0 0006 1           EXTEND                      BIT 6 OF CHANNEL 11
 2714    REF  15  LAST  476        4422  05 011 1           WOR     DSALMOUT
 2715    REF 137  LAST  477        4423  0 0002 0           TC      Q


 2716    REF  34  LAST  477        4424  4 4737 1  FLASHOFF CS      BIT6                TURN OFF V/N FLASH
 2717                              4425  0 0006 1           EXTEND
 2718    REF  16  LAST  477        4426  03 011 1           WAND    DSALMOUT            BIT 6 OF CHANNEL 11
 2719    REF 138  LAST  477        4427  0 0002 0           TC      Q
```

```
P2720   INTERNAL USE OF KEYBOARD AND DISPLAY PROGRAM

R2721   USER MUST SCHEDULE CALLS TO NVSUB SO THAT THERE IS NO CONFLICT OF USE OR
R2722   CONFUSION TO OPERATOR. THE OLD GRABLOCK (INTERNAL/INTERNAL INTERLOCK)
R2723   HAS BEEN REMOVED AND THE INTERNAL USER NO LONGER HAS THE PROTECTION THIS
R2724   OFFERED.

R2725   THERE ARE TWO WAYS A JOB CAN BE PUT TO SLEEP BY THE KEYBOARD + DISPLAY
R2726   PROGRAM.     1) BY ENDIDLE
R2727                2) BY NVSUBUSY
R2728   THE BASIC CONVENTION IS THAT ONLY ONE JOB WILL BE PERMITTED ASLEEP VIA
R2729   THE KEYBOARD + DISPLAY PROGRAM AT A TIME. IF A JOB ATTEMPTS TO GO TO
R2730   SLEEP BY MEANS OF (1) OR (2) AND THERE IS ALREADY A JOB ASLEEP THAT WAS
R2731   PUT TO SLEEP BY (1) OR (2), THEN AN ABORT IS CAUSED.


R2732   THE CALLING SEQUENCE FOR NVSUB IS
R2733              CAF      V/N
R2734   L          TC       NVSUB
R2735   L+1        RETURN HERE IF OPERATOR HAS INTERVENED
R2736   L+2        RETURN HERE AFTER EXECUTION


R2737           A ROUTINE CALLED  NVSUBUSY IS PROVIDED (USE IS OPTIONAL)  TO PUT
R2738   YOUR JOB TO SLEEP UNTIL THE OPERATOR RELEASES THE KEYBOARD + DISPLAY
R2739   SYSTEM. NVSUBUSY ALSO TURNS ON THE KEY RELEASE LIGHT.
R2740   NVSUBUSY CANNOT BE CALLED FROM ERASABLE OR F/F MEMORY,
R2741   SINCE JOBSLEEP AND JOBWAKE CAN HANDLE ONLY FIXED BANKS.


R2742             THE CALLING SEQUENCE IS
R2743              CAF      WAKEFCADR
R2744              TC       NVSUBUSY


R2745   .


R2746   NVSUBUSY IS INTENDED FOR USE WHEN AN INTERNAL PROGRAM FINDS THE OPERATOR
R2747   IS USING THE KEYBOARD + DISPLAY PROGRAM (BY HIS OWN INITIATION). IT IS
R2748   NOT INTENDED FOR USE WHEN ONE INTERNAL PROGRAM FINDS ANOTHER INTERNAL
R2749   PROGRAM USING THE KEYBOARD + DISPLAY PROGRAM.


R2750   NVSUBUSY ABORTS (WITH CODE 01206) IF A SECOND JOB ATTEMPTS TO GO TO
R2751   SLEEP IN PINBALL. IN PARTICULAR, IF AN ATTEMPT IS MADE TO GO TO NVSUBUSY
R2752   WHEN
R2753   1) DSPLIST NOT= +0. THIS IS THE CASE WHERE THE CAPACITY OF THE DSPLIST
R2754      IS EXCEEDED.
R2755   2) CADRSTOR NOT= +0. THIS INDICATES THAT A JOB IS ALREADY USING
```

```
R2756   ENDIDLE. (+-NZ INDICATE A JOB IS ALREADY ASLEEP DUE TO ENDIDLE.)

 2757   REF   1                   4430  4 4435 0  PRENVBSY CS      2K+3             SPECIAL ENTRANCE FOR ROUTINES IN FIXED
 2758   REF 139  LAST  477        4431  6 0002 0           AD      Q                BANKS ONLY DESIRING THE FCADR OF(LOC
 2759   REF   2  LAST  470        4432  6 0004 0           AD      FBANK            FROM WHICH THE TC PRENVBSY WAS DONE) -2
 2760   REF  35  LAST  471        4433  0 4626 1  NVSUBUSY TC      POSTJUMP         TO BE ENTERED.
 2761   REF   1                   4434   10670 1           CADR    NVSUBSY1
 2762                             4435   02003 0  2K+3     OCT     2003

R27625  NVSUBSY1 MUST BE IN BANK 27 OR LOWER, SO IT WILL PUT CALLER TO SLEEP
R27626  WITH HIS PROPER SUPERBITS.

 2763   REF   1             04,2670                        SETLOC ENDSPMM +1
 27635  REF   2 LAST  472 TO  473:      9      9*          COUNT* $$/PIN
 2764   REF  62  LAST  473  04,2670  54 001 1  NVSUBSY1 TS      L
 2769   REF   2  LAST  470  04,2671  0 4211 1           TC      ISCADR+0         ABORT IF CADRSTOR NOT= +0.
 2770   REF   2  LAST  470  04,2672  0 4215 0           TC      ISLIST+0         ABORT IF DSPLIST NOT= +0.
 2771   REF   3  LAST  454  04,2673  0 4365 0           TC      RELDSPON
 2772   REF  63  LAST  479  04,2674  3 0001 0           CA      L
 2773   REF   3  LAST  470  04,2675  55'042 1           TS      DSPLIST
 2774   REF   3  LAST  470  04,2676  0 5124 0  ENDNVBSY TC      JOBSLEEP


R2775   NVSBWAIT IS A SPECIAL ENTRANCE FOR ROUTINES IN FIXED BANKS ONLY. IF
R2776   SYSTEM IS NOT BUSY, IT EXECUTES V/N AND RETURNS TO L+1 (L= LOC FROM
R2777   WHICH THE TC NVSBWAIT WAS DONE). IF SYSTEM IS BUSY, IT PUTS CALLING JOB
R2778   TO SLEEP WITH L-1 GOING INTO LIST FOR EVENTUAL WAKING UP WHEN SYSTEM
R2779   IS NOT BUSY.

 2780   REF   1                   4436                     SETLOC NVSUBUSY +3
 27805  REF   5 LAST  475 TO  479:      98   202*          COUNT* $$/PIN
 2781                             4436  22 007 0  NVSBWAIT LXCH    7                ZERO NVMONOPT OPTIONS
 2782   REF   9  LAST  472        4437  54 123 0           TS      NVTEMP
 2783   REF  43  LAST  471        4440  3 4727 1           CAF     BIT14
 27831  REF  10  LAST  471        4441  7 1020 0           MASK    MONSAVE1         EXTERNAL MONITOR BIT
 27832  REF   8  LAST  471        4442  6 1011 0           AD      DSPLOCK
 27833  REF 149  LAST  477        4443  10 000 0           CCS     A
 27834  REF   1                   4444  1 4446 1           TCF     NVSBWT1          BUSY
 2784   REF   1                   4445  1 4155 0           TCF     NVSBCOM          FREE. NVSUB WILL SAVE L+1 FOR RETURN
A2785                                                                               AFTER EXECUTION.
 2786   REF 140  LAST  479        4446  24 002 0  NVSBWT1  INCR    Q                L+2. PRENVBSY WILL PUT L-1 INTO LIST AND
 2787   REF   1                   4447  1 4430 0           TCF     PRENVBSY         GO TO SLEEP.


R2788   RELDSP IS USED BY VBPROC, VBTERM, VBRQEXEC, VBRQWAIT, VBRELDSP, EXTENDED
R2789   VERB DISPATCHER, VBRESEQ, RECALTST.
R2790   RELDSP1 IS USED BY MONITOR SET UP, VBRELDSP.
 2791   REF 141  LAST  479        4450  56 002 0  RELDSP   XCH     Q                SET DSPLOCK TO +0, TURN RELDSP LIGHT
 2792   REF   1                   4451  54 144 1           TS      RELRET           OFF,  SEARCH DSPLIST
 27921  REF  44  LAST  479        4452  4 4727 0           CS      BIT14
```

```
L        PINBALL GAME  BUTTONS AND LIGHTS                                                     USER'S PAGE NO.  79       E4 S4

 27922                                  4453  0 0004 0              INHINT
 27923  REF  11  LAST  479              4454  7 1020 0              MASK    MONSAVE1
 27924  REF  12  LAST  480              4455  55'020 0              TS      MONSAVE1         TURN OFF EXTERNAL MONITOR BIT
 2793   REF   4  LAST  479              4456  11'042 1              CCS     DSPLIST
 2794                                   4457  0 4461 0              TC      +2
 2795   REF   1                         4460  0 4464 0              TC      RELDSP2          LIST EMPTY
 2796   REF 102  LAST  477              4461  3 4746 0              CAF     ZERO
 2797   REF   5  LAST  480              4462  57'042 0              XCH     DSPLIST
 2799   REF   4  LAST  473              4463  0 5130 0              TC      JOBWAKE
 2800                                   4464  0 0003 1    RELDSP2   RELINT
 2801   REF  24  LAST  476              4465  4 4740 1              CS      BIT5             TURN OFF KEY RELEASE LIGHT
 2802                                   4466  0 0006 1              EXTEND                   (BIT 5 OF CHANNEL 11)
 2803   REF  17  LAST  477              4467  03 011 1              WAND    DSALMOUT
 2804   REF 103  LAST  480              4470  3 4746 0              CAF     ZERO
 2805   REF   9  LAST  479              4471  55'011 1              TS      DSPLOCK
 2807   REF   2  LAST  479              4472  0 0144 0              TC      RELRET
 2808   REF 142  LAST  479              4473  56 002 0    RELDSP1   XCH     Q                SET DSPLOCK TO +0. NO DSPLIST SEARCH.
 2809   REF   3  LAST  480              4474  54 144 1              TS      RELRET           TURN KEY RLSE LIGHT OFF IF DSPLIST IS
A2810                                                                                        EMPTY. LEAVE KEY RLSE LIGHT ALONE IF
A2811                                                                                        DSPLIST IS NOT EMPTY.
 2812   REF   6  LAST  480              4475  11'042 1              CCS     DSPLIST
 2813                                   4476  0 4500 0              TC      +2               +  NOT EMPTY. LEAVE KEY RLSE LIGHT ALONE
 2814   REF   2  LAST  480              4477  0 4464 0              TC      RELDSP2          +0 EMPTY. TURN OFF KEY RLSE LIGHT
 2815   REF 104  LAST  480              4500  3 4746 0              CAF     ZERO             -  NOT EMPTY. LEAVE KEY RLSE LIGHT ALONE
 2816   REF  10  LAST  480              4501  55'011 1              TS      DSPLOCK
 2817   REF   4  LAST  480              4502  0 0144 0              TC      RELRET


 2818                                   4503              ENDPINBF  EQUALS
```

```
P28181  PINTEST IS NEEDED FOR AUTO CHECK OF PINBALL.
 28182  REF   2  LAST  275   43,2002           PINTEST  EQUALS LST2FAN
```

```
P2819   VBTSTLTS TURNS ON ALL DISPLAY PANEL LIGHTS. AFTER 5 SEC, IT TURNS
R2820   OFF THE CAUTION AND STATUS LIGHTS.

 2821   REF   1                 41,3662                             SETLOC ENDNVS81 +1

 28215  REF   8 LAST  467 TO   469:     61   930*                   COUNT* $$/PIN
 2822                           41,3662  0 0004 0  VBTSTLTS INHINT
 28222  REF 100  LAST  462      41,3663  0 4607 1           TC      BANKCALL          OPP ERR IF NOT IN POO
 28224  REF   6  LAST  302      41,3664   66121 0           CADR    CHKPOOH
 2823   REF  25  LAST  471      41,3665  4 4744 0           CS      BIT1              SET BIT 1 OF IMODES33 SO IMUMON WONT
 2824   REF  26  LAST  238      41,3666  7 1300 1           MASK    IMODES33          TURN OUT ANY LAMPS.
 2825   REF  26  LAST  482      41,3667  6 4744 1           AD      BIT1
 2826   REF  27  LAST  482      41,3670  55'300 1           TS      IMODES33

 2827   RFF   1                 41,3671  3 3730 0           CAF     TSTCON1           TURN ON UPLINK ACTIVITY, TEMP, KEY RLSE,
 2828                           41,3672  0 0006 1           EXTEND                    V/N FLASH, OPERATOR ERROR.
 2829   REF  18  LAST  480      41,3673  05 C11 1           WOR     DSALMOUT
 2830   REF   1                 41,3674  3 3731 1           CAF     TSTCON2           TURN ON NO ATT, GIMBAL LOCK, TRACKER,
 2831   REF  34  LAST  468      41,3675  55'035 1           TS      DSPTAB  +11D      PROG ALM.
 28311  REF   1                 41,3676  0 6040 0           TC      C13STALL
 2832   REF  19  LAST  431      41,3677  3 4733 1           CAF     BIT10             TURN ON TEST ALARM OUTBIT
 2833                           41,3700  0 0006 1           EXTEND
 2834   RFF   5  LAST  231      41,3701  05 C13 0           WOR     CHAN13
 2835   REF   6  LAST  432      41,3702  3 4354 1           CAF     TEN
 2836   RFF   1                 41,3703  54 117 1  TSTLTS1  TS      ERCNT
 2837   PFF   1                 41,3704  4 3726 0           CS      FULLDSP
 2838   REF   2  LAST  482      41,3705  50 117 0           INDEX   ERCNT
 2839   REF  35  LAST  482      41,3706  55'022 1           TS      DSPTAB
 2840   REF   3  LAST  482      41,3707  10 117 1           CCS     ERCNT
 2841   REF   1                 41,3710  0 3703 0           TC      TSTLTS1
 2842   REF   1                 41,3711  4 3727 1           CS      FULLDSP1
 2843   REF  36  LAST  482      41,3712  55'C23 0           TS      DSPTAB  +1        TURN ON 3 PLUS SIGNS
 2844   REF  37  LAST  482      41,3713  55'026 0           TS      DSPTAB  +4
 2845   REF  38  LAST  482      41,3714  55'030 1           TS      DSPTAB  +6
 2846   RFF   1                 41,3715  3 4751 0           CAF     ELEVEN
 2847   REF   9  LAST  468      41,3716  55'015 0           TS      NOUT
 2848                           41,3717  0 C003 1           RELINT
 2849   RFF   I                 41,3720  3 3733 0           CAF     SHOLTS
 2850                           41,3721  0 0C04 0           INHINT
 2851   REF  I8  LAST  476      41,3722  0 5205 0           TC      WAITLIST
 2852   REF  39  LAST  482         1022                     EBANK=  DSPTAB
 2853   REF   1                 41,3723   C3641 1           2CADR   TSTLTS2
 2853   REF   1                 41,3724   60102 1
 2854   REF  63  LAST  473      41,3725  0 5146 1           TC      ENDOFJOB          DSPLOCK IS LEFT BUSY (FROM KEYBOARD
A2855                                                                                 ACTION) UNTIL TSTLTS3 TO INSURE THAT
A2856                                                                                 LIGHTS TEST WILL BE SEEN.


 2857                           41,3726   05675 0  FULLDSP  OCT     05675             DISPLAY ALL 8:S
 2858                           41,3727   C7675 1  FULLDSP1 OCT     07675             DISPLAY ALL 8:S AND +
 2859                         41,3730   00175 1  TSTCON1   OCT    00175
A2860                                                                               UPLINK ACTIVITY, TEMP, KEY RLSE,
A2861                                                                               V/N FLASH, OPERATOR ERROR.
 2862                         41,3731   40677 0  TSTCON2   OCT    40677             DSPTAB +11D BITS 1,2,3,4,5,6,8,9.
A28621                                                                                  DAP, LR, SUPER KEYREL,
A2863                                                                               NO ATT, GIMBAL LOCK, TRACKER, PROG ALM.
 2864                         41,3732   00115 1  TSTCON3   OCT    00115             CHAN 11  BITS 1, 3, 4, 7.
A2865                                                                               UPLINK ACTIVITY, TEMP, OPERATOR ERROR.
 2866                         41,3733   00764 1  SHOLTS    OCT    764               5 SEC


28665    REF   3  LAST  410   40,2000                      SETLOC PINBALL1
28666                         40,3641                      BANK

2867     REF   4  LAST  472   40,3641  3 4346 1  TSTLTS2   CAF    CHRPR10           CALLED BY WAITLIST
2868     REF  11  LAST  476   40,3642  0 5063 1            TC     NOVAC
2869     REF  40  LAST  482      1022                      EBANK= DSPTAB
2870     REF   1              40,3643   03734 1            2CADR  TSTLTS3
2870     REF   1              40,3644   62102 0
2871     REF  14  LAST  476   40,3645  0 5263 0            TC     TASKOVER


28715    REF   3  LAST  419   41,2000                      SETLOC PINBALL2
28716                         41,3734                      BANK

2872     REF   1              41,3734  4 3732 0  TSTLTS3   CS     TSTCON3           CALLED BY EXECUTIVE
2873                          41,3735  0 0004 0            INHINT
2874                          41,3736  0 0006 1            EXTEND                   TURN OFF  UPLINK ACTIVITY, TEMP,
2875     REF  19  LAST  482   41,3737  03 011 1            WAND   DSALMOUT          OPERATOR ERROR.
28751    REF   2  LAST  482   41,3740  0 6040 0            TC     C13STALL
2876     REF  20  LAST  482   41,3741  4 4733 0            CS     BIT10             TURN OFF TEST ALARM OUTBIT
2877                          41,3742  0 0006 1            EXTEND
2878     REF   6  LAST  482   41,3743  03 013 0            WAND   CHAN13
28781    REF  24  LAST  344   41,3744  3 4741 1            CAF    BIT4              MAKE NO ATT FOLLOW BIT 4 OF CHANNEL 12
28782                         41,3745  0 0006 1            EXTEND                     (NO ATT LIGHT ON IF IN COARSE ALIGN)
28783    REF  23  LAST  300   41,3746  02 012 0            RAND   CHAN12
2879     REF  29  LAST  469   41,3747  6 4726 0            AD     BIT15             TURN OFF AUTO, HOLD, FREE, SPARE,
2880     REF  41  LAST  483   41,3750  55'035 1            TS     DSPTAB  +11D      GIMBAL LOCK, SPARE, TRACKER, PROG ALM
2881     REF   1              41,3751  4 3774 1            CS     13-11,1           SET BITS TO INDICATE ALL LAMPS OUT. TEST
2882     REF  28  LAST  482   41,3752  7 1300 1            MASK   IMODES33          LIGHTS COMPLETE.
2883     REF   3  LAST  234   41,3753  6 5017 1            AD     PRIO16
2884     REF  29  LAST  483   41,3754  55'300 1            TS     IMODES33

2885     REF   1              41,3755  4 3776 0            CS     OCT55000
2886     REF  43  LAST  238   41,3756  7 1277 0            MASK   IMODES30
2887     REF   5  LAST  274   41,3757  6 5016 0            AD     PRIO15            15000.
2888     REF  44  LAST  483   41,3760  55'277 0            TS     IMODES30

2889     REF   1              41,3761  4 3775 0            CS     RFAILS2
2890     REF  28  LAST  431   41,3762  7 0110 0            MASK   RADMODES
```

```
 2891   REF   3  LAST  195   41,3763  6 4736 1            AD      RCDUFBIT
 2892   REF  29  LAST  483   41,3764  54 110 0            TS      RADMODES

 2893                        41,3765  0 0003 1            RELINT

 2894   REF 101  LAST  482   41,3766  0 4607 1            TC      BANKCALL        REDISPLAY C(MODREG)
 2895   REF   1              41,3767   10657 1            CADR    DSPMM
 2896   REF   4  LAST  467   41,3770  0 4175 0            TC      KILMONON        TURN ON KILL MONITOR BIT.
 2897   REF   5  LAST  468   41,3771  0 4424 1            TC      FLASHOFF        TURN OFF V/N FLASH.
 2898   REF  36  LAST  479   41,3772  0 4626 1            TC      POSTJUMP        DOES RELDSP AND GOES TO PINBRNCH IF
 2899   REF   1              41,3773   61527 0            CADR    TSTLTS4          ENDIDLE IS AWAITING OPERATOR RESPONSE.
 2901                        41,3774   16001 1  13-11,1   OCT     16001
 2902                        41,3775   00330 1  RFAILS2   OCT     330             RADAR CDU AND DATA FAIL FLAGS.
 2903                        41,3776   55000 1  OCT55000  OCT     55000
 2904                        41,3777            ENDPINS2  EQUALS
```

```
R2905    ERROR LIGHT RESET (RSET) TURNS OFF,
R2906    UPLINK ACTIVITY, AUTO, HOLD, FREE, OPERATOR ERROR,
R2907    PROG ALM, TRACKER FAIL.
R2908    LEAVES GIMBAL LOCK AND NO ATT ALONE.
R2909    IT ALSO ZEROES THE :TEST ALARM: OUT BIT, WHICH TURNS OFF STBY,RESTART.
R2910    IT ALSO SETS :CAUTION RESET: TO 1.
R2911    IT ALSO FORCES BIT 12 OF ALL DSPTAB ENTRIES TO 1.

 2912    REF   4  LAST  483    40,2000                              SETLCC PINBALL1
 29122                         40,3646                              BANK

 29125   REF  10 LAST  473 TO  475:     39    882*                  COUNT* $$/PIN
 2913    REF   3  LAST  465    40,3646  56 115 1  ERROR             XCH     21/22REG         RESTORE ORIGINAL C(DSPLOCK). THUS ERROR
 2914    REF  11  LAST  480    40,3647  55'011 1                    TS      DSPLOCK          LIGHT RESET LEAVES DSPLOCK UNCHANGED.
 2915                          40,3650  0 0004 0                    INHINT
 2916    REF  21  LAST  483    40,3651  3 4733 1                    CAF     BIT10            TURN ON :CAUTION RESET: OUTBIT
 2917                          40,3652  0 0006 1                    EXTEND
 2918    REF  20  LAST  483    40,3653  05 011 1                    WOR     DSALMOUT         BIT10 CHAN 11
 2919    REF   1               40,3654  3 3735 0                    CAF     GL,ETC.          LEAVE GIMBAL LOCK, NO ATT, DAPLITE,
A29191                                                                                         & SUPER KEYRELEASE LITES INTACT
 2920    REF  42  LAST  483    40,3655  7 1035 1                    MASK    DSPTAB +11D      TURNING OFF AUTO, HOLD, FREE,
 2921    REF  30  LAST  483    40,3656  6 4726 0                    AD      BIT15            PROG ALARM, AND TRACKER.
 2922    REF  43  LAST  485    40,3657  55'035 1                    TS      DSPTAB +11D
 2923    REF   4  LAST  483    40,3660  4 5017 0                    CS      PRIO16           RESET FAIL BITS WHICH GENERATE PROG
 2924    REF  30  LAST  483    40,3661  7 1300 1                    MASK    IMODES33         ALARM SO THAT IF THE FAILURE STILL
 2925    REF   5  LAST  485    40,3662  6 5017 1                    AD      PRIO16           EXISTS, THE ALARM WILL COME BACK.
 2926    REF  31  LAST  485    40,3663  55'300 1                    TS      IMODES33
 2927    REF  22  LAST  485    40,3664  4 4733 0                    CS      BIT10
 2928    REF  45  LAST  483    40,3665  7 1277 0                    MASK    IMODES30
 2929    REF  23  LAST  485    40,3666  6 4733 1                    AD      BIT10
 2930    REF  46  LAST  485    40,3667  55'277 0                    TS      IMODES30

 2931    REF   1               40,3670  4 3734 0                    CS      RFAILS
 2932    REF  30  LAST  484    40,3671  7 0110 0                    MASK    RADMODES
 2933    REF   4  LAST  484    40,3672  6 4736 1                    AD      RCDUFBIT
 2934    REF  31  LAST  485    40,3673  54 110 0                    TS      RADMODES

 29341   REF   3  LAST  483    40,3674  0 6040 0                    TC      C13STALL
 2935    REF  24  LAST  485    40,3675  4 4733 0                    CS      BIT10            TURN OFF :TEST ALARM: OUTBIT.
 2936                          40,3676  0 0006 1                    EXTEND
 2937    REF   7  LAST  483    40,3677  03 013 0                    WAND    CHAN13
 2938    REF   1               40,3700  4 3733 1                    CS      ERCON            TURN OFF UPLINK ACTIVITY,
 2939                          40,3701  0 0006 1                    EXTEND                   OPERATOR ERROR.
 2940    REF  21  LAST  485    40,3702  03 011 1                    WAND    DSALMOUT
 2941    REF   2  LAST  456    40,3703  3 4354 1  TSTAB             CAF     BINCON           (DEC 10)
 2942    REF   4  LAST  482    40,3704  54 117 1                    TS      ERCNT            ERCNT = COUNT
 2943                          40,3705  0 0004 0                    INHINT
 2944    REF   5  LAST  485    40,3706  50 117 0                    INDEX   ERCNT
 2945    REF  44  LAST  485    40,3707  11'022 1                    CCS     DSPTAB
 2946    REF  59  LAST  473    40,3710  6 4744 1                    AD      ONE
 2947   REF   1                40,3711   0 3716 1             TC       ERPLUS
 2948   REF  60   LAST  485    40,3712   6 4744 1             AD       ONE
 2949   REF 150   LAST  479    40,3713   4 0000 0  ERMINUS    CS       A
 2950   REF   1                40,3714   7 3736 1             MASK     NOTBIT12
 2951   REF   1                40,3715   0 3721 0             TC       ERCOM
 2952   PFF 151   LAST  486    40,3716   4 0000 0  ERPLUS     CS       A
 2953   REF   2   LAST  486    40,3717   7 3736 1             MASK     NOTBIT12
 2954   REF 152   LAST  486    40,3720   4 0000 0             CS       A                  MIGHT WANT TO RESET CLPASS, DECBRNCH,
 2955   REF   6   LAST  485    40,3721   50 117 0  ERCOM      INDEX    ERCNT              ETC.
 2956   REF  45   LAST  485    40,3722   55'022 1             TS       DSPTAB
 2957                          40,3723   0 0003 1             RELINT
 2958   REF   7   LAST  486    40,3724   10 117 1             CCS      ERCNT
 2959   REF   1                40,3725   0 3704 1             TC       TSTAB    +1
 2960   REF 105   LAST  480    40,3726   3 4746 0             CAF      ZERO
 2961   REF   6   LAST  317    40,3727   54 375 1             TS       FAILREG
 29611  RFF   7   LAST  486    40,3730   54 376 1             TS       FAILREG +1
 2962   REF   2   LAST  112    40,3731   55'357 0             TS       SEAIL
 2963   REF  64   LAST  482    40,3732   0 5146 1             TC       ENDOFJOB

 2964                          40,3733    00104 1  ERCON      OCT      104                CHAN 11 BITS 3,7.
A2965                                                                                     UPLINK ACTIVITY, AND OPERATOR ERROR.
 2966                          40,3734    00330 1  RFAILS     OCT      330                RADAR CDU AND DATA FAIL FLAGS.
 296c5                         40,3735    00053 1  GL,ETC.    OCT      00053              NO ATT, GIMB LOCK, DAPLITE, SUPER KR.
 2967                          40,3736    73777 1  NOTBIT12 OCT      73777


 2968                          40,3737             ENDPINS1 EQUALS


 2969   REF   5   LAST  332    30,2000                        SBANK= LOWSUPER
```

```
L        R60,R62                                                                USER'S PAGE NO.   1      E0 S?

R0100    MOD NO: 0                      DATE: 1 MAY 1968

R0101    MOD BY: DIGITAL DEVEL GROUP    LOG SECTION R60,R62

R0102    FUNCTIONAL DESCRIPTION:

R0103    CALLED AS A GENERAL SUBROUTINE TO MANEUVER THE LM TO A SPECIFIED
R0104    ATTITUDE.

R0105    1. IF THE 3-AXIS FLAG IS NOT SET THE FINAL CDU ANGLES ARE
R0106    CALCULATED (VECPOINT).

R0107    2. THE FDAI BALL ANGLES (NOUN 18) ARE CALCULATED (BALLANGS).

R0108    3. REQUEST FLASHING DISPLAY V50 N18 PLEASE PERFORM AUTO MANEUVER.

R0109    4. IF PRIORITY DISPLAY FLAG IS SET DO A PHASECHANGE. THEN AWAIT
R0110    ASTRONAUT RESPONSE.

R0111    5. DISPLAY RESPONSE RETURNS:

R0112         A. ENTER - RESET 3-AXIS FLAG AND RETURN TO CLIENT.

R0113         B. TERMINATE - IF IN P00 GO TO STEP 5A. OTHERWISE CHECK IF R61 IS
R0114            THE CALLING PROGRAM. IF IN R61 AN EXIT IS MADE TO GOTOV56. IF
R0115            NOT IN R61 AN EXIT IS DONE VIA GOTOPOOH.

R0116         C. PROCEED - CONTINUE WITH PROGRAM AT STEP 6.

R0117    6. IF THE 3-AXISFLAG IS NOT SET, THE FINAL CDU ANGLES ARE CALCULATED
R0118       (VECPOINT).

R0119    7. THE FDAI BALL ANGLES (NOUN 18) ARE CALCULATED (BALLANGS).

R0120    8. IF THE G+N SWITCH IS NOT SET GO BACK TO STEP 3.

R0121    9. IF THE AUTO SWITCH IS NOT SET GO BACK TO STEP 3.

R0122    10. NONFLASHING DISPLAY V06N18 (FDAI ANGLES).

R0123    11. DO A PHASECHANGE.

R0124    12. DO A MANEUVER CALCULATION AND ICDU DRIVE ROUTINE TO ACHIEVE FINAL

R0125         GIMBAL ANGLES (GOMANUR).
R0126    13. AT END OF MANEUVER GO TO STEP 3.

R0127               IF SATISFACTORY MANEUVER STEP 5A EXITS R60.
R0128               FOR FURTHER ADJUSTMENT OF THE VEHICLE ATTITUDE ABOUT THE
R0129               DESIRED VECTOR, THE ROUTINE MAY BE PERFORMED AGAIN STARTING AT
```

```
R0130             STEP 5C.


R0131    CALLING SEQUENCE:  TC BANKCALL
R0132                       CADR R60LEM

R0133    ERASABLE INITIALIZATION REQUIRED : SCAXIS, POINTVSM (FOR VECPOINT)
R0134                                       3AXISFLG.

R0135    SUBROUTINES CALLED: VECPOINT, BALLANGS, GOPERF2R, LINUS, GODSPER,
R0136                        GCMANUR, DOWNFLAG, PHASCHNG, UPFLAG

R0137    NORMAL EXIT MODES: CAF TEMPR60   (CALLERS RETURN ADDRESS)
R0138                       TC  BANKJUMP

R0139    ALARMS: NONE

R0140    OUTPUT: NONE

R0141    DEBRIS: CPHI, CTHETA, CPSI, 3AXISFLG, TBASE2


 0142                        34,2000                       BANK    34
 0143    REF    1            26,2000                       SETLOC MANUVER
 0144                        26,2125                       BANK

 0145    REF    1               1163                       EBANK= TEMPR60

 0146    REF    1                                          COUNT* $$/R06
 0147    REF    2  LAST  283  26,2125  0 4636 0  R60LEM    TC      MAKECADR
 0148    REF    2  LAST  488  26,2126  55'163 0            TS      TEMPR60

 0149    REF    1             26,2127  3 4737 0  REDOMANN CAF     3AXISBIT
 0150    REF   13  LAST  302  26,2130  7 0101 0            MASK    FLAGWRD5        IS 3-AXIS FLAG SET
 0151    REF  153  LAST  486  26,2131  10 000 0            CCS     A
 0152    REF    1             26,2132  1 2140 1            TCF     TOBALL          YES
 0153    REF   29  LAST  400  26,2133  0 6060 1            TC      INTPRET
 0154                         26,2134   77624 1            CALL
 0155    REF    2  LAST  352  26,2135   56040 0                    VECPOINT        TO COMPUTE FINAL ANGLES
 0156    REF    5  LAST  381  26,2136   00322 1            STORE   CPHI            STORE FINAL ANGLES - CPHI,CTHETA,CPSI
 0157                         26,2137   77776 1            EXIT

 01571   REF   15  LAST  310  26,2140  0 5506 1  TOBALL    TC      UPFLAG          INSURE THAT TOTAL ATTITUDE ERRORS ARE
 01572   REF    3  LAST  279  26,2141   00013 0            ADRES   NEEDLFLG        DISPLAYED ON FDAI ERROR NEEDLES
 01573   REF   29  LAST  400  26,2142  0 5520 0            TC      DOWNFLAG
 01574   REF    3  LAST  279  26,2143   00000 1            ADRES   NEED2FLG
 0158    REF  102  LAST  484  26,2144  0 4607 1            TC      BANKCALL
 01585   REF    2  LAST  352  26,2145   54300 0            CADR    BALLANGS        TO CONVERT ANGLES TO FDAI
 0159    REF    1             26,2146  3 2266 1  TOBALLA   CAF     V06N18
 0160    REF  103  LAST  488  26,2147  0 4607 1            TC      BANKCALL
```

```
L        R60,R62                                                                        USER'S PAGE NO.   3      E2 S3

 0161   REF   1               26,2150   20722 1            CADR    GOPERF2R       DISPLAY PLEASE PERFORM AUTO MANEUVER
 0162   REF   1               26,2151  0 2254 0            TC      R61TEST
 0163   REF   1               26,2152  0 2162 0            TC      REDOMANC       PROCEED
 0164   REF   1               26,2153  0 2207 0            TC      ENDMANU1       ENTER I.E. FINISHED WITH R60
 0165   REF   1               26,2154  0 2214 1            TC      CHKLINUS       TO CHECK FOR PRIORITY DISPLAYS
 0166   REF  65  LAST  486    26,2155  0 5146 1            TC      ENDOFJOB

 01665  REF  16  LAST  457    26,2156  4 6266 1            CS      THREE          SET UP RESTART POINT AT BEGINNING OF
 01666  REF   4  LAST  382    26,2157  6 0133 0            AD      BUF2             DISPLAY IF PRIORITY DISP FLAG SET
 01667  REF   1               26,2160  0 2221 1            TC      CHKLINS1
 01668  REF  66  LAST  489    26,2161  0 5146 1            TC      ENDOFJOB

 0167   REF   2  LAST  488    26,2162  3 4737 0  REDOMANC  CAF     3AXISBIT
 0168   REF  14  LAST  488    26,2163  7 0101 0            MASK    FLAGWRD5       IS 3-AXIS FLAG SET
 0169   REF 154  LAST  488    26,2164  10 000 0            CCS     A
 0170   REF   1               26,2165  1 2173 1            TCF     TOBALLC        YES
 0171   REF  30  LAST  488    26,2166  0 6060 1            TC      INTPRET
 0172                         26,2167   77624 1            CALL
 0173   REF   3  LAST  488    26,2170   56040 0                    VECPOINT       TO COMPUTE FINAL ANGLES
 0174   REF   6  LAST  488    26,2171   00322 1            STORE   CPHI           STORE ANGLES
 0175                         26,2172   77776 1            EXIT

 0176   REF 104  LAST  488    26,2173  0 4607 1  TOBALLC   TC      BANKCALL
 01765  REF   3  LAST  438    26,2174   54300 0            CADR    BALLANGS       TO CONVERT ANGLES TO FDAI
 0177   REF   1               26,2175  0 2267 0            TC      G+N,AUTO       CHECK AUTO MODE
 0178   REF 155  LAST  489    26,2176  10 000 0            CCS     A
 0179   REF   1               26,2177  1 2146 1            TCF     TOBALLA        NOT AUTO, GO REREQUEST AUTO MANEUVER.

 0180   REF   2  LAST  489    26,2200  0 2214 1  AUTOMANV  TC      CHKLINUS
 0181   REF   1               26,2201  1 2204 1            TCF     STARTMNV
 0182   REF   1               26,2202  3 2213 0            CAF     STRTMNAD       RESTART AT STARTMNV IF PRIORITY
 0183   REF   1               26,2203  55'054 0            TS      TBASE2            DISPLAY FLAG SET

 0184   REF 105  LAST  489    26,2204  0 4607 1  STARTMNV  TC      BANKCALL       PERFORM MANEUVER VIA KALCMANU
 0185   REF   1               26,2205   42764 1            CADR    GOMANUR

 0186   REF   2  LAST  489    26,2206  1 2146 1  ENDMANUV  TCF     TOBALLA        FINISHED MANEUVER.
 0187   REF  30  LAST  488    26,2207  0 5520 0  ENDMANU1  TC      DOWNFLAG       RESET 3-AXIS FLAG
 0188   REF   3  LAST  352    26,2210   00124 0            ADRES   3AXISFLG
 0189   REF   3  LAST  488    26,2211  31'163 1            CAE     TEMPR60                                                 -
 0190   REF   6  LAST  460    26,2212  0 4631 1            TC      BANKJUMP                                                -

 01905  REF   2  LAST  489    26,2213   02204 0  STRTMNAD  ADRES   STARTMNV

 0191   REF  15  LAST  489    26,2214  4 0101 0  CHKLINUS  CS      FLAGWRD5
 0192   REF   1               26,2215  7 4727 0            MASK    PDSPFBIT       IS PRIORITY DISPLAY FLAG SET?
 0193   REF 156  LAST  489    26,2216  10 000 0            CCS     A                                                       -
 0194   REF 143  LAST  480    26,2217  0 0002 0            TC      Q              NO - EXIT
 0195   REF   3  LAST  281    26,2220  1 6760 1            TCF     Q+1            GO BACK AND SET UP CORRECT RESTART ADDR.
 0196   REF   2  LAST  489    26,2221  55'054 0  CHKLINS1 TS      TBASE2
 0197   REF 144  LAST  489    26,2222  3 0002 0           CA      Q
 0198   REF 238  LAST  477    26,2223  54 156 1           TS      MPAC +2

 0200   REF   3  LAST  300    26,2224  0 5355 1           TC      PHASCHNG
 0201                         26,2225   00132 1           OCT     00132

 0202   REF  23  LAST  476    26,2226  3 4736 1           CAF     BIT7
 0203   REF   1               26,2227  0 5466 0           TC      LINUS              GO SET BITS FOR PRIORITY DISPLAY      -
 0204   REF 239  LAST  490    26,2230  0 0156 0           TC      MPAC +2

 0205   REF   2  LAST  380    26,2231  3 7735 1  RELINUS  CAF     PRIO26             RESTORE ORIGINAL PRIORITY
 0206   REF   6  LAST  311    26,2232  0 5137 1           TC      PRIOCHNG

 0207   REF   4  LAST  300    26,2233  3 4740 0           CAF     TRACKBIT           DON'T CONTINUE R60 UNLESS TRACKFLAG ON.
 0208   REF  17  LAST  306    26,2234  7 0075 1           MASK    FLAGWRD1
 0209   REF 157  LAST  489    26,2235  10 000 0           CCS     A
 0210   REF   1               26,2236  1 2251 1           TCF     RER60

 0211   REF   5  LAST  300    26,2237  3 4736 1           CAF     RNDVZBIT           IS IT P20?
 0212   REF  23  LAST  300    26,2240  7 0074 0           MASK    FLAGWRD0
 0213   REF 158  LAST  490    26,2241  10 000 0           CCS     A
 0214                         26,2242  0 2246 0           TC      +4                 YES
 0215   REF   4  LAST  490    26,2243  0 5355 1           TC      PHASCHNG           NO, MUST BE P25, SET 2.11 SPOT
 0216                         26,2244   40112 1           OCT     40112

 0217   REF  67  LAST  489    26,2245  0 5146 1           TC      ENDOFJOB

 0218   REF   5  LAST  490    26,2246  0 5355 1           TC      PHASCHNG           SET 2.7 SPOT FOR P20
 0219                         26,2247   40072 0           OCT     40072

 0220   REF  68  LAST  490    26,2250  0 5146 1           TC      ENDOFJOB

 0221   REF  16  LAST  488    26,2251  0 5506 1  RER60    TC      UPFLAG             SET PRIO DISPLAY FLAG AFTER RESTART
 0222   REF   1               26,2252   00114 0           ADRES   PDSPFLAG

 0223   REF   3  LAST  490    26,2253  0 1054 1           TC      TBASE2

 0224   REF   8  LAST  473    26,2254  3 1010 1  R61TEST  CA      MODREG             IF WE ARE IN P00 IT MUST BE V49 OR V89
 0225                         26,2255  0 0006 1           EXTEND
 0226   REF   2  LAST  489    26,2256  1 2207 1           BZF     ENDMANU1           THUS WE GO TO ENDEXT VIA USER

 0227   REF  16  LAST  489    26,2257  3 0101 1           CA      FLAGWRD5
 0228   REF   2  LAST  489    26,2260  7 4727 0           MASK    PDSPFBIT
 0229                         26,2261  0 0006 1           EXTEND
 0230   REF   3  LAST  256    26,2262  1 6001 1           BZF     GOTOPOOH           NO.
 0231   REF   1               26,2263  0 6043 0           TC      GOTOV56            YES

 0232                         26,2264   20100 1  BIT14+7  OCT     20100                                                    -
 0233                         26,2265   00203 0  OCT203   OCT     203
 0234                          26,2266   01422 1  V06N18    VN      0618
R0236           SUBROUTINE TO CHECK FOR G+N CONTROL, AUTO STABILIZATION

R0237           RETURNS WITH C(A) = +  IF NOT SET FOR G+N, AUTO
R0238           RETURNS WITH C(A) = +0 IF SWITCHES ARE SET

 0239                          26,2267  0 0006 1  G+N,AUTO EXTEND
 0240  REF   3  LAST  195      26,2270  00 030 1           READ     CHAN30
 0241  REF  25  LAST  485      26,2271  7 4733 0           MASK     BIT10
 0242  REF 159  LAST  490      26,2272  10 000 0           CCS      A
 0243  REF 145  LAST  490      26,2273  0 0002 0           TC       Q                NOT IN G+N  C(A) = +
 0244                          26,2274  0 0006 1  ISITAUTO EXTEND                    CHECK FOR AUTO MODE
 0245  REF   2  LAST  293      26,2275  00 031 0           READ     CHAN31
 0246  REF  45  LAST  479      26,2276  7 4727 0           MASK     BIT14
 0247  REF 146  LAST  491      26,2277  0 0002 0           TC       Q                (+) = NOT IN AUTO,  (+0) = AOK
```

```
P0248    PROGRAM DESCRIPTION BALLANGS
R0249    MOD NO.          LOG SECTION  R60,R62

R0250    WRITTEN BY RAMA M.AIYAWAR
R0251    FUNCTIONAL DESCRIPTION

R0252    COMPUTES LM FDAI BALL DISPLAY ANGLES
R0253    CALLING SEQUENCE

R0254             TC      BALLANGS
R0255    NORMAL EXIT MODE

R0256             TC      BALLEXIT         (SAVED Q)

R0257    ALARM OR EXIT MODE  NIL
R0258    SUBROUTINES CALLED
R0259             CD*TR*G
R0260             ARCTAN

R0261    INPUT

R0262    CPHI,CTHETA,CPSI  ARE  THE ANGLES CORRESPONDING TO AOG,AIG,AMG. THEY ARE
R0263    SP,2S COMPLIMENT SCALED TO HALF REVOLUTION.
R0264    OUTPUT

R0265    FDAIX,FDAIY,FDAIZ ARE THE REQUIRED BALL ANGLES SCALED TO HALF REVOLUTION
R0266    SP,2S COMPLIMENT.
R0267    THESE ANGLES WILL BE DISPLAYED AS DEGREES AND HUNDREDTHS, IN THE ORDER  ROLL, PITCH, YAW, USING NOUNS 18 & 19.

R0269    ERASABLE INITIALIZATION REQUIRED

R0270    CPHI,CTHETA,CPSI EACH A SP REGISTER
R0271    DEBRIS

R0272    A,L,Q,MPAC,SINCDU,COSCDU,PUSHLIST,BALLEXIT


R0273    NOMENCLATURE:  CPHI, CTHETA, & CPSI REPRESENT THE OUTER, INNER, & MIDDLE GIMBAL ANGLES, RESPECTIVELY; OR
R0275    EQUIVALENTLY, CDUX, CDUY, & CDUZ.

R0276    NOTE:  ARCTAN CHECKS FOR OVERFLOW AND SHOULD BE ABLE TO HANDLE ANY SINGULARITIES.


 0278    REF   2  LAST  351    26,2000                        SETLOC BAWLANGS
 0279                          26,2300                        BANK

 0280    REF   1                                              COUNT* $$/BALL
 0281    REF   3  LAST  488    26,2300  0 4536 0  BALLANGS TC      MAKECADR
 0282    REF   1               26,2301  55'337 0              TS      BALLEXIT
 0283    REF   7  LAST  489    26,2302  3 0321 1              CA      CPHI
```

```
0284  REF   8  LAST  266   26,2303  54 771 1            TS      CDUSPOT +4
0285  REF   2  LAST  381   26,2304  3 0322 1            CA      CTHETA
0286  REF   9  LAST  493   26,2305  54 765 1            TS      CDUSPOT
0287  REF   3  LAST  381   26,2306  3 0323 0            CA      CPSI
0288  REF  10  LAST  493   26,2307  54 767 0            TS      CDUSPOT +2

0289  REF  31  LAST  489   26,2310  0 6060 1            TC      INTPRET
0290                       26,2311   45001 1            SETPD   CALL
0291                       26,2312   00001 0                    0D
0292  REF   2  LAST  261   26,2313   47526 0                    CD*TR*G

0293                       26,2314   41345 0            DLOAD   DMP
0294  REF   1              26,2315   00742 0                    SINCDUX          SIN (OGA)
0295  REF   1              26,2316   00746 1                    COSCDUZ          COS (MGA)

0296                       26,2317   57552 1            SL1     DCOMP            SCALE
0297                       26,2320   65336 1            ARCSIN  PDDL             YAW = ARCSIN(-SXCZ) INTO 0 PD
0298  REF   1              26,2321   00740 1                    SINCDUZ
0299  REF   4  LAST  334   26,2322   14023 0            STODL   SINTH            (SINTH = 18D IN PD)
0300  REF   2  LAST  493   26,2323   00746 1                    COSCDUZ
0301                       26,2324   72405 0            DMP     SL1              RESCALE
0302  REF   1              26,2325   00750 0                    COSCDUX
0303  REF   4  LAST  334   26,2326   34021 0            STCALL  COSTH            (COSTH= 16D IN PD)
0304  REF   1              26,2327   26545 1                    ARCTAN
0305                       26,2330   41325 0            PDDL    DMP              ROLL = ARCTAN(SZ/CZCX) INTO 2 PD
0306  REF   2  LAST  493   26,2331   00740 1                    SINCDUZ
0307  REF   2  LAST  493   26,2332   00742 0                    SINCDUX
0308                       26,2333   41512 1            SL2     PUSH             SXSZ INTO 4 PD
0309                       26,2334   65205 0            DMP     PDDL             SXSZCY INTO 4 PD
0310  REF   1              26,2335   00744 0                    COSCDUY
0311                       26,2336   65205 0            DMP     PDDL             SXSZSY INTO 6 PD
0312  REF   1              26,2337   00736 0                    SINCDUY
0313  REF   2  LAST  493   26,2340   00750 0                    COSCDUX
0314                       26,2341   72405 0            DMP     SL1              CXCY
0315  REF   2  LAST  493   26,2342   00744 0                    COSCDUY
0316                       26,2343   45425 0            DSU     STADR            PULL UP FROM 6 PD
0317  REF   5  LAST  493   26,2344   63756 0            STODL   COSTH            COSTH = CXCY - SXSZSY
0318  REF   2  LAST  493   26,2345   00736 0                    SINCDUY
0319                       26,2346   72405 0            DMP     SL1
0320  REF   3  LAST  493   26,2347   00750 0                    COSCDUX          CXSY
0321                       26,2350   45415 0            DAD     STADR            PULL UP FROM 4 PD
0322  REF   5  LAST  493   26,2351   43754 0            STCALL  SINTH            SINTH = CXSY + SXSZCY
0323  REF   2  LAST  493   26,2352   26545 1                    ARCTAN           RETURNS WITH D(MPAC) = PITCH
0324                       26,2353   55525 0            PDDL    VDEF             PITCH INTO 2 PD, ROLL INTO MPAC FROM 2PD
0325                       26,2354   77634 0            RTB                      VDEF MAKES V(MPAC) = ROLL, PITCH, YAW
0326  REF   2  LAST  377   26,2355   21630 1                    V1STO2S
0327  REF   2  LAST  317   26,2356   02336 0            STORE   FDAIX            MODE IS TP
0328                       26,2357   77776 1            EXIT

0329  REF   2  LAST  492   26,2360  3 1337 1  ENDBALL   CA      BALLEXIT
```

```
 03295  REF   7  LAST  489   26,2361  0 4631 1          TC      BANKJUMP
```

```
P0330    PROGRAM DESCRIPTION - VECPOINT

R0331             THIS INTERPRETIVE SUBROUTINE MAY BE USED TO POINT A SPACECRAFT AXIS IN A DESIRED DIRECTION.  THE AXIS
R0333    TO BE POINTED MUST APPEAR AS A HALF UNIT DOUBLE PRECISION VECTOR IN SUCCESSIVE LOCATIONS OF ERASABLE MEMORY
R0335    BEGINNING WITH THE LOCATION CALLED SCAXIS.  THE COMPONENTS OF THIS VECTOR ARE GIVEN IN SPACECRAFT COORDINATES.
R0337    THE DIRECTION IN WHICH THIS AXIS IS TO BE POINTED MUST APPEAR AS A HALF UNIT DOUBLE PRECISION VECTOR IN
R0339    SUCCESSIVE LOCATIONS OF ERASABLE MEMORY BEGINNING WITH THE ADDRESS CALLED POINTVSM.  THE COMPONENTS OF THIS
R0341    VECTOR ARE GIVEN IN STABLE MEMBER COORDINATES.  WITH THIS INFORMATION VECPOINT COMPUTES A SET OF THREE GIMBAL
R0343    ANGLES (2S COMPLEMENT) CORESPONDING TO THE CROSS-PRODUCT ROTATION BETWE EN SCAXIS AND POINTVSM AND STORES THEM
R0345    IN T(MPAC) BEFORE RETURNING TO THE CALLER.
R0346             THIS ROTATION, HOWEVER, MAY BRING THE S/C INTO GIMBAL LOCK.  WHEN POINTING A VECTOR IN THE Y-Z PLANE,
R0348    THE TRANSPONDER AXIS, OR THE AOT FOR THE LEM, THE PROGRAM WILL CORRECT THIS PROBLEM BY ROTATING THE CROSS-
R0350    PRODUCT ATTITUDE ABOUT POINTVSM BY A FIXED AMOUNT SUFFICIENT TO ROTATE THE DESIRED S/C ATTITUDE OUT OF GIMBAL
R0352    LOCK.  IF THE AXIS TO BE POINTED IS MORE THAN 40.6 DEGREES BUT LESS THAN 60.5 DEG FROM THE +X (OR-X) AXIS,
R0354    THE ADDITIONAL ROTATION TO AVOID GIMAL LOCK IS 35 DEGREES.  IF THE AXIS IS MORE THAN 60.5 DEGEES FROM +X (OR -X)
R0356    THE ADDITIONAL ROTATION IS 35 DEGREES.  THE GIMBAL ANGLES CORRESPONDING TO THIS ATTITUDE ARE THEN COMPUTED AND
R0358    STORED AS 2S COMPLIMENT ANGLES IN T(MPAC) BEFORE RETURNING TO THE CALLER.
R0360             WHEN POINTING THE X-AXIS, OR THE THRUST VECTOR, OR ANY VECTOR WITHIN 40.6 DEG OF THE X-AXIS, VECPOINT
R0362    CANNOT CORRECT FOR A CROSS-PRODUCT ROTATION INTO GIMBAL LOCK.  IN THIS CASE A PLATFORM REALIGNMENT WOULD BE
R0364    REQUIRED TO POINT THE VECTOR IN THE DESIRED DIRECTION.  AT PRESENT NO INDICATION IS GIVEN FOR THIS SITUATION
R0366    EXCEPT THAT THE FINAL MIDDLE GIMBAL ANGLE IN MPAC +2 IS GREATER THAN 59 DEGREES.

R0368             CALLING SEQUENCE -
R0369                 1) LOAD SCAXIS, POINTVSM
R0370                 2) CALL
R0371                        VECPOINT

R0372             RETURNS WITH

R0373                 1) DESIRED OUTER  GIMBAL ANGLE IN MPAC
R0374                 2) DESIRED INNER  GIMBAL ANGLE IN MPAC +1
R0375                 3) DESIRED MIDDLE GIMBAL ANGLE IN MPAC +2


R0376             ERASABLES USED -

R0377                 1) SCAXIS          6
R0378                 2) POINTVSM        6
R0379                 3) MIS            18
R0380                 4) DEL            18
R0381                 5) COF             6
R0382                 6) VECQTEMP        1
R0383                 7) ALL OF VAC AREA 43

R0384                       TOTAL       99


 0385    REF   1               27,2000                         SETLOC VECPT
 0386                          27,2032                         BANK
 0387     REF   1                                            COUNT* $$/VECPT

 0388     REF  11  LAST  378   E6,1675                        EBANK= BCDU

 0388C5                        27,2032   40020 1  VECPNT1  STQ    BDV          THIS ENTRY USES DESIRED CDUS
 03881    REF   1              27,2033   03324 1                  VECQTEMP     NOT PRESENT-ENTER WITH CDUD'S IN MPAC
 038815 PEF     1              27,2034   56035 1                  VECPNT2
 03882                         27,2035   52164 0  VECPNT2  AXC,2  GOTD
 038825 REF    11  LAST  377   27,2036   03245 1                  MIS
 038865 REF     1              27,2037   56046 0                  STORANG
 0389                          27,2040   40020 1  VECPOINT STQ    BDV          SAVE RETURN ADDRESS
 0390     REF   2  LAST  496   27,2041   03324 1                  VECQTEMP
 0391     REF   1              27,2042   56043 0                  VECLEAR      AND CLEAR DVFIND
 0392                          27,2043   47164 1  VECLEAR  AXC,2  RTB
 0393     REF  12  LAST  496   27,2044   03245 1                  MIS          READ THE PRESENT CDU ANGLES AND
 0394     REF   2  LAST  363   27,2045   44403 0                  READCDUK     STORE THEM IN PD25, 26, 27
 0395                        . 27,2046   34032 1  STORANG  STCALL 25D
 0396     REF   3  LAST  363   27,2047   44410 1                  CDUTODCM     S/C AXES TO STABLE MEMBER AXES (MIS)
 0397                          27,2050   61375 1           VLOAD  VXM
 0398     RFF   5  LAST  351   27,2051   03773 1                  POINTVSM     RESOLVE THE POINTING DIRECTION VF INTO
 0399     REF  13  LAST  496   27,2052   03246 1                  MIS          INITIAL S/C AXES ( VF = POINTVSM)
 0400                          27,2053   77656 1           UNIT
 0401                          27,2054   00035 1           STORE  28D
A0402                                                                          PD 28 29 30 31 32 33
 0403                        . 27,2055   53435 0           VXV    UNIT         TAKE THE CROSS PRODUCT VF X VI
 0404     REF  12  LAST  352   27,2056   03765 0                  SCAXIS       WHERE VI = SCAXIS
 0405                          27,2057   57400 1           BOV    VCOMP
 0406     RFF   1              27,2060   56170 1                  PICKAXIS
 0407     RFF  40  LAST  376   27,2061   17270 1           STODL  COF          CHECK MAGNITUDE
 0408                          27,2062   00045 0                  36D          OF CROSS PRODUCT
 0409                          27,2063   50025 0           DSU    BMN          VECTOR, IF LESS
 0410     REF   1              27,2064   14423 1                  DPB-14       THAN B-14 ASSUME
 0411     REF   2  LAST  496   27,2065   56170 1                  PICKAXIS     UNIT OPERATION
 0412                          27,2066   50375 0           VLOAD  DOT                 INVALID.
 0413     RFF  13  LAST  496   27,2067   03765 0                  SCAXIS
 0414                          27,2070   00035 1                  28D
 0415                          27,2071   65552 0           SL1    ARCCOS
 0416                          27,2072   77624 1  COMPMATX CALL                NOW COMPUTE THE TRANSFORMATION FROM
 0417     REF   2  LAST  376   27,2073   44527 1                  DELCOMP      FINAL S/C AXES TO INITIAL S/C AXES  MFI
 0418                          27,2074   75160 1           AXC,1  AXC,2
 0419     RFF  14  LAST  496   27,2075   03245 1                  MIS          COMPUTE THE TRANSFORMATION FROM FINAL
 0420     REF  11  LAST  377   27,2076   02221 1                  KEL          S/C AXES TO STABLE MEMBEP AXES
 0421                          27,2077   77624 1           CALL                MFS = MIS MFI
 0422     REF   3  LAST  377   27,2100   44312 1                  MXM3         (IN PD LIST)

 0423                          27,2101   51545 1           DLOAD  ABS
 0424                          27,2102   00C07 0                  6            MFS6 = SIN(CPSI)                      $2
 0425                          27,2103   50025 0           DSU    BMN
 0426     REF   1              27,2104   14410 1                  SINGIMLC      = SIN(59 DEGS)                       $2
 0427     REF   1              27,2105   56160 0                  FINDGIMB     /CPSI/ LESS THAN 59 DEGS
```

```
A0428                                                                            I.E. DESIRED ATTITUDE NOT IN GIMBAL LOCK

 0429                            27,2106    51545 1            DLOAD   ABS       CHECK TO SEE IF WE ARE POINTING
 0430    REF  14  LAST  496      27,2107    03765 0                    SCAXIS    THE THRUST AXIS
 0431                            27,2110    51025 1            DSU     BPL
 0432    REF   1                 27,2111    14412 0                    SINVEC1   SIN 49.4 DEGS                        $2
 0433    REF   2  LAST  496      27,2112    56160 0                    FINDGIMB  IF SO, WE ARE TRYING TO POINT IT INTO
 0434                            27,2113    77775 1            VLOAD             GIMBAL LOCK, ABORT COULD GO HERE
 0435                            27,2114    77626 0            STADR
 0436    REF  15  LAST  496      27,2115    50515 0            STOVL   MIS +12D
 0437                            27,2116    77626 0            STADR             STORE MFS (IN PD LIST) IN MIS
 0438    REF  16  LAST  497      27,2117    50523 0            STOVL   MIS +6
 0439                            27,2120    77626 0            STADR
 0440    REF  17  LAST  497      27,2121    50531 0            STOVL   MIS
 0441    REF  18  LAST  497      27,2122    03254 1                    MIS +6    INNER GIMBAL AXIS IN FINAL S/C AXES
 0442                            27,2123    57444 1            BPL     VCOMP     LOCATE THE IG AXIS DIRECTION CLOSEST TO
 0443    REF   1                 27,2124    56125 1                    IGSAMEX   FINAL X S/C AXIS

 0444                            27,2125    50035 1  IGSAMEX   VXV     BMN       FIND THE SHORTEST WAY OF ROTATING THE
 0445    REF  15  LAST  497      27,2126    03765 0                    SCAXIS    S/C OUT OF GIMBAL LOCK BY A ROTATION
 0446    REF   1                 27,2127    56134 1                    U=SCAXIS  ABOUT +- SCAXIS, I.E. IF (IG (SGN MFS3)
A0447                                                                            X SCAXIS . XF) LESS THAN 0, U = SCAXIS
A0448                                                                            OTHERWISE U = -SCAXIS

 0449                            27,2130    57575 1            VLOAD   VCOMP
 0450    REF  16  LAST  497      27,2131    03765 0                    SCAXIS
 0451    REF  41  LAST  496      27,2132    37270 0            STCALL  COF       ROTATE ABOUT -SCAXIS
 0452    REF   1                 27,2133    56137 1                    CHEKAXIS
 0453                            27,2134    77775 1  U=SCAXIS  VLOAD
 0454    REF  17  LAST  497      27,2135    03765 0                    SCAXIS
 0455    REF  42  LAST  497      27,2136    03270 1            STORE   COF       ROTATE ABOUT + SCAXIS
 0456                            27,2137    51545 1  CHEKAXIS  DLOAD   ABS
 0457    REF  18  LAST  497      27,2140    03765 0                    SCAXIS    SEE IF WE ARE POINTING THE AOT
 0458                            27,2141    51025 1            DSU     BPL
 0459    REF   1                 27,2142    14414 0                    SINVEC2   SIN 29.5 DEGS                        $2
 0460    REF   1                 27,2143    56147 0                    PICKANG1  IF SO, ROTATE 50 DEGS ABOUT +- SCAXIS
 0461                            27,2144    52145 0            DLOAD   GOTO      IF NOT, MUST BE POINTING THE TRANSPONDER
 0462    REF   1                 27,2145    14420 1                    VECANG2   OR SOME VECTOR IN THE Y, OR Z PLANE
 0463    REF   1                 27,2146    56151 1                    COMPMFSN  IN THIS CASE ROTATE 35 DEGS TO GET OUT
A0464                                                                            OF GIMBAL LOCK (VECANG2  $360)
 0465                            27,2147    77745 1  PICKANG1  DLOAD
 0466    REF   1                 27,2150    14416 1                    VECANG1   = 50 DEGS                           $ 360
 0467                            27,2151    77624 1  COMPMFSN  CALL
 0468    REF   3  LAST  496      27,2152    44527 1                    DELCOMP   COMPUTE THE ROTATION ABOUT SCAXIS TO
 0469                            27,2153    75160 1            AXC,1   AXC,2     BRING MFS OUT OF GIMBAL LOCK
 0470    REF  19  LAST  497      27,2154    03245 1                    MIS
 0471    REF  12  LAST  496      27,2155    02221 1                    KEL
 0472                            27,2156    77624 1            CALL              COMPUTE THE NEW TRANSFORMATION FROM
 0473    REF   4  LAST  496      27,2157    44312 1                    MXM3      DESIRED S/C AXES TO STABLE MEMBER AXES
A0474                                                                            WHICH WILL ALIGN VI WITH VF AND AVOID
```

```
A0475                                                                          GIMBAL LOCK
 0476                         27,2160   45160 1  FINDGIMB AXC,1  CALL
 0477                         27,2161   00000 1                  0             EXTRACT THE COMMANDED CDU ANGLES FROM
 0478    REF   2  LAST  377   27,2162   44654 0                  DCMTOCDU      THIS MATRIX
 0479                         27,2163   40234 0           RT8    SETPD
 0480    REF   3  LAST  493   27,2164   21630 1                  V1STO2S       CONVERT TO 2:S COMPLEMENT
 0481                         27,2165   00001 0                  0
 0482                         27,2166   77650 1           GOTO
 0483    REF   3  LAST  496   27,2167   03324 1                  VECQTEMP      RETURN TO CALLER

 0484                         27,2170   50375 0  PICKAXIS VLOAD  DOT           IF VF X VI = 0,  FIND VF . VI
 0485                         27,2171   00035 1                  28D
 0486    REF  19  LAST  497   27,2172   03765 0                  SCAXIS
 0487                         27,2173   72240 1           BMN    TLOAD
 0488    REF   1              27,2174   54362 1                  ROT180
 0489                         27,2175   00032 0                  25D
 0490                         27,2176   77650 1           GOTO                 IF VF = VI, CDU DESIRED = PRESENT CDU
 0491    REF   4  LAST  498   27,2177   03324 1                  VECQTEMP      PRESENT CDU ANGLES

 0492                         35,2000                     BANK   35
 0493    REF   1              26,2000                     SETLOC MANUVER1
 0494                         26,2362                     BANK
 0495                         26,2362   47375 0  ROT180   VLOAD  VXV           IF VF, VI ANTIPARALLEL, 108 DEG ROTATION
 0496    REF  20  LAST  497   26,2363   03254 1                  MIS +6        IS REQUIRED. Y STABLE MEMBER AXIS IN
 0497    REF   1              26,2364   06503 1                  HIDPHALF      INITIAL S/C AXES.
 0498                         26,2365   47256 0           UNIT   VXV           FIND Y(SM) X X(I)
 0499    REF  20  LAST  498   26,2366   03765 0                  SCAXIS        FIND UNIT(VI X UNIT(Y(SM) X X(I)))
 0500                         26,2367   40056 0           UNIT   BOV           I.E. PICK A VECTOR IN THE PLANE OF X(I),
 0501    REF   1              26,2370   54404 0                  PICKX         Y(SM) PERPENDICULAR TO VI
 0502    REF  43  LAST  497   26,2371   17270 1           STODL  COF
 0503                         26,2372   00045 0                  36D           CHECK MAGNITUDE
 0504                         26,2373   50025 0           DSU    BMN           OF THIS VECTOR.
 0505    REF   2  LAST  496   26,2374   14423 1                  DPB-14        IF LESS THAN B-14,
 0506    REF   2  LAST  498   26,2375   54404 0                  PICKX         PICK X-AXIS.
 0507                         26,2376   77775 1           VLOAD
 0508    REF  44  LAST  498   26,2377   03270 1                  COF
 0509    REF  45  LAST  498   26,2400   17270 1  XROT     STODL  COF
 0510    REF   2  LAST  498   26,2401   06503 1                  HIDPHALF
 0511                         26,2402   77650 1           GOTO
 0512    REF   1              26,2403   56072 1                  COMPMATX
 0513                         26,2404   52175 0  PICKX    VLOAD  GOTO          PICK THE XAXIS IN THIS CASE
 0514    REF   3  LAST  498   26,2405   06503 1                  HIDPHALF
 0515    REF   1              26,2406   54400 1                  XROT
 0516                         26,2407   15555 0  SINGIMLC 2DEC   .4285836003   =SIN(59)             $2
 0516                         26,2410   35172 0
 0517                         26,2411   14113 1  SINVEC1  2DEC   .3796356537   =SIN(49.4)           $2
 0517                         26,2412   36326 0
 0518                         26,2413   07701 0  SINVEC2  2DEC   .2462117800   =SIN(29.5)           $2
 0518                         26,2414   35703 0
 0519                         26,2415   04343 1  VECANG1  2DEC   .1388888889   = 50 DEGREES                    $360
 0519                         26,2416   21616 0
```

```
0520                        26,2417   03070 0  VECANG2  2DEC    .09722222222    = 35 DEGREES                   $360
0520                        26,2420   34344 0
0521                        26,2421   00000 1  1BITDP   OCT     0              KEEP THIS BEFORE DPB(-14)      *********
0522                        26,2422   00001 0  DPB-14   OCT     00001
0523                        26,2423   00000 1           OCT     00000
```

```
P0524    ROUTINE FOR INITIATING AUTOMATIC MANEUVER VIA KEYBOARD (V49)


 0525                          34,2000                        BANK    34
 0526    REF   1               23,2000                        SETLOC  R62
 0527                          23,2103                        BANK
 0528    REF  12  LAST  496    E6,1675                        EBANK=  BCDU

 0529    REF   1                                              COUNT*  $$/R62

 0530    REF   1               23,2103              R62DISP   EQUALS  R62FLASH

 0531    REF   1               23,2103  3 5001 0  R62FLASH  CAF     V06N22           FLASH V06N22 AND
 0532    REF 106  LAST  489    23,2104  0 4607 1            TC      BANKCALL         ICDU ANGLES
 0533    REF   6  LAST  393    23,2105   20471 1            CADR    GOFLASH
 0534    REF  29  LAST  389    23,2106  1 5474 1            TCF     ENDEXT           TERMINATE
 0535    REF   1               23,2107  1 2111 0            TCF     GOMOVE           PROCEED
 0536    REF   2  LAST  500  . 23,2110  1 2103 0            TCF     R62FLASH         ENTER

A0537                                                                                ASTRONAUT MAY LOAD NEW ICDUS AT THIS
A0538                                                                                POINT
 0539    REF  17  LAST  490    23,2111  0 5506 1  GOMOVE    TC      UPFLAG           SET FOR 3-AXIS MANEUVER
 0540    REF   4  LAST  489    23,2112   00124 0            ADRES   3AXISFLG

 0541    REF 107  LAST  500    23,2113  0 4607 1            TC      BANKCALL
 0542    REF   2  LAST  352  · 23,2114   54125 0            CADR    R60LEM
 0543    REF  30  LAST  500    23,2115  1 5474 1            TCF     ENDEXT           END R62
```

```
R2000    SUBROUTINE NAME: R05 - S-BAND ANTENNA FOR LM

R2001    MOD0 BY T. JAMES
R2002    MOD1 BY P. SHAKIR

R2003    FUNCTIONAL DESCRIPTION

R2004        THE S-BAND ANTENNA ROUTINE, R05, COMPUTES AND DISPLAYS THE PITCH AND
R2005    YAW ANTENNA GIMBAL ANGLES REQUIRED TO POINT THE LM STEERABLE ANTENNA
R2006    TOWARD THE CENTER OF THE EARTH. THIS ROUTINE IS SELECTED BY THE ASTRO-
R2007    NAUT VIA DSKY ENTRY DURING COASTING FLIGHT OR WHEN THE LM IS ON THE MOON
R2008    SURFACE. THE EARTH OR MOON REFERENCE COORDINATE SYSTEM IS USED DEPENDING
R2009    ON WHETHER THE LM IS ABOUT TO ENTER OR HAS ALREADY ENTERED THE MOON
R2010    SPHERE OF INFLUENCE, RESPECTIVELY.  CAN BE CALLED ANY TIME EXCEPT WHEN
R20101   ANOTHER EXTENDED VERB IS IN USE. DISPLAY IS MEANINGLESS WITH IMU OFF.

R2011    TO CALL SUBROUTINE, ASTRONAUT KEYS IN V 64 E

R2012    SUBROUTINES CALLED-

R2014        INTPRET
R2015        LOADTIME
R2016        LEMCONIC
R2017        LUNPOS
R2018        CDUTRIG
R2019        *SMNB*
R2020        BANKCALL
R2021        B5OFF
R2022        ENDOFJOB
R2023        BLANKET

R2024    RETURNS WITH

R2025        PITCH ANGLE IN PITCHANG  REV. B0
R2026        YAW ANGLE IN YAWANG  REV. B0

R2027    ERASABLES USED

R2028        PITCHANG
R2029        YAWANG
R2030        RLM
R2031        VAC AREA

 2032                              41,3777                           BANK    41
 2033    REF   4  LAST  299        42,2000                           SETLOC SBAND
 2034                              42,3617                           BANK

 2035    REF   2  LAST  235        E7,1471                           EBANK= WHOCARES
 2036    REF   2 LAST   48 TO   49:      2      2*                   COUNT* $$/R05
 2039    REF  32  LAST  493        42,3617  0 6060 1  SBANDANT TC      INTPRET
```

```
2040                           42,3620  47001 0             SETPD  RTB
2041                           42,3621  00001 0                    0D
2042  REF   6  LAST  392       42,3622  21603 1                    LOADTIME          PICK UP CURRENT TIME
2043  REF   6  LAST  351       42,3623  34041 0             STCALL TDEC1             ADVANCE INTEGRATION TO TIME IN TDEC1
2044  REF   2  LAST  351       42,3624  27136 0                    LEMCONIC          USING CONIC INTEGRATION
2045                           42,3625  46135 1             SLOAD  BHIZ
2046  REF   1                  42,3626  00050 1                    X2                X2 =0 EARTH SPHERE, X2 =2 MOON SPHERE
2047  REF   1                  42,3627  65645 0                    CONV4
2048                           42,3630  77775 1             VLOAD
2049  REF   3  LAST  351       42,3631  00001 0                    RATT
2050  REF   1                  42,3632  16176 0             STODL  RLM
2051  REF   3  LAST  219       42,3633  00015 0                    TAT
2052                           42,3634  77624 1  CONV3      CALL
2053  REF   1                  42,3635  33646 0                    LUNPOS            UNIT POSITION VECTOR FROM EARTH TO MOON
2054                           42,3636  74375 0             VLOAD  VXSC
2055  REF   2  LAST  128       42,3637  02723 0                    VMOON
2056  REF   1                  42,3640  24001 0                    REMDIST           MEAN DISTANCE FROM EARTH TO MOON
2057                           42,3641  53372 1             VSL1   VAD
2058  REF   2  LAST  502       42,3642  02176 0                    RLM
2059                           42,3643  77650 1             GOTO
2060  REF   1                  42,3644  65647 1                    CONV5
2061                           42,3645  77775 1  CONV4      VLOAD
2062  REF   4  LAST  502       42,3646  00001 0                    RATT              UE = -UNIT(RATT)  EARTH SPHERE
2063                           42,3647  53401 1  CONV5      SETPD  UNIT              UE = -UNIT((REM)(UEM) + RL)  MOON SPHERE
2064                           42,3650  00001 0                    0D                SET PL POINTER TO 0
2065                           42,3651  45076 1             VCOMP  CALL
2066  REF   1                  42,3652  47522 1                    CDUTRIG           COMPUTE SINES AND COSINES OF CDU ANGLES
2067                           42,3653  76521 0             MXV    VSL1              TRANSFORM REF. COORDINATE SYSTEM TO
2068  REF   9  LAST  351       42,3654  01732 0                    REFSMMAT          STABLE MEMBER  B-1 X B-1 X B+1 = B-1
2069                           42,3655  71206 0             PUSH   DLOAD             8D
2070  REF   2  LAST  311       42,3656  06505 1                    HI6ZEROS
2071  REF   2  LAST  122       42,3657  02172 1             STORE  PITCHANG
2072  REF   1                  42,3660  26174 1             STOVL  YAWANG            ZERO OUT ANGLES
2073                           42,3661  77624 1             CALL
2074  REF   2  LAST  263       42,3662  47663 1                    *SMNB*
2075  REF   3  LAST  502       42,3663  16176 0             STODL  RLM               PRE-MULTIPLY RLM BY (NBSA) MATRIX(B0)
2076  REF   4  LAST  502       42,3664  02200 1                    RLM +2
2077                           42,3665  45206 1             PUSH   DSU
2078  REF   5  LAST  502       42,3666  02176 0                    RLM
2079                           42,3667  77605 1             DMP
2080  REF   1                  42,3670  21740 1                    1OVSQRT2
2081  REF   6  LAST  502       42,3671  16200 1             STODL  RLM +2
2082                           42,3672  41215 1             DAD    DMP
2083  REF   7  LAST  502       42,3673  02176 0                    RLM
2084  REF   2  LAST  502       42,3674  21740 1                    1OVSQRT2
2085  REF   8  LAST  502       42,3675  26176 0             STOVL  RLM               R  B-1
2086  REF   9  LAST  502       42,3676  02176 0                    RLM
2087                           42,3677  63256 0             UNIT   PDVL
2088  REF  10  LAST  502       42,3700  02176 0                    RLM
2089                           42,3701  72431 1             VPROJ  VSL2              PROJECTION OF R ONTO LM XZ PLANE
```

```
 2090  REF   1              42,3702   06501 0                     HIUNITY
 2091                       42,3703   40045 1            BVSU     BOV            CLEAR OVERFLOW INDICATOR IF ON
 2092  REF  11  LAST  502   42,3704   02176 0                     RLM
 2093  REF   1              42,3705   65706 0                     COVCNV
 2094                       42,3706   40056 0  COVCNV    UNIT     BOV            EXIT ON OVERFLOW
 2095  REF   1              42,3707   65754 1                     SBANDEX
 2096                       42,3710   47206 0            PUSH     VXV            URP VECTOR  B-1
 2097  REF   1              42,3711   06477 0                     HIUNITZ
 2098                       42,3712   57572 0            VSL1     VCOMP          UZ X URP = -(URP X UZ)
 2099  REF  12  LAST  503   42,3713   02176 0            STORE    RLM            X VEC  B-1
 2100                       42,3714   63241 0            DOT      PDVL           SGN(X.UY) UNSCALED
 2101  REF   2  LAST  503   42,3715   06501 0                     HIUNITY
 2102  REF  13  LAST  503   42,3716   02176 0                     RLM
 2103                       42,3717   75246 0            ABVAL    SIGN
 2104                       42,3720   77736 0            ASIN                    ASIN((SGN(X.UY))ABV(X)) REV B0
 2105  REF   3  LAST  502   42,3721   26172 1            STOVL    PITCHANG
 2106  REF   1              42,3722   00007 0                     URP
 2107                       42,3723   51041 0            DOT      BPL
 2108  REF   2  LAST  503   42,3724   06477 0                     HIUNITZ
 2109  REF   1              42,3725   65732 1                     NOADJUST       YES, -90 TO +90
 2110                       42,3726   45345 1            DLOAD    DSU
 2111  REF   4  LAST  498   42,3727   06503 1                     HIDPHALF
 2112  REF   4  LAST  503   42,3730   02172 1                     PITCHANG
 2113  REF   5  LAST  503   42,3731   02172 1            STORE    PITCHANG
 2114                       42,3732   47375 0  NOADJUST  VLOAD    VXV
 2115  REF   1              42,3733   00001 0                     UR             Z = (UR X URP)
 2116  REF   2  LAST  503   42,3734   00007 0                     URP
 2117                       42,3735   77772 0            VSL1
 2118  REF  14  LAST  503   42,3736   16176 0            STODL    RLM            Z VEC  B-1
 2119  REF   6  LAST  503   42,3737   02172 1                     PITCHANG
 2120                       42,3740   74356 1            SIN      VXSC
 2121  REF   3  LAST  503   42,3741   06477 0                     HIUNITZ
 2122                       42,3742   71525 0            PDDL     COS
 2123  REF   7  LAST  503   42,3743   02172 1                     PITCHANG
 2124                       42,3744   52361 1            VXSC     VSU
 2125  REF   1              42,3745   06503 1                     HIUNITX        (UX COS ALPHA) - (UZ SIN ALPHA)
 2126                       42,3746   63241 0            DOT      PDVL           YAW.Z
 2127  REF  15  LAST  503   42,3747   02176 0                     RLM
 2128  REF  16  LAST  503   42,3750   02176 0                     RLM
 2129                       42,3751   75246 0            ABVAL    SIGN
 2130                       42,3752   77736 0            ASIN
 2131  REF   2  LAST  502   42,3753   02174 1            STORE    YAWANG
 2132                       42,3754   77776 1  SBANDEX   EXIT
 2133  REF   8  LAST  312   42,3755  3 1043 1            CA       FXTVBACT
 2134  REF  25  LAST  480   42,3756  7 4740 1            MASK     BIT5           IS BIT5 STILL ON
 2135                       42,3757  0 0006 1            EXTEND
 2136  REF  31  LAST  500   42,3760  1 5474 1            BZF      ENDEXT         NO
21362  REF   4  LAST  311   42,3761  3 5010 0            CAF      PRIO5
21364  REF   7  LAST  490   42,3762  0 5137 1            TC       PRIOCHNG
 2137  REF   1              42,3763  3 3776 1            CAF      V06N51         DISPLAY ANGLES
```

```
L        S-BAND ANTENNA FOR LM                                                                       USER'S PAGE NO.   4      E7 S4

 2138   REF 108  LAST  500   42,3764  0 4607 1             TC       BANKCALL
 2139   REF   6  LAST  311   42,3765   20345 1             CADR     GOMARKER
 2140   REF   4  LAST  311   42,3766  0 5565 1             TC       B5OFF           TERMINATE
 2141   REF   5  LAST  504   42,3767  0 5565 1             TC       B5OFF           PROCEED
 2142   REF  69  LAST  490   42,3770  0 5146 1             TC       ENDOFJOB        RECYCLE
 2143   REF  26  LAST  472   42,3771  3 4742 1             CAF      BIT3            IMMEDIATE RETURN
 2144   REF  11  LAST  311   42,3772  0 5466 0             TC       BLANKET         BLANK R3
 2145   REF   4  LAST  311   42,3773  3 4731 0             CAF      PRIO4
 2146   REF   8  LAST  503   42,3774  0 5137 1             TC       PRIOCHNG
 2148   REF   2  LAST  292   42,3775  0 3617 1             TC       SBANDANT        YES, CONTINUE DISPLAYING ANGLES.
 2150                        42,3776   01463 1  V06N51     VN       0651
A21504
 21505  REF   1              40,2000                       SETLOC SBAND40
 21506                       40,3737                       BANK

 2151                        40,3737   26501 1  1OVSQRT2 2DEC     .7071067815     1/SQRT(2)
 2151                        40,3740   07463 1
A21515
 2152                           0000            UR         EQUALS 0D
 2153                           0006            URP        EQUALS 6D
 2154   REF   6  LAST  486   30,2000                       SBANK= LOWSUPER

*** END OF LEMONAID.156 ***
```

```
 0001                        15,2162                          BANK    15
 0002  REF   1               15,2000                          SETLOC  RRLEADIN
 0003                        15,2162                          BANK

 0004  REF   7  LAST  328    E4,1571                          EBANK=  RSTACK

R0005  RADAR SAMPLING LOOP.

 0006  REF   1                                                COUNT*  $$/RLEAD
 0007  REF   8  LAST  291    15,2162  11'770 1   RADSAMP      CCS     RSAMPDT          TIMES NORMAL ONCE-PER-SECOND SAMPLING.
 0008                        15,2163  1 2165 0                TCF     +2
 0009  REF  15  LAST  483    15,2164  1 5263 1                TCF     TASKOVER         +0 INSERTED MANUALLY TERMINATES TEST.

 0010  REF   5  LAST  396    15,2165  0 5175 1                TC      TWIDDLE
 0012  REF   2  LAST  289    15,2166   02162 0                ADRES   RADSAMP
 0013  REF   1               15,2167  3 7734 0                CAF     PRIO25
 0014  REF  12  LAST  483    15,2170  0 5063 1                TC      NOVAC
 0015  REF   8  LAST  505    E4,1571                          EBANK=  RSTACK
 0016  REE   1               15,2171   02003 0                2CADR   DORSAMP
 0016  REF   1               15,2172   52064 1
 0017  REF  46  LAST  491    15,2173  3 4727 1                CAE     BIT14            FOR CYCLIC SAMPLING, RTSTDEX =
 0018                        15,2174  0 0006 1                EXTEND                   RTSTLOC/2 + RTSTBASE
 0019  REF   3  LAST  290    15,2175  7 1767 1                MP      RTSTLOC
 0020  REF   4  LAST  291    15,2176  6 1766 1                AD      RTSTBASE         0 FOR RR, 2 FOR LR.
 0021  REF   4  LAST  290    15,2177  55'764 1                TS      RTSTDEX
 0022  REF  16  LAST  505    15,2200  1 5263 1                TCF     TASKOVER

 00222                       25,2003                          BANK    25
 00223 REE   1               25,2000                          SETLOC  DRSAMP
 00224                       25,2003                          BANK

 00225 REF   9  LAST  505    E4,1571                          EBANK=  RSTACK
R0023  DO THE ACTUAL RADAR SAMPLE.

 0024  REF   1               25,2003  0 2040 1   DORSAMP      TC      VARADAR          SELECTS VARIABLE RADAR CHANNFL.
 0025  REF 109  LAST  504    25,2004  0 4607 1                TC      BANKCALL
 0026  REF   3  LAST  283    25,2005   17733 0                CADR    RADSTALL

 0027  REF   2  LAST  238    25,2006  25'566 C                INCR    RFAILCNT         ADVANCE EAIL COUNTER BUT ACCEPT BAD DATA

 0028                        25,2007  0 0004 0   DORSAMP2     INHINT
 00281 REF  17  LAST  490    25,2010  3 0101 1                CA      FLAGWRD5         DON'T UPDATE RSTACK IF IN R77.
 00282 REF   3  LAST  292    25,2011  7 4732 1                MASK    R77ELBIT
 00283 REF 160  LAST  491    25,2012  10 000 0                CCS     A
 00284 REF   1               25,2013  1 2030 1                TCF     R77IN

 0029  REE   2  LAST  106    25,2014  53'101 1                DXCH    SAMPLSUM
 0030  REF   4  LAST  505    25,2015  51'767 0                INDEX   RTSTLOC
 0031  REF  10  LAST  505    25,2016  53'572 1                DXCH    RSTACK
 00311  REF  32  LAST  485   25,2017   3 0110 1             CA       RADMODES
 00312                       25,2020   0 0006 1             EXTEND
 00313  REF   7  LAST  431   25,2021   06 033 1             RXOR     CHAN33
 00314  REF  35  LAST  477   25,2022   7 4737 1             MASK     BIT6
 00315                       25,2023   0 0006 1             EXTEND
 00316  REF   2  LAST  505   25,2024   1 2030 1             BZF      R77IN

 00317  REF  18  LAST  400   25,2025   0 5571 1             TC       ALARM
 00318                       25,2026    00522 1             OCT      522
 00319  REF   3  LAST  505   25,2027   25'566 0             INCR     RFAILCNT

 0038   REF   5  LAST  505   25,2030   4 1767 1  R77IN      CS       RTSTLOC               CYCLE RTSTLOC
 0039   REF   2  LAST  289   25,2031   6 1765 1             AD       RTSTMAX
 0040                        25,2032   0 0006 1             EXTEND
 0041                        25,2033   1 2036 1             BZF      +3
 0042   REF   6  LAST  506   25,2034   3 1767 0             CA       RTSTLOC
 0043   REF  33  LAST  473   25,2035   6 4743 0             AD       TWO                   STORAGE IS DP
 0044   REF   7  LAST  506   25,2036   55'767 1             TS       RTSTLOC
 0045   REF  70  LAST  504   25,2037   1 5146 0             TCF      ENDOFJOB              CONTINUOUS SAMPLING AND 2N TRIES - GONE.

R0056   VARIABLE RADAR DATA CALLER FOR ONE MEASUREMENT ONLY.

 0057   REF  61  LAST  486   25,2040   3 4744 1  VARADAR    CAF      ONE                   WILL BE SENT TO RADAR ROUTINE IN A BY
 0058   REF   5  LAST  489   25,2041   54 133 1             TS       BUF2                  SWCALL.
 0059   REF   5  LAST  505   25,2042   51'764 0             INDEX    RTSTDEX
 0060   REF   1              25,2043   3 2045 1             CAF      RDRLOCS
 0061   REF   2  LAST  382   25,2044   1 4613 0             TCF      SWCALL                NOT TOUCHING Q.

 0062   REF   1              25,2045    53074 1  RDRLOCS    CADR     RRRANGE               =0
 0063   REF   1              25,2046    53072 1             CADR     RRRDOT                =1
 0064   REF   1              25,2047    53070 0             CADR     LRVELX                =2
 0065   REF   1              25,2050    53066 1             CADR     LRVELY                =3
 0066   REF   1              25,2051    53064 0             CADR     LRVELZ                =4
 0067   REF   1              25,2052    53062 0             CADR     LRALT                 =5
```

```
L        P20-P25                                                                                   USER'S PAGE NO.   1      E0 S3

P0001    RENDEZVOUS NAVIGATION PROGRAM 20
R0002    PROGRAM DESCRIPTION
R0003    MOD NO - 2
R0004    BY  P. VOLANTE
R0005    FUNCTIONAL DESCRIPTION
R0006
R0007      THE PURPOSE OF THIS PROGRAM IS TO CONTROL THE RENDEZVOUS RADAR FROM
R0008    STARTUP THROUGH ACQUISITION AND LOCKON TO THE CSM AND TO UPDATE EITHER
R0009    THE LM OR CSM STATE VECTOR (AS SPECIFIED BY THE ASTRONAUT BY DSKY ENTRY)
R0010    ON THE BASIS OF THE RR TRACKING DATA.
R0011    CALLING SEQUENCE -
R0012
R0013    ASTRONAUT REQUEST THROUGH DSKY V37E20E
R0014    SUBROUTINES CALLED
R0015      R02BOTH (IMU STATUS CHECK)                    FLAGUP
R0016      GOFLASH (PINBALL-DISPLAY)                     FLAGDOWN
R0017      R23LEM  (MANUAL ACQUISITION)                  BANKCALL
R0018      LS201   (LOS DETERMINATION)                   TASKOVER
R0019      LS202   (RANGE LIMIT TEST)
R0020      R61LEM  (PREFERRED TRACKING ATTITUDE)
R0021      R21LEM  (RR DESIGNATE)                        ENDOFJOB
R0022      R22LEM  (DATA READ)                           GOPERF1
R0023      R31LEM  (RENDEZVOUS PARAMETER DISPLAY)
R0024      PRIOLARM (PRIORITY DISPLAY)
R0025    NORMAL EXIT MODES-
R0026      P20 MAY BE TERMINATED IN TWO WAYS-ASTRONAUT SELECTION OF IDLING
R0027    PROGRAM (P00) BY KEYING V37E00E OR BY KEYING IN V56E
R0028    ALARM OR ABORT EXIT MODES-
R0029      RANGE GREATER THAN 400 NM DISPLAY
R0030    OUTPUT
R0031      TRKMKCNT = NO OF RENDEZVOUS TRACKING MARKS TAKEN (COUNTER)
R0032    ERASABLE INITIALIZATION REQUIRED
R0033    FLAGS SET + RESET
R0034      SRCHOPT,RNDVZFLG,ACMODFLG,VEHUPFLG,UPDATFLG,TRACKFLG,
R0035    DEBRIS
R0036      CENTRALS-A,Q,L
 0037    REF    7  LAST  504   30,2000                           SBANK= LOWSUPER        FOR LOW 2CADR'S.

 0038                          33,2113                           BANK    33
 0039    REF    1              24,2000                           SETLOC  P20S
 0040                          24,2000                           BANK

 0041    REF    8  LAST  282   E7,1456                           EBANK= LOSCOUNT
 0042    REF    1                                                COUNT*  $$/P20
 00421   REF    2  LAST  245   24,2000              PROG22       =       PROG20
 0043    REF    1              24,2000  0 5331 0    PROG20       TC      2PHSCHNG
 0044                          24,2001   00004 0                 OCT     4
 0045                          24,2002   05022 1                 OCT     05022
 0046                          24,2003   26000 0                 OCT     26000          PRIORITY 26
 0047    REF    1              24,2004  0 2751 0                 TC      LUNSFCHK       CHECK IF ON LUNAR SURFACE
 0048   REF   1                24,2005  0 2007 1            TC       ORBCHG0           YES
 0049   REF   1                24,2006  0 2036 0            TC       PROG20A -2        NO - CONTINUE WITH P20
 0050   REF  18  LAST  500     24,2007  0 5506 1  ORBCHG0   TC       UPFLAG            SET VEHUPELG - CSM STATE
 0051   REF   3  LAST  301     24,2010   00026 0            AORES    VEHUPELG          VECTOR TO BE UPDATED
 0052   REF  62  LAST  506     24,2011  3 4744 1            CAF      ONE               SET R2 FOR OPTION CSM WILL NOT
 0053   REF   1                24,2012  55'144 0            TS       OPTION2           CHANGE PRESENT ORBIT
 0054   REF   1                24,2013  3 4354 1            CAF      OCT00012
 0055   REF 110  LAST  505     24,2014  0 4607 1            TC       BANKCALL          OISPLAY ASSUMEO CSM ORBIT OPTION
 0056   REF   1                24,2015   20645 1            CADR     GOPERF4
 0057   REF   4  LAST  490     24,2016  0 6001 0            TC       GOTOPOOH          TERMINATE
 0058   REF   1                24,2017  0 2021 0            TC       ORBCHG1           PROCEEO VALUE OF ASSUMED OPTION OK
 0059                          24,2020  0 2013 1            TC       -5                R2 LOADED THRU DSKY
 0060   REF  63  LAST  508     24,2021  4 4744 0  ORBCHG1   CS       ONE
 0061   REF   2  LAST  508     24,2022  6 1144 1            AD       OPTION2
 0062                          24,2023  0 0006 1            EXTEND
 0063   REF   2  LAST  508     24,2024  1 2040 0            BZF      PROG20A
 0064   REF   1                24,2025  3 2367 1            CAF      V06N33*
 0065   REF 111  LAST  508     24,2026  0 4607 1            TC       BANKCALL          FLASH VERB-NOUN TO REQUEST ESTIMATEO
 0066   REF   7  LAST  500     24,2027   20471 1            CAOR     GOFLASH           TIME OF LAUNCH
 0067   REF   5  LAST  508     24,2030  0 6001 0            TC       GOTOPOOH          TERMINATE
 0068   REF   1                24,2031  0 2033 0            TC       ORBCHG2           PROCEEO VALUFS OK
 0069                          24,2032  0 2025 1            TC       -5                TIME LOAOED THRU DSKY
 0070   REF  33  LAST  501     24,2033  0 6060 1  ORBCHG2   TC       INTPRET
 0071                          24,2034   77650 1            GOTO
 0072   REF   1                24,2035   64213 0                     ORBCHG3
 0073                          32,2213                      BANK     32
 0074   REF   1                32,2000                      SETLOC P20S4
 0075                          32,2213                      BANK
 0076   REF   1                                             COUNT* $$/P20

 0077                          32,2213   77624 1  ORBCHG3   CALL
 0078   REF   5  LAST  309     32,2214   27447 0                     INTSTALL
 0079                          32,2215   77745 1            OLOAD
 0080   REF   9  LAST  318     32,2216   03442 0                     TIG
 00801  REF   2  LAST  155     32,2217   03661 0            STORE    LNCHTM
 0081   REF   7  LAST  502     32,2220   00041 1            STORE    TDEC1             ESTIMATED LAUNCH TIME
 0082                          32,2221   43014 0            CLEAR    CLEAR
 0083   REF   4  LAST  248     32,2222   01674 0                     VINTFLAG          LM INTEGRATION
 0084   REF   1                32,2223   01673 1                     INTYPFLG          PRECISION - ENCKE
 0085                          32,2224   43014 0            CLEAR    CLEAR
 0086   REF   3  LAST  248     32,2225   01676 1                     DIMOFLAG          NO W-MATRIX
 0087   REF   2  LAST  248     32,2226   01675 1                     D6OR9FLG
 0088                          32,2227   77624 1            CALL
 0089   REF   3  LAST  248     32,2230   27172 0                     INTEGRV           PLANETARY INERTIAL ORIENTATION
 0090                          32,2231   77624 1            CALL
 0091   REF   1                32,2232   51770 0                     GRP2PC
 0092                          32,2233   77775 1            VLOAO
 0093   REF   2  LAST  221     32,2234   00017 1                     RATT1
 0094   REF   2  LAST  155     32,2235   17631 0            STOOL    RSUBL             SAVE LM POSITION
 0095   REF   4  LAST  502     32,2236   00015 0                     TAT
```

```
0096   REF  8  LAST  508   32,2237   34041 0             STCALL  TOEC1
0097   REF  6  LAST  508   32,2240   27447 0                     INTSTALL
0098                       32,2241   43014 0             SET     CLEAR
0099   REF  5  LAST  508   32,2242   01474 1                     VINTFLAG           CSM INTEGRATION
0100   REF  2  LAST  508   32,2243   01673 1                     INTYPFLG
0101                       32,2244   43014 0             CLEAR   BOFF
0102   REF  4  LAST  508   32,2245   01676 1                     DIMOFLAG
0103   REF  3  LAST  248   32,2246   02756 1                     RENDWFLG           W MATRIX VALID
0104   REF  1              32,2247   64253 1                     NOWMATX            NO
0105                       32,2250   43014 0             SET     SET                YES - SET FOR W MATRIX
0106   REF  5  LAST  509   32,2251   01476 0                     DIMOFLAG
0107   REF  3  LAST  508   32,2252   01475 0                     D6OR9FLG
0108                       32,2253   77624 1   NOWMATX   CALL
0109   REF  4  LAST  508   32,2254   27172 0                     INTEGRV            CSM INTEGRATION
0110                       32,2255   77624 1             CALL
0111   REF  2  LAST  508   32,2256   51770 0                     GRP2PC
0112                       32,2257   77775 1             VLOAD
0113   REF  6  LAST  221   32,2260   00025 0                     VATT1
0114   REF  1              32,2261   25757 0             STOVL   VSUBC              SAVE CSM VELOCITY
0115   REF  3  LAST  508   32,2262   00017 1                     RATT1
0116   REF  1              32,2263   01101 0             STORE   RSUBC              SAVE CSM POSITION
0117                       32,2264   53435 0             VXV     UNIT               COMPUTE NORMAL TO CSM ORBITAL PLANE
0118   REF  2  LAST  509   32,2265   01757 0                     VSUBC              NSUB1=UNIT(R(CM) CROSS V(CM)
0119                       32,2266   24025 0             STOVL   20D                SAVE NSUB1
0120   REF  3  LAST  508   32,2267   03631 0                     RSUBL              COMPUTE ESTIMATED ORBITAL
0121                       32,2270   53435 0             VXV     UNIT               PLANE CHANGE
0122                       32,2271   00025 0                     20D                UCSM = UNIT(R(LM) CROSS NSUB1)
0123   REF  2  LAST  155   32,2272   27637 0             STOVL   UCSM
0124   REF  2  LAST  509   32,2273   01101 0                     RSUBC              COMPUTE ANGLE BETWEEN UCSM
0125                       32,2274   50256 0             UNIT    DOT                AND RSUBC
0126   REF  3  LAST  509   32,2275   03637 0                     UCSM               COS A = UCSM DOT UNIT (R(CM))
0127                       32,2276   77752 1             SL1
0128   REF  2  LAST  130   32,2277   02732 0             STORE   CSTH               SAVE DOE TIME-THETA SUBROUTINE
0129                       32,2300   44316 0             DSQ     BDSU               COMPUTE SINE A
0130   REF  1              32,2301   06475 1                     ONEB-2
0131                       32,2302   77766 0             SQRT
0132   REF  2  LAST  130   32,2303   26730 1             STOVL   SNTH               SAVE FOR TIME-THETA SUBROUTINE
0133   REF  3  LAST  509   32,2304   01101 0                     RSUBC              POSITION OF CSM AT EST. LAUNCH
0134   REF  1              32,2305   26655 0             STOVL   RVEC               TIME FOR TIME-THETA   B-27
0135   REF  3  LAST  509   32,2306   01757 0                     VSUBC              VELOCITY OF CSM AT EST. LAUNCH
01351                      32,2307   77676 0             VCOMP
0136   REF  2  LAST  130   32,2310   02744 1             STORE   VVEC               TIME FOR TIME THETA   B-5
0137                       32,2311   45014 0             CLEAR   CALL
0138   REF  1              32,2312   03666 1                     RVSW
0139   REF  1              32,2313   24732 1                     TIMETHET
01391                      32,2314   77676 0             VCOMP
0140   REF  2  LAST  155   32,2315   03645 0             STORE   NEWVEL             TERMINAL VELOCITY OF CSM
01401                      32,2316   77745 1             DLOAD
01402  REF  1              32,2317   00037 0                     T
01403  REF  2  LAST  155   32,2320   27663 1             STOVL   TRANSTM            TRANSFER TIME
```

```
01404  REF   3  LAST  509   32,2321   03645 0                      NEWVEL
0141                        32,2322   77646 0              ABVAL
01411                       32,2323   24025 0              STOVL   20D
0142                        32,2324   00001 0                      0D
0143   REF   2  LAST  155   32,2325   03653 1              STORE   NEWPOS          TERMINAL POSITION OF CSM
0144                        32,2326   53435 0              VXV     UNIT            COMPUTE NORMAL TO CSM ORBITAL PLANE
0145   REF   4  LAST  509   32,2327   03631 0                      RSUBL           NSUB2 = UNIT(NEWPOS CROSS R(LM))
0146                        32,2330   53435 0              VXV     UNIT            ROTATE TERMINAL VEL INTO DESIRED
0147   REF   3  LAST  510   32,2331   03653 1                      NEWPOS          ORBITAL PLANE
0148                        32,2332   76561 1              VXSC    VSL1            VSUBC = ABVAL(NEWVEL) $ UNIT( NSUB2
0149                        32,2333   00025 0                      20D
0150   REF   1              32,2334   37665 0              STCALL  NCSMVEL         NEW CSM VELOCITY
0151   REF   3  LAST  509   32,2335   51770 0                      GRP2PC
0152                        32,2336   77624 1              CALL
0153   REF   7  LAST  509   32,2337   27447 0                      INTSTALL
0154                        32,2340   44345 0              DLOAD   BDSU
0155   REF   3  LAST  509   32,2341   03663 1                      TRANSTM         LAUNCH TIME - TRANSFER TIME
01551  REF   3  LAST  508   32,2342   03661 0                      LNCHTM
0156   REF   7  LAST  332   32,2343   25517 0              STOVL   TET
0157   REF   4  LAST  510   32,2344   03653 1                      NEWPOS
0158   REF   4  LAST  333   32,2345   01535 0              STORE   RCV
0159   REF   2  LAST  115   32,2346   25503 0              STOVL   RRECT
0160   REF   2  LAST  510   32,2347   03665 1                      NCSMVEL
0161   REF   2  LAST  115   32,2350   35511 1              STCALL  VRECT
0162   REF   1              32,2351   27734 1                      MINIRECT
01621                       32,2352   45174 1              AXT,2   CALL
01622                       32,2353   00002 0                      2
0163   REF   2  LAST   38   32,2354   26717 1                      ATOPCSM
0164                        32,2355   77624 1              CALL
0165   REF   1              32,2356   27456 0                      INTWAKE0
0166                        32,2357   77776 1              EXIT
0167   REF 112  LAST  508   32,2360  0 4607 1              TC      BANKCALL
0168   REF   3  LAST  508   32,2361   50040 0              CADR    PROG20A
0169                        24,2036                        BANK    24
0170   REF   2  LAST  507   24,2000                        SETLOC  P20S
0171                        24,2036                        BANK
0172   REF   2 LAST  507 TO  508:     30     30*           COUNT*  $$/P20

0173   REF  31  LAST  489   24,2036  0 5520 0              TC      DOWNFLAG        RESET VEHUPFLG- LM STATE VECTOR
0174   REF   4  LAST  508   24,2037   00026 0              ADRES   VEHUPFLG        TO BE UPDATED
0175   REF 113  LAST  510   24,2040  0 4607 1    PROG20A   TC      BANKCALL
0176   REF   2  LAST  351   24,2041   33757 1              CADR    R02BOTH
0177   REF  19  LAST  508   24,2042  0 5506 1              TC      UPFLAG
0178   REF   2  LAST  300   24,2043   00027 1              ADRES   UPDATFLG        SET UPDATE FLAG
0179   REF  20  LAST  510   24,2044  0 5506 1              TC      UPFLAG
0180   REF   1              24,2045   00031 0              ADRES   TRACKFLG        SET TRACK FLAG
0181   REF  21  LAST  510   24,2046  0 5506 1              TC      UPFLAG
0182   REF   1              24,2047   00010 0              ADRES   RNDVZFLG        SET RENDEZVOUS FLAG
0183   REF  32  LAST  510   24,2050  0 5520 0              TC      DOWNFLAG
0184   REF   2  LAST  299   24,2051   00037 0              ADRES   SRCHOPTN        INSURE SEARCH OPTION OFF
```

```
0185    REF  33  LAST  510   24,2052   0 5520 0             TC       DOWNFLAG        ALSO MANUAL ACQUISITION FLAG RESET
0186    REF   1              24,2053    0C040 0             ADRES    ACMODFLG
0187    REF  34  LAST  511   24,2054   0 5520 0             TC       DOWNFLAG        TURN OFF R04FLAG TO ENSURE GETTING
0188    REF   4  LAST  291   24,2055    00063 1             ADRES    R04FLAG         ALARM 521 IF CANT READ RADAR
0189    REF  35  LAST  511   24,2056   0 5520 0             TC       DOWNFLAG        ENSURE R25 GIMBAL MONITOR IS ENABLED
0190    REF   3  LAST  284   24,2057    00126 1             ADRES    NORRMON         (RESET NORRMON FLAG)
0191    REF  36  LAST  511   24,2060   0 5520 0             TC       DOWNFLAG        RESET LOS BEING COMPUTED FLAG
0192    REF   1              24,2061    00041 1             ADRES    LOSCMFLG
0193   *REF   1              24,2062   0 6032 0             TC       CLRADMD1
0194    REF  22  LAST  510   24,2063   0 5506 1             TC       UPFLAG
01945   REF   1              24,2064    0CC05 1             ADRES    FSPASFLG        SET FIRST PASS FLAG FOR ALARM
0195    REF   6  LAST  490   24,2065   0 5355 1  P20LEM1    TC       PHASCHNG
0196                         24,2066    04022 0             OCT      04022
0197    REF 1C6  LAST  486   24,2067   3 4746 0             CAF      ZERO            ZERO MARK COUNTER
0198    REF   1              24,2070   55'462 1             TS       MARKCTR
0199    REF  34  LAST  508   24,2071   0 6060 1  P20LEM2    TC       INTPRET         LOS DETERMINATION ROUTINE
0200                         24,2072    77634 0             RTB
0201    REF   7  LAST  502   24,2073    21603 1                      LOADTIME
0202    REF   9  LAST  509   24,2074    34041 0             STCALL   TDEC1
0203    REF   1              24,2075    51337 1                      LPS20.1
0204                         24,2076    77624 1             CALL
0205    REF   1              24,2077    53626 0                      LPS20.2         TEST RANGE R/UTINE
0206                         24,2100    77776 1             EXIT
0207    REF 240  LAST  490   24,2101   50 154 1             INDEX    MPAC
0208                         24,2102   0 2103 1             TC       +1
0209    REF   1              24,2103   0 2167 0             TC       P20LEMA         NORMAL RETURN WITHIN 400 N M
0210    REF  35  LAST  511   24,2104   0 6060 1  526ALARM   TC       INTPRET
0211                         24,2105    53575 0             VLOAD    UNIT
0212    REF   1              24,2106    0CC25 0                      RRANGE
0213                         24,2107    72441 0             DOT      SL1
0214    REF   1              24,2110    00017 1                      VELLOS
0215    REF   3  LAST  327   24,2111    16216 0             STODL    RRATE           RANGE RATE FOR NOUN 54 B-7
0216                         24,2112    0CC45 0                      36D
02162                        24,2113    51025 1             DSU      BPL             IF RANGE>999.99,DISPLAY 999.99
02164   REF   1              24,2114    10372 0                      999.99NM
02166   REF   1              24,2115    50142 0                      TOOBIG
02168                        24,2116    77745 1             DLOAD
02169                        24,2117    00045 0                      36D
0217    REF   3  LAST  327   24,2120    16214 1  526ALRM1   STODL    RANGE            RANGE FOR NOUN 54 B-29
0218    REF   2  LAST   38   24,2121    06505 1                      ZEROVECS
0219    REF   2  LAST  327   24,2122    02220 0             STORE    RTHETA          ZERO THETA FOR NOUN 54
0220                         24,2123    43014 0             BOFF     BOFF
0221    REF   2  LAST  511   24,2124    0C345 0                      FSPASFLG        FIRST PASS
0222    REF   1              24,2125    50155 0                      P20LEMC5        NO
0223    REF   4  LAST  266   24,2126    04347 0                      SURFFLAG        ON LUNAR SURFACE
0224    REF   1              24,2127    50147 0                      ALRMLT          NO
02242                        24,2130    51145 0             DLOAD    BPL
02244   REF   4  LAST  511   24,2131    02216 0                      RRATE
02246   REF   1              24,2132    5C145 1                      ENDRN
0225                         24,2133    77776 1             EXIT                     YES
```

```
0226   REF    7  LAST  511   24,2134  0 5355 1             TC      PHASCHNG        IN CASE OF RESTART
0227                         24,2135   04022 0             OCT     04022           REACTIVATE DISPLAY
0228   REF    1              24,2136  3 2373 1             CAF     V16N5420
0229   REF  114  LAST  510   24,2137  0 4607 1             TC      BANKCALL        TURN ON V16N54 - DISPLAY
0230   REF    1              24,2140   20444 1             CADR    GODSPR          RANGE AND RANGE RATE
0231   REF    1              24,2141  0 2156 1             TC      P20LEM5


02312                        24,2142   52145 0  TOOBIG     DLOAD   GOTO
02314  REF    2  LAST  511   24,2143   10372 0                     999.99NM
02316  REF    1              24,2144   50120 1                     526ALRM1

02317                        24,2145   77776 1  ENDRN      EXIT
02318  REF    2  LAST  490   24,2146  0 6043 0             TC      GOTOV56

0232                         24,2147   77776 1  ALRMLT     EXIT
0233   REF    8  LAST  512   24,2150  0 5355 1             TC      PHASCHNG
0234                         24,2151   04022 0             OCT     04022
0235   REF   19  LAST  506   24,2152  0 5571 1             TC      ALARM           TURN ON ALARM LIGHT P20
0236                         24,2153   00526 0             OCT     526
0237   REF    2  LAST  512   24,2154  0 2156 1             TC      P20LEM5
0238                         24,2155   77776 1  P20LEMC5   EXIT
0239   REF   37  LAST  511   24,2156  0 5520 0  P20LEM5    TC      DOWNFLAG
0240   REF    3  LAST  511   24,2157   00005 1             ADRES   FSPASFLG
0241   REF    1              24,2160  3 2370 1             CAF     500DEC          WAIT 5SECS
0242   REF  115  LAST  512   24,2161  0 4607 1             TC      BANKCALL
0243   REF    8  LAST  312   24,2162   01736 1             CADR    DELAYJOB
0244   REF    1              24,2163  0 2071 0             TC      P20LEM2


0245   REF  116  LAST  512   24,2164  0 4607 1  P20LEM3    TC      BANKCALL
0246   REF    1              24,2165   20451 0             CADR    CLEANDSP


02465  REF    1              24,2166  0 2175 0             TC      P20LEMB
0247   REF    9  LAST  512   24,2167  0 5355 1  P20LEMA    TC      PHASCHNG
0248                         24,2170   04022 0             OCT     04022
0249   REF    2  LAST  507   24,2171  0 2751 0             TC      LUNSFCHK        CHECK LUNAR SURFACE FLAG (P22 FLAG)
0250   REF    1              24,2172  0 2164 0             TC      P20LEM3
0251   REF  117  LAST  512   24,2173  0 4607 1             TC      BANKCALL
0252   REF    1              24,2174   46116 0             CADR    R61LEM          PREFERRED TRACKING ATTITUDE ROUTINE
0253   REF   10  LAST  512   24,2175  0 5355 1  P20LEMB    TC      PHASCHNG
0254                         24,2176   05022 1             OCT     05022           RESTART AT PRIORITY 10 TO ALLOW V37
0255                         24,2177   10000 0             OCT     10000           REQUESTED PROGRAM TO RUN FIRST
0256   REF    3  LAST  490   24,2200  3 7735 1             CAF     PRIO26          RESTORE PRIORITY 26
0257   REF    9  LAST  504   24,2201  0 5137 1             TC      PRIOCHNG
0258   REF   18  LAST  490   24,2202  3 0075 0             CA      FLAGWRD1        IS THE TRACK FLAG SET
0259   REF    5  LAST  490   24,2203  7 4740 1             MASK    TRACKBIT
0260                         24,2204  0 0006 1             EXTEND
0261   REF    1              24,2205  1 2310 0             BZF     P20LEMWT         BRANCH - NO - WAIT FOR IT TO BE SET
```

```
 0262    REF  27  LAST  472    24,2206  3 4743 0  P20LEMB7 CAF      BIT2            IS RR AUTO MODE DISCRETE PRESENT
 0263                          24,2207  0 0006 1           EXTEND
 0264    REF   8  LAST  506    24,2210  02 033 0           RAND     CHAN33
 0265                          24,2211  0 0006 1           EXTEND
 0266    REF   1               24,2212  1 2246 1           BZF      P20LEMB3        YES - DO AUTOMATIC ACQUISITION (R21)


 0267    REF   4  LAST  308    24,2213  4 6007 1  P20LEMB5 CS       OCT24           RADAR NOT IN AUTO CHECK IF
 0268    REF   9  LAST  490    24,2214  6 1010 1           AD       MODREG          MAJOR MODE IS 20
 0269                          24,2215  0 0006 1           EXTEND
 0270    REF   1               24,2216  1 2231 1           BZF      P20LEMB6        BRANCH - YES-OK TO DO PLEASE PERFORM


 0271    REF   3  LAST  416    24,2217  6 7767 0           AD       NEG2            ALSO CHECK FOR P22
 0272                          24,2220  0 0006 1           EXTEND
 0273    REF   2  LAST  513    24,2221  1 2231 1           BZF      P20LEMB6        BRANCH - YES OK TO DO PLEASE PERFORM
 0274    REF   1               24,2222  3 2365 0           CAF      ALRM514         TRACK FLAG SET-FLASH PRIORITY ALARM 514-
 0275    REF 118  LAST  512    24,2223  0 4607 1           TC       BANKCALL        RADAR GOES OUT OF AUTO MODE WHILE IN USE
 0276    REF   1               24,2224   21572 1           CADR     PRIOLARM
 0277    REF   3  LAST  512    24,2225  0 6043 0           TC       GOTOV56         TERMINATE EXITS VIA V56
 0278    REF   2  LAST  512    24,2226  0 2175 0           TC       P20LEMB         PROCEED AND ENTER BOTH GO BACK
 0279    REF   3  LAST  513    24,2227  0 2175 0           TC       P20LEMB         TO CHECK AUTO MODE AGAIN
 0280    REF  71  LAST  506    24,2230  0 5146 1           TC       ENDOFJOB
 0281    REF   1               24,2231  3 2364 1  P20LEMB6 CAF      OCT201          REQUEST RR AUTO MODE SELECTION
 0282    REF 119  LAST  513    24,2232  0 4607 1           TC       BANKCALL
 0283    REF   1               24,2233   20635 0           CADR     GOPERF1
 0284    REF   4  LAST  513    24,2234  0 6043 0           TC       GOTOV56         TERMINATE EXITS P20 VIA V56 CODING
 0285    REF   4  LAST  513    24,2235  0 2175 0           TC       P20LEMB         PROCEED CHECKS AUTO MODE DISCRETE AGAIN
 0286    REF   3  LAST  512    24,2236  0 2751 0           TC       LUNSFCHK        ENTER INDICATES MANUAL ACQUISITION (R23)
 0287    REF   1               24,2237  0 2244 1           TC       P20LEMB2        YES - R23 NOT ALLOWED-TURN ON OPR ERROR
 0288    REF   1               24,2240  0 3220 1           TC       R23LEM          NO - DO MANUAL ACQUISITION


 0289    REF  23  LAST  511    24,2241  0 5506 1  P20LEMB1 TC       UPFLAG          RETURN FROM R23 - LOCKON ACHIEVED
 0290    REF   2  LAST  511    24,2242   00040 0           ADRES    ACMODFLG        SET MANUAL FLAG AND GO BACK TO CHECK
 0291    REF   5  LAST  513    24,2243  0 2175 0           TC       P20LEMB         RR AUTO MODE


 0292    REF   6  LAST  461    24,2244  0 4355 0  P20LEMB2 TC       FALTON          TURNS ON OPERATOR ERROR LIGHT ON DSKY
 0293    REF   6  LAST  513    24,2245  0 2175 0           TC       P20LEMB         AND GOES BACK TO CHECK AUTO MODE


 0294    REF  33  LAST  506    24,2246  4 0110 0  P20LEMB3 CS       RADMODES        ARE RR CDUS BEING ZEROED
 0295    REF   1               24,2247  7 4730 0           MASK     RCDUOBIT
 0296                          24,2250  0 0006 1           EXTEND
 0297    REF   1               24,2251  1 2263 0           BZF      P20LEMB4        BRANCH - YES - WAIT
 0298    REF   5  LAST  305    24,2252  3 4346 1           CAF      BIT13-14        IS SEARCH OR MANUAL ACQUISITION FLAG SET
 0299    REF   7  LAST  346    24,2253  7 0076 1           MASK     FLAGWRD2
 0300                          24,2254  0 0006 1           EXTEND
 0301    REF   1               24,2255  1 2267 1           BZF      P20LEMC3        ZERO MEANS AUTOMATIC RR ACQUISTION
 0302   REF  38  LAST  512    24,2256   0 5520 0            TC       DOWNFLAG         RESET TO AUTO MODE
 0303   REF   3  LAST  510    24,2257    00037 0            ADRES    SRCHOPTN
 0304   REF  39  LAST  514    24,2260   0 5520 0            TC       DOWNFLAG
 0305   REF   3  LAST  513    24,2261    00040 0            ADRES    ACMODFLG
 0306   REF   2  LAST  512    24,2262   0 2310 1            TC       P20LEMWT         WAIT 2.5 SECONDS THEN GO TO RR DATA READ


 0307   REF   1               24,2263   3 2362 1  P20LEMB4  CAF      250DEC
 0308   REF 120  LAST  513    24,2264   0 4607 1            TC       BANKCALL         WAIT 2.5 SECONDS WHILE RR CDUS ARE BEING
 0309   REF   9  LAST  512    24,2265    01736 1            CADR     DELAYJOB         ZEROED-THEN GO BACK AND CHECK AGAIN
 0310   REF   2  LAST  513    24,2266   0 2246 0            TC       P20LEMB3


 0311   REF  36  LAST  511    24,2267   0 6060 1  P20LEMC3  TC       INTPRET
 0312                         24,2270    77634 0            RTB
 0313   REF   8  LAST  511    24,2271    21603 1                     LOADTIME
 0314   REF  10  LAST  511    24,2272    34041 0            STCALL   TDEC1
 0315   REF   1               24,2273    50374 1                     UPPSV
 0316                         24,2274    77776 1  P20LEMC4  EXIT
 0317   REF  11  LAST  512    24,2275   0 5355 1  P20LEMC   TC       PHASCHNG
 0318                         24,2276    04022 0            OCT      04022
 0319   REF  24  LAST  490    24,2277   30 074 1            CAE      FLAGWRD0         IS THE RENDEZVOUS FLAG SET
 0320   REF   6  LAST  490    24,2300   7 4736 0            MASK     RNDVZBIT
 0321                         24,2301   0 0006 1            EXTEND
 0322   REF  72  LAST  513    24,2302   1 5146 0            BZF      ENDOFJOB         NO - EXIT P20
 0323   REF  19  LAST  512    24,2303   30 075 0            CAE      FLAGWRD1         IS TRACK FLAG SET  (BIT 5 FLAGWORD 1)
 0324   REF   6  LAST  512    24,2304   7 4740 1            MASK     TRACKBIT
 0325                         24,2305   0 0006 1            EXTEND
 0326   REF   1               24,2306   1 2342 1            BZF      P20LEMD          BRANCH-TRACK FLAG NOT ON-WAIT 15 SECONDS
 0327   REF   1               24,2307   0 2756 1  P20LEMF   TC       R21LEM


 0328   REF   2  LAST  514    24,2310   3 2362 1  P20LEMWT  CAF      250DEC
 0329   REF   6  LAST  505    24,2311   0 5175 1            TC       TWIDDLE          USE INSTEAD OF WAITLIST SINCE SAME BANK
 0330   REF   2  LAST  251    24,2312    02322 0            ADRES    P20LEMC1         WAIT 2.5 SECONDS
 0331   REF  20  LAST  514    24,2313   30 075 0            CAE      FLAGWRD1         IS TRACK FLAG SET
 0332   REF   7  LAST  514    24,2314   7 4740 1            MASK     TRACKBIT
 0333                         24,2315   0 0006 1            EXTEND
 0334   REF  73  LAST  514    24,2316   1 5146 0            BZF      ENDOFJOB         NO-EXIT WITHOUT DOING 2.7 PHASE CHANGE
 0335   REF  12  LAST  514    24,2317   0 5355 1  P20LMWT1  TC       PHASCHNG
 0336                         24,2320    40072 0            OCT      40072
 0337   REF  74  LAST  514    24,2321   0 5146 1            TC       ENDOFJOB


 0338   REF  25  LAST  514    24,2322   30 074 1  P20LEMC1  CAE      FLAGWRD0         IS RENDEZVOUS FLAG SET
 0339   REF   7  LAST  514    24,2323   7 4736 0            MASK     RNDVZBIT
 0340                         24,2324   0 0006 1            EXTEND
 0341   REF  17  LAST  505    24,2325   1 5263 1            BZF      TASKOVER         NO - EXIT P20/R22
 0342   REF  21  LAST  514    24,2326   30 075 0            CAE      FLAGWRD1         IS TRACK FLAG SET
 0343   REF   8  LAST  514    24,2327   7 4740 1            MASK     TRACKBIT
```

```
0344                              24,2330  0 0006 1                EXTEND
0345  REF   1                     24,2331  1 2337 0                BZF      P20LEMC2         NO-DONT SCHEDULE R22 JOB
0346  REF   4  LAST  512          24,2332  3 7735 1                CAF      PRIO26           YES-SCHEDULE R22 JOB (RR DATA READ)
0347  REF  17  LAST  476          24,2333  0 5076 0                TC       FINDVAC
0348  REF   9  LAST  507          E7,1456                          EBANK=   LOSCOUNT
0349  REF   1                     24,2334   02713 0                2CADR    R22LEM42
0349  REF   1                     24,2335   50067 0
0350  REF  18  LAST  514          24,2336  0 5263 0                TC       TASKOVER


0351  REF   1                     24,2337  0 5223 1  P20LEMC2 TC       FIXDELAY         TRACK FLAG NOT SET ,WAIT 15 SECONDS
0352                              24,2340   02734 0                DEC      1500             AND CHECK AGAIN

0353  REF   3  LAST  514          24,2341  0 2322 0                TC       P20LEMC1

0354  REF   1                     24,2342  3 2750 1  P20LEMD  CAF      1500DEC
0355  REF   7  LAST  514          24,2343  0 5175 1                TC       TWIDDLE          WAITLIST FOR 15 SECONDS
0356  REF   1                     24,2344   02346 1                ADRES    P20LEMD1
0357  REF  75  LAST  514          24,2345  0 5146 1                TC       ENDOFJOB


0358  REF  22  LAST  514          24,2346  30 075 0  P20LEMD1 CAE      FLAGWRD1         IS TRACK FLAG SET
0359  REF   9  LAST  514          24,2347  7 4740 1                MASK     TRACKBIT
0360  REF 161  LAST  505          24,2350  10 000 0                CCS      A
0361  REF   1                     24,2351  1 2355 1                TCF      P20LEMD2         YES-SCHEDULE DESIGNATE JOB
0362  REF   2  LAST  515          24,2352  0 5223 1                TC       FIXDELAY         NO-WAIT 15 SECONDS
0363                              24,2353   02734 0                DEC      1500
0364  REF   2  LAST  515          24,2354  0 2346 1                TC       P20LEMD1


0365  REF   5  LAST  515          24,2355  3 7735 1  P20LEMD2 CAF      PRIO26           SCHEDULE JOB TO DO R21
0366  REF  18  LAST  515          24,2356  0 5076 0                TC       FINDVAC
0367  REF  10  LAST  515          E7,1456                          EBANK=   LOSCOUNT
0368  REF   2  LAST  513          24,2357   02267 0                2CADR    P20LEMC3         START AT PERM. MEMORY INTEGRATION
0368                              24,2360   50067 0
0369  REF  19  LAST  515          24,2361  0 5263 0                TC       TASKOVER


0370                              24,2362   00372 1  250DEC   DEC      250
0371                              24,2363   00526 0  ALRM526  OCT      00526
0372                              24,2364   00201 1  OCT201   OCT      00201
0373                              24,2365   00514 1  ALRM514  OCT      514
0374                              24,2366   00074 1  MAXTRIES DEC      60
0375  REF   3  LAST  485             4354              OCT00012 EQUALS   BINCON
0376  REF   3  LAST  364          23,2474              ONEB-2   EQUALS   DP1/4TH
0377                              24,2367   01441 1  V06N33*  VN       0633
0378                              24,2370   00764 1  500DEC   DEC      500
03782                             24,2371   00070 0  999.99NM 2DEC     1851982 B-29
03782                             24,2372   20447 1
0379                              24,2373   04066 0  V16N5420 VN       1654
```

```
0380                         24,2374   45020 1  UPPSV    STQ     CALL            UPDATES PERMANENT STATE VECTORS
0381   REF   1               24,2375   01755 1                   LS21X            TO PRESENT TIME
0382   REF   8  LAST  510    24,2376   27447 0                   INTSTALL
0383                         24,2377   77624 1           CALL
0384   REF   2  LAST  247    24,2400   26702 0                   SETIFLGS
0385                         24,2401   43014 0           BOF     SET             IF W-MATRIX INVALID,DONT INTEGRATE IT
0386   REF   4  LAST  509    24,2402   02756 1                   RENDWFLG
0387   REF   1               24,2403   50414 0                   UPPSV1
0388   REF   6  LAST  509    24,2404   01476 0                   DIMOFLAG        SET DIMOFLAG TO INTEGRATE W-MATRIX
0389                         24,2405   43014 0           BON     SET
0390   REF   5  LAST  511    24,2406   04307 1                   SURFFLAG        IF ON LUNAR SURFACE W IS 6X6
0391   REF   1               24,2407   50411 0                   UPPSV5
0392   REF   4  LAST  509    24,2410   01475 0                   D6OR9FLG        OTHERWISE 9X9
0393                         24,2411   77614 1  UPPSV5   BOF
0394   REF   5  LAST  510    24,2412   00747 0                   VEHUPFLG
0395   REF   1               24,2413   50446 1                   UPPSV3
0396                         24,2414   77614 1  UPPSV1   SET
0397   REF   6  LAST  509    24,2415   01474 1                   VINTFLAG
0398                         24,2416   77624 1           CALL
0399   REF   5  LAST  509    24,2417   27172 0                   INTEGRV
0400                         24,2420   77624 1           CALL                    GROUP 2 PHASE CHANGE
0401   REF   4  LAST  510    24,2421   51770 0                   GRP2PC          TO PROTECT INTEGRATION
0402                         24,2422   77624 1           CALL
0403   REF   9  LAST  516    24,2423   27447 0                   INTSTALL
0404                         24,2424   43145 0           DLOAD   CLEAR           GET TETCSM TO STORE IN TDEC FOR LM INT.
0405   REF   4  LAST  247    24,2425   01571 0                   TETCSM
0406   REF   7  LAST  516    24,2426   01674 0                   VINTFLAG
0407                         24,2427   77624 1  UPPSV4   CALL                    INTEGRATE OTHER VEHICLE
0408   REF   3  LAST  516    24,2430   26702 0                   SETIFLGS         WITHOUT W-MATRIX
0409   REF  11  LAST  514    24,2431   34041 0           STCALL  TDEC1
0410   REF   6  LAST  516    24,2432   27172 0                   INTEGRV
0411                         24,2433   77214 0           BOFF    VLOAD
0412   REF   6  LAST  516    24,2434   04347 0                   SURFFLAG
0413   REF   1               24,2435   50274 0                   P20LEMC4
0414   REF   1               24,2436   01661 1                   RCVLEM
0415                         24,2437   77742 0           VSR2
0416   REF   1               24,2440   26343 1           STOVL   LMPOS
0417   REF   1               24,2441   01667 1                   VCVLEM
0418                         24,2442   77742 0           VSR2
0419   REF   1               24,2443   02351 1           STORE   LMVEL
0420                         24,2444   77650 1           GOTO
0421   REF   2  LAST  516    24,2445   01755 1                   LS21X


0422                         24,2446   45014 0  UPPSV3   CLEAR   CALL
0423   REF   8  LAST  516    24,2447   01674 0                   VINTFLAG
0424   REF   7  LAST  516    24,2450   27172 0                   INTEGRV
0425                         24,2451   77624 1           CALL
0426   REF   5  LAST  516    24,2452   51770 0                   GRP2PC
0427                         24,2453   77624 1           CALL
```

```
L       P20-P25                                                                          USER'S PAGE NO.  11       E7 S3

 0428   REF  10  LAST  516    24,2454    27447 0                        INTSTALL
 0429                         24,2455    71214 0              SET       DLOAD
 0430   REF   9  LAST  516    24,2456    01474 1                        VINTFLAG
 0431   REF   2  LAST  116    24,2457    01643 1                        TETLEM          GET TETLEM TO STORE IN TDEC FOR CSM INT.
 0432                         24,2460    77650 1              GOTO
 0433   REF   1               24,2461    50427 0                        UPPSV4

 0434   REF  11  LAST  515    E7,1456                         EBANK=    LOSCOUNT
 0435   REF   1                                               COUNT*    $$/P22
```

```
P0436   PROGRAM DESCRIPTION
R0437   PREFERRED TRACKING ATTITUDE PROGRAM P25
R0438   MOD NO - 3
R0439   BY  P. VOLANTE
R0440   FUNCTIONAL DESCRIPTION
R0441
R0442     THE PURPOSE OF THIS PROGRAM IS TO COMPUTE THE PREFERRED TRACKING
R0443   ATTITUDE OF THE LM TO CONTINUOUSLY POINT THE LM TRACKING BEACON AT THE
R0444   CSM AND TO PERFORM THE MANEUVER TO THE PREFERRED TRACKING ATTITUDE AND
R0445   CONTINUOUSLY MAINTAIN THIS ATTITUDE WITHIN PRESCRIBED LIMITS
R0446   CALLING SEQUENCE -
R0447     ASTRONAUT REQUEST THROUGH DSKY V37E25E
R0448   SUBROUTINES CALLED -
R0449     BANKCALL                        FLAGUP
R0450     R02BOTH  (IMU STATUS CHECK)     ENDOFJOB
R0451     R61LEM   (PREF TRK ATT ROUT)    WAITLIST
R0452     TASKOVER                        FINDVAC
R0453   NORMAL EXIT MODES  -
R0454     P25 MAY BE TERMINATED IN TWO WAYS-ASTRONAUT SELECTION OF IDLING
R0455   PROGRAM(P00) BY KEYING V37E00E OR BY KEYING IN V56E
R0456   ALARM OR ABORT EXIT MODES -
R0457     NONE
R0458   OUTPUT
R0459   ERASABLE INITIALIZATION REQUIRED
R0460   FLAGS SET + RESET
R0461     TRACKFLG,P25FLAG
R0462   DEBRIS
R0463     NONE
 0464   REF  12  LAST  517   F7,1456                           EBANK= LOSCOUNT
 0465   REF   1                                                COUNT* $$/P25
 0466   RFE   2  LAST  507   24,2462  0 5331 0  PROG25         TC     2PHSCHNG
 0467                        24,2463   00004 0                 OCT    4               MAKE GROUP 4 INACTIVE (VERB 37)
 0468                        24,2464   05022 1                 OCT    05022
 0469                        24,2465   26000 0                 OCT    26000           PRIORITY 26

 0470   REF 121  LAST  514   24,2466  0 4607 1                 TC     BANKCALL
 0471   REF   3  LAST  510   24,2467   33757 1                 CADR   R02BOTH         IMU STATUS CHECK
 0472   REF  24  LAST  513   24,2470  0 5506 1                 TC     UPFLAG
 0473   REF   2  LAST  510   24,2471   00031 0                 ADRES  TRACKFLG        SET TRACK FLAG
 0474   REF  25  LAST  518   24,2472  0 5506 1                 TC     UPFLAG
 0475   REF   1              24,2473   00006 1                 ADRES  P25FLAG         SET P25FLAG
 0476   REF  40  LAST  514   24,2474  0 5520 0                 TC     DOWNFLAG
 0477   REF   2  LAST  510   24,2475   00010 0                 ADRES  RNDVZFLG
 0478   REF  13  LAST  514   24,2476  0 5355 1  P25LEM1        TC     PHASCHNG
 0479                        24,2477   04022 0                 OCT    04022
 0480   REF   4  LAST  300   24,2500  3 4734 0                 CAF    P25FLBIT
 0431   REF  32  LAST  250   24,2501  7 0074 0                 MASK   STATE           IS P25FLAG SET
 0482                        24,2502  0 0006 1                 EXTEND
 0483   REF  76  LAST  515   24,2503  1 5146 0                 BZF    ENDOFJOB
 0484   REF  10  LAST  515   24,2504  3 4740 0                 CAF    TRACKBIT        IS TRACKFLAG SET?
 0485  REF  33  LAST  518   24,2505  7 0075 1             MASK    STATE +1
 0486                       24,2506  0 0006 1             EXTEND
 0487  REF   1              24,2507  1 2515 0             BZF     P25LMWT1          NO-SKIP PHASE CHANGE AND WAIT 1 MINUTE
 0488  REF   8  LAST  471   24,2510  3 4750 1             CAF     SEVEN             CALL R65 - FINE PREFERRED
 0489  REF   2  LAST  158   24,2511  55'745 1             TS      R65CNTR
 0490  REF 122  LAST  518   24,2512  0 4607 1             TC      BANKCALL          TRACKING ATTITUDE ROUTINE
 0491  REF   1              24,2513   46123 0             CADR    R65LEM
 0492  REF   2  LAST  251   24,2514  0 2476 0             TC      P25LEM1           THEN GO CHECK FLAGS
 0493  REF   1              24,2515  3 2526 1  P25LMWT1   CAF     60SCNDS
 0494  REF   8  LAST  515   24,2516  0 5175 1             TC      TWIDDLE           WAIT ONE MINUTE THEN CHECK AGAIN
 0495  REF   1              24,2517   02521 0             ADRES   P25LEM2
 0496  REF  77  LAST  518   24,2520  0 5146 1             TC      ENDOFJOB
 0497  REF   1              24,2521  3 5015 0  P25LEM2    CAF     PRIO14
 0498  REF  19  LAST  515   24,2522  0 5076 0             TC      FINDVAC
 0499  REF  13  LAST  518   E7,1456                       EBANK=  LOSCOUNT
 0500  REF   3  LAST  519   24,2523   02476 0             2CADR   P25LEM1
 0500                       24,2524   50067 0
 0501  REF  20  LAST  515   24,2525  0 5263 0             TC      TASKOVER
 0502                       24,2526   13560 0  60SCNDS    DEC     6000
```

```
R0503    DATA READ ROUTINE 22 (LEM)
R0504    PROGRAM DESCRIPTION
R0505    MOD NO - 2
R0506    BY P VOLANTE
R0507    FUNCTIONAL DESCRIPTION
R0508
R0509      TO PROCESS AUTOMATIC RR MARK DATA TO UPDATE THE STATE VECTOR OF EITHER
R0510    LM OR CSM AS DEFINED IN THE RENDEZVOUS NAVIGATION PROGRAM (P20)
R0511    CALLING SEQUENCE -
R0512              TC       BANKCALL
R0513              CADR     R22LEM
R0514    SUBROUTINES CALLED.-
R0515      LSR22.1             GOFLASH         WAITLIST
R0516      LSR22.2             PRIOLARM        BANKCALL
R0517      LSR22.3             R61LEM
R0518    NORMAL EXIT MODES-
R0519      R22 WILL CONTINUE TO RECYCLE,UPDATING STATE VECTORS WITH RADAR DATA
R0520    UNTIL P20 CEASES TO OPERATE (RENDEZVOUS FLAG SET TO ZERO) AT WHICH TIME
R0521    R22 WILL TERMINATE SELF.
R0522    ALARM OR ABORT EXIT MODES-
R0523      PRIORITY ALARM
R0524    PRIORITY ALARM 525 LOS NOT WITHIN 3 DEGREE LIMIT
R0525    OUTPUT
R0526      SEE OUTPUT FROM LSR22.3
R0527    ERASABLE INITIALIZATION REQUIRED
R0528      SEE LSR22.1,LSR22.2,LSR22.3
R0529    FLAGS SET + RESET
R0530      NOANGFLG
R0531    DEBRIS
R0532      SEE LSR22.1,LSR22.2,LSR22.3
 0533    REF   2  LAST  152   E7,1737                          EBANK= LRS22.1X
 0534    REF   1                                               COUNT* $$/R22
 0535    REF  14  LAST  518   24,2527  0 5355 1  R22LEM        TC     PHASCHNG
 0536                         24,2530   04022 0                OCT    04022
 0537    REF   8  LAST  514   24,2531  3 4736 1                CAF    RNDVZBIT         IS RENDESVOUS FLAG SET?
 0538    REF  34  LAST  519   24,2532  7 0074 0                MASK   STATE
 0539                         24,2533  0 0006 1                EXTEND
 0540    REF  78  LAST  519   24,2534  1 5146 0                BZF    ENDOFJOB         NO-EXIT R22 AND P20
 0541    REF  11  LAST  518   24,2535  3 4740 0                CAF    TRACKBIT         IS TRACKFLAG SET?
 0542    REF  35  LAST  520   24,2536  7 0075 1                MASK   STATE +1
 0543                         24,2537  0 0006 1                EXTEND
 0544    REF   1              24,2540  1 2724 0                BZF    R22WAIT          NO WAIT
 0545    REF  47  LAST  505   24,2541  3 4727 1  R22LEM12      CAF    BIT14            IS RR AUTO TRACK ENABLE DISCRETE STILL
 0546                         24,2542  0 0006 1                EXTEND                  ON (A MONITOR REPOSITION BY R25 CLEARSIT
 0547    REF  24  LAST  483   24,2543  02 012 0                RAND   CHAN12
 0548                         24,2544  0 0006 1                EXTEND
 0549    REF   2  LAST  511   24,2545  1 2167 1                BZE    P20LEMA          NO - RETURN TO P20
 0550    REF  28  LAST  513   24,2546  3 4743 0                CAF    BIT2             YES
 0551                         24,2547  0 0006 1                EXTEND                  IS RR AUTO MODE DISCRETE PRESENT
 0552    REF   9  LAST  513   24,2550  02 033 0                RAND   CHAN33
```

```
0553                              24,2551   0 0006 1               EXTEND
0554                              24,2552   1 2554 0               BZF      +2                   YES CONTINUE
0555   REF    1                   24,2553   0 2213 0               TC       P20LEMB5             NO - SET IT
0556   REF   34   LAST   513      24,2554   4 0110 0               CS       RADMODES             ARE RR CDUS BEING ZEROED
0557   REF    2   LAST   513      24,2555   7 4730 0               MASK     RCDUOBIT
0558                              24,2556   0 0006 1               EXTEND
0559   REF    2   LAST   515      24,2557   1 2713 1               BZF      R22LEM42             CDUS BEING ZEROED
0560   REF   15   LAST   520      24,2560   0 5355 1               TC       PHASCHNG             IF A RESTART OCCURS,AN EXTRA RADAR
0561                              24,2561    00152 1               OCT      00152                READING IS TAKEN,SO BAD DATA ISN'T USED
0562   REF  123   LAST   519      24,2562   0 4607 1               TC       BANKCALL             YES READ DATA + CALCULATE LOS
0563   REF    1                   24,2563    64362 1               CADR     LRS22.1              DATA READ SUBROUTINE
0564   REF  241   LAST   511      24,2564   50 154 1               INDEX    MPAC
0565                              24,2565   0 2566 0               TC       +1
0566   REF    1                   24,2566   0 2607 1               TC       R22LEM2              NORMAL RETURN (GOOD DATA)
0567   REF    1                   24,2567   0 2275 0               TC       P20LEMC              COULD NOT READ RADAR-TRY TO REDESIGNATE
0568   REF    1                   24,2570   3 2745 0               CAF      ALRM525              RR LOS NOT WITHIN 3 DEGREES (ALARM)
0569   REF  124   LAST   521      24,2571   0 4607 1               TC       BANKCALL
0570   REF    2   LAST   513      24,2572    21572 1               CADR     PRIOLARM
0571   REF    5   LAST   513      24,2573   0 6043 0               TC       GOTOV56              TERMINATE EXITS P20 VIA V56 CODING
0572   REF    1                   24,2574   0 2577 0               TC       R22LEM1              PROC  (DISPLAY DELTA THETA)
0573                              24,2575   0 2570 1               TC       -5                   ENTER(ILLEGAL OPTION)
0574   REF   79   LAST   520      24,2576   0 5146 1               TC       ENDOFJOB


0575   REF   16   LAST   521      24,2577   0 5355 1    R22LEM1    TC       PHASCHNG
0576                              24,2600    04022 0               OCT      04022
0577   REF    1                   24,2601   3 2746 0               CAF      V06N05               DISPLAY DELTA THETA
0578   REF  125   LAST   521      24,2602   0 4607 1               TC       BANKCALL
0579   REF    1                   24,2603    20502 1               CADR     PRIODSP
0580   REF    6   LAST   521      24,2604   0 6043 0               TC       GOTOV56              TERMINATE EXITS P20 VIA V56 CODING
0581   REF    2   LAST   521      24,2605   0 2607 1               TC       R22LEM2              PROC  (OK CONTINUE)
0582   REF    2   LAST   521      24,2606   0 2275 0               TC       P20LEMC              ENTER(RECYCLE)
0583   REF   17   LAST   521      24,2607   0 5355 1    R22LEM2    TC       PHASCHNG
0584                              24,2610    04022 0               OCT      04022
0585   REF    4   LAST   513      24,2611   0 2751 0               TC       LUNSFCHK             CHECK IF ON LUNAR SURFACE (P22FLAG SET)
0586   REF    1                   24,2612   0 2627 0               TC       R22LEM3              YES-BYPASS FLAG CHECKS AND LRS22.2
0587   REF   23   LAST   515      24,2613   3 0075 0               CA       FLAGWRD1             IS TRACK FLAG SET
0588   REF   12   LAST   520      24,2614   7 4740 1               MASK     TRACKBIT
0589                              24,2615   0 0006 1               EXTEND
0590   REF    2   LAST   520      24,2616   1 2724 0               BZF      R22WAIT              NO - WAIT
0591   REF  126   LAST   521      24,2617   0 4607 1               TC       BANKCALL             YES
0592   REF    1                   24,2620    51416 0               CADR     LRS22.2              CHECKS RR BORESIGHT WITHIN 30 DEG OF +Z
0593   REF  242   LAST   521      24,2621   50 154 1               INDEX    MPAC
0594                              24,2622   0 2623 1               TC       +1
0595   REF    2   LAST   521      24,2623   0 2627 0               TC       R22LEM3              NORMAL RETURN(LOS WITHIN 30  OF Z-AXIS)
0596   REF  127   LAST   521      24,2624   0 4607 1               TC       BANKCALL
0597   REF    2   LAST   512      24,2625    46116 0               CADR     R61LEM
0598   REF    3   LAST   521      24,2626   0 2724 1               TC       R22WAIT              NOT WITHIN 30 DEG OF Z-AXIS
0599   REF   24   LAST   521      24,2627   4 0075 1    R22LEM3    CS       FLAGWRD1             SHOULD WE BYPASS STATE VECTOR UPDATE
0600   REF    1                   24,2630   7 4737 1               MASK     NOUPFBIT             (IS NOUPDATE FLAG SET?)
```

```
0601                          24,2631  0 0006 1           EXTEND
0602  REF   3  LAST  521      24,2632  1 2713 1           BZF     R22LEM42       BRANCH-YES
0603  REF  25  LAST  521      24,2633  3 C075 0           CA      FLAGWRD1       IS UPDATE FLAG SET
0604  REF   1                 24,2634  7 4736 0           MASK    UPDATBIT
0605                          24,2635  0 C006 1           FXTEND
0606  REF   4  LAST  522      24,2636  1 2713 1           BZF     R22LEM42       UPDATE FLAG NOT SET
0607  REF   6  LAST  515      24,2637  3 7735 1           CAF     PRIO26         INSURE HIGH PRIO IN RESTART
0608  REF   3  LAST  240      24,2640  55'C55 1           TS      PHSPRDT2

0609  REF  37  LAST  514      24,2641  0 6060 1           TC      INTPRET
0610                          24,2642   77650 1           GOTO
0611  REF   1                 24,2643   54424 1                   LSP22.3
0612                          24,2644   77776 1  R22LEM93 EXIT                   NORMAL EXIT FROM LSR22.3
0613  REF  18  LAST  521      24,2645  0 5355 1           TC      PHASCHNG       PHASE CHANGE TO PROTECT AGAINST
0614                          24,2646   04022 0           OCT     04022          CONFLICT WITH GRP2PC ERASEABLE
0615  REF   1                 24,2647  1 2706 0           TCF     R22LEM44
0616                          24,2650   77776 1  R22LEM96 EXIT
0617  REF 1C7  LAST  511      24,2651  3 4746 0           CAF     ZERO           SET N49FLAG = ZERO TO INDICATE
0618  REF   1                 24,2652  55'746 1           TS      N49ELAG        V06 N49 DISPLAY HASNT BEEN ANSWERED
0619  RFF  19  LAST  522      24,2653  0 5355 1           TC      PHASCHNG
0620                          24,2654   04022 0           OCT     04022          TO PROTECT DISPLAY
0621  REF   3  LAST  234      24,2655  3 7736 1           CAF     PR1027         PROTECT DISPLAY
0622  REF  13  LAST  505      24,2656  0 5063 1           TC      NCVAC
0623  REF   2  LAST  522      E7,1746                     EBANK=  N49FLAG
0624  REF   1                 24,2657   02726 0           2CADR   N49DSP
0624  REF   1                 24,2660   5CC67 0
0625  REF  38  LAST  522      24,2661  0 6060 1           TC      INTPRET
0626                          24,2662   77735 0           SLOAD
0627  REF   3  LAST  522      24,2663   03747 0                   N49FLAG
0628                          24,2664   50C54 0           BZE     BMN            LOOP TO CHECK IF FLAG
0629                          24,2665   50662 0                   -3             SETTING CHANGED-BRANCH - NO
0630  REF   1                 24,2666   5C674 1                   R22LEM7        PROCEED
0631                          24,2667   77650 1           GOTO                   DISPLAY ANSWERED BY RECYCLE-INCORPORATE
0632  REF   3  LAST  151      24,2670   03675 0                   LGRET                 NEXT MEASUREMENT
0633  REF  34  LAST  506      24,2671  4 4743 1  V34TON49 CS      TWO
0634  REF   4  LAST  522      24,2672  55'746 1           TS      N49FLAG
0635  REF  80  LAST  521      24,2673  0 5146 1           TC      ENDOFJOB
0636                          24,2674   77776 1  R22LEM7  EXIT
0637  REF   5  LAST  522      24,2675  3 1746 0           CA      N49FLAG        WAS ANSWER TO DISPLAY PRO OR TERM
0638  REF  35  LAST  522      24,2676  6 4743 0           AD      TWO
0639                          24,2677  0 0006 1           EXTEND
0640  REF   1                 24,2700  1 2527 1           BZF     R22LEM         BRANCH - TERM - TAKE ANOTHER RR READING
0641  REF  39  LAST  522      24,2701  0 6C60 1           TC      INTPRET
0642                          24,2702   77624 1           CALL
0643  REF   6  LAST  516      24,2703   51770 0                   GRP2PC         PHASE CHANGE AND
0644                          24,2704   77650 1           GOTO                   GO TO INCORPORATE DATA.
0645  REF   1                 24,2705   55430 0                   ASTOK
0646  REF   2  LAST  511      24,2706  25'462 0  R22LFM44 INCR    MARKCTR        INCREMENT COUNT OF MARKS INCORPORATED.
0647  RFF   5  LAST  521      24,2707  0 2751 0           TC      LUNSFCHK       ARE WE ON LUNAR SURFACE
0648  REF   5  LAST  522      24,2710  0 2713 0           TC      R22LEM42
```

```
 0649   REF  10  LAST  441   24,2711  3 4747 1             CA       FIVE              NOT ON LUNAR SURFACE
 0650   REF   1              24,2712  0 2720 0             TC       P22LEM45          R65COUNTER = 5
 0651   REF 128  LAST  521   24,2713  0 4607 1  R22LEM42   TC       BANKCALL
 06515  REF   3  LAST  290   24,2714   01735 1             CADR     2SECDELY
 06516  REF   6  LAST  522   24,2715  0 2751 0             TC       LUNSFCHK
 0652   REF   2  LAST  522   24,2716  0 2527 0             TC       R22LEM

 0653   REF  36  LAST  522   24,2717  3 4743 0             CA       TWO               NO-SET R65COUNTER = 2
 0654   REF   3  LAST  519   24,2720  55'745 1  R22LEM45   TS       R65CNTR
 0655   REF 129  LAST  523   24,2721  0 4607 1             TC       BANKCALL
 0656   REF   2  LAST  519   24,2722   46123 0             CADR     R65LEM            FINE PREFERRED TRACKING ATTITUDE
 0657   REF   3  LAST  523   24,2723  0 2527 0             TC       R22LEM
 0658   REF   2  LAST  515   24,2724  3 2750 1  R22WAIT    CAF      1500DEC
 0659   REF   3  LAST  514   24,2725  0 2311 0             TC       P20LEMWT +1


 0663   REF   1              24,2726  3 2747 1  N49DSP     CAF      V06N49NB
 0664   REF 130  LAST  523   24,2727  0 4607 1             TC       BANKCALL          EXCESSIVE STATE VECTOR UPDATE - FLASH
 0665   REF   2  LAST  521   24,2730   20502 1             CADR     PRIODSP           VERB 06 NOUN 49 R1=DELTA R, R2=DELTA V
 0666   REF   1              24,2731  0 2671 0             TC       V34TON49          TERMINATE - SET N49FLAG = -2
 0667   REF  64  LAST  508   24,2732  4 4744 0             CS       ONE               PROCEED - N49FLAG = -1
 0668   REF   6  LAST  522   24,2733  55'746 1             TS       N49FLAG           RECYCLE - N49FLAG = + VALUE
 0669   REF  81  LAST  522   24,2734  0 5146 1             TC       ENDOFJOB
 0670   REF  20  LAST  522   24,2735  0 5355 1  R22RSTRT   TC       PHASCHNG          IF A RESTART OCCURS WHILE READING RADAR
 0671                        24,2736   00152 1             OCT      00152             COME HERE TO TAKE A RANGE-RATE READING
 0672   REF 131  LAST  523   24,2737  0 4607 1             TC       BANKCALL          WHICH ISNT USED TO PREVENT TAKING A BAD
 0673   REF   2  LAST  506   24,2740   53072 1             CADR     RRRDOT            READING AND TRYING TO INCORPORATE THE
 0674   REF 132  LAST  523   24,2741  0 4607 1             TC       BANKCALL          BAD DATA
 0675   REF   4  LAST  505   24,2742   17733 0             CADR     RADSTALL          WAIT FOR READ COMPLETE
 0676   REF   3  LAST  521   24,2743  0 2275 0             TC       P20LEMC           COULD NOT READ RADAR-TRY TO REDESIGNATE
 0677   REF   4  LAST  523   24,2744  0 2527 0             TC       R22LEM            READ SUCCESSFUL-CONTINUE AT R22


 0678                        24,2745   00525 0  ALRM525    OCT      00525
 0679                        24,2746   01405 1  V06N05     VN       00605
 0680                        24,2747   01461 0  V06N49NB   VN       00649
 0681                        24,2750   02734 0  1500DEC    DEC      1500
R0682   LUNSFCHK-CLOSED SUBROUTINE TO CHECK IF ON LUNAR SURFACE (P22FLAG)
R0683             RETURNS TO CALLER +1 IF P22FLAG SET
R0684                   TO CALLER +2 IF P22FLAG NOT SET

 0685   REF   2 LAST  517 TO  518:      0      0*              COUNT*   $$/P22
 0686   REF   5  LAST  348   24,2751  4 0104 0  LUNSFCHK   CS       FLAGWRD8          CHECK IF ON LUNAR SURFACE
 0687   REF   3  LAST  348   24,2752  7 4735 0             MASK     SURFFBIT          IS SURFFLAG SET?
 0688   REF 162  LAST  515   24,2753  10 000 0             CCS      A                 BRANCH - P22FLAG SET
 0689   REF 147  LAST  491   24,2754  24 C02 0             INCR     Q                 NOT SET
 0690   REF 148  LAST  523   24,2755  0 0002 0             TC       Q                 RETURN
```

```
P0691    RR DESIGNATF ROUTINF (R21LFM)
R0692    PRCGRAM DESCRIPTION
R0693    MOD NO - 2
R0694    BY P VCLANTE
R0695    FUNCTICNAL DESCRIPTION
R0696
R0697      TO PCINT THE RENDEZVOUS RADAR AT THE CSM UNTIL AUTOMATIC ACQUISITION
R0698    OF THE CSM IS ACCOMPLISHED BY THE RADAR. ROUTINE IS CALLED BY P20.
R0699    CALLING SFQUENCF -
R0700            .TC      BANKCALL
R0701             CADR    R21LEM
R0702    SUBROUTINES CALLED -
R0703      FINCVAC        FLAGUP          FNDOFJOB        PRIOLARM
R0704      NOVAC          INTPRET         LPS20.1         PHASCHNG
R0705      WAITLIST       JOBSLEFP        JOBWAKE         FLAGDOWN
R0706      TASKOVER       BANKCALL        RADSTALL        RRDESSM
R0707    NORMAL FXIT MODFS
R0708      WHEN LOCK-ON IS ACHIEVED,BRANCH WILL BF TO P20 WHERE R22 (DATA READ
R0709    WILL BE SFLFCTED OR A NEFD FOR A MANEUVER(BRANCH TO P20LEMA)
R0710    ALARM CR ABORT EXIT MODES-
R0711      PRICRITY ALARM 503 WHFN LOCK-ON HASN:T BFEN ACHIEVED AFTER 30SECS -
R0712    THIS RFQUIRES ASTRONAUT INTERFACE- SELECTION OF SEARCH OPTION OF
R0713    ACCUISITION
R0714    OUTPUT
R0715      SEF LPS20.1,RRDFSSM
R0716    ERASABLF INITIALIZATION REQUIRED
R0717      RRTARGET,RADMODES ARE USED BY LPS20.1 AND RRDESSM
R0718    FLAGS SFT + RESFT
R0719      LOSCMFLG       LOKONSW
R0720    DFBRIS
R0721      SEE LPS20.1,RRDFSSM
 0722    REF  14  LAST  519   E7,1456                         FBANK= LOSCOUNT
 0723    RFF   1                                              COUNT* $$/R21
 0724    REF  48  LAST  520   24,2756  4 4727 0  R21LFM    CS      BIT14          REMOVF RP SELF TRACK ENABLF
 0725                         24,2757  0 0006 1            EXTEND
 0726    REF  25  LAST  520   24,2760  03 C12 1            WAND    CHAN12
 07263   REF  49  LAST  524   24,2761  3 4727 1            CAF     BIT14          RESET AGSCODE SINCE R21
 07266   RFF   4  LAST  299   24,2762  55'073 0            TS      AGSCODE        CLOBBERS DOWNLINK MARK DATA
 0727    RFF   7  LAST  523   24,2763  0 2751 0            TC      LUNSFCHK
 0728    REF   1              24,2764  0 2771 1            TC      R21LEM5
 0729    REF 108  LAST  522   24,2765  3 4746 0            CAF     ZERO                CCMMAND ANTENNA TO MODE CENTFR
 0730    REF   4  LAST  328   24,2766  55'106 0            TS      TANG           IF NOT ON SURFACE-MODF 1-(T=0,S=0)
 0731    REF   5  LAST  524   24,2767  55'107 1            TS      TANG +1
 0732    REF   1              24,2770  0 3001 0            TC      R21LEM6
 0733    REF  21  LAST  468   24,2771  3 4731 0  R21LFM5   CAF     BIT12
 0734    REF  35  LAST  521   24,2772  7 0110 0            MASK    RADMODES
 0735    REF 163  LAST  523   24,2773  10 000 0            CCS     A
 0736    REF   1              24,2774  0 3011 1            TC      R21LEM10
 0737    REF  31  LAST  485   24,2775  3 4726 0            CAF     BIT15
 0738    REF   6  LAST  524   24,2776  55'106 0            TS      TANG
 0739   REF   4  LAST  385   24,2777  4 4727 0            CS      HALF
 0740   REF   7  LAST  524   24,3000  55'107 1            TS      TANG +1
 0741   REF  41  LAST  518   24,3001  0 5520 0  R21LEM6   TC      DOWNFLAG
 0742   REF   3  LAST  284   24,3002   00012 1            ADRES   LOKONSW
 0743   REF 133  LAST  523   24,3003  0 4607 1            TC      BANKCALL
 0744   REF   2  LAST  282   24,3004   52466 1            CADR    RRDESNB
 0745                        24,3005  0 3006 1            TC      +1
 0746   REF 134  LAST  525   24,3006  0 4607 1            TC      BANKCALL
 0747   REF   5  LAST  523   24,3007   17733 0            CADR    RADSTALL
 0748   REF   1              24,3010  0 3044 1            TC      R21-503            BAD RETURN FROM DESIGNATE -ISSUE ALARM
 0749   REF  26  LAST  518   24,3011  0 5506 1  R21LEM10  TC      UPFLAG
 0750   REF   2  LAST  511   24,3012   00041 1            ADRES   LOSCMFLG           EVERY FOURTH PASS THRU DODES
 0751   REF   1              24,3013  3 2366 0            CAF     MAXTRIES           ALLOW 60 PASSES (APPROX 45 SECONDS)
 0752   REF   1              24,3014  55'113 1            TS      DESCOUNT           TO DESIGNATE AND LOCK ON
 0753   REF  17  LAST  489   24,3015  3 6266 0  R21LEM2   CAF     THREE
 0754   REF  15  LAST  524   24,3016  55'456 0            TS      LOSCOUNT
 0755   REF  40  LAST  522   24,3017  0 6060 1  R21LEM1   TC      INTPRET
 0756                        24,3020   43234 0            RTB     DAD
 0757   REF   9  LAST  514   24,3021   21603 1                    LOADTIME
 0758   REF   1              24,3022   11206 0                    HALFSEC            EXTRAPOLATE TO PRESENT TIME + .5 SEC.
 0759   REF  12  LAST  516   24,3023   34041 0            STCALL  TDEC1              LOS DETERMINATION ROUTINE
 0760   REF   2  LAST  511   24,3024   51337 1                    LPS20.1
 0761                        24,3025   77776 1            EXIT
 0762   REF  27  LAST  525   24,3026  0 5506 1  R21LEM3   TC      UPFLAG             SET LOKONSW TO RADAR-ON DESIRED
 0763   REF   4  LAST  525   24,3027   00012 1            ADRES   LOKONSW
 0764   REF  42  LAST  525   24,3030  0 5520 0            TC      DOWNFLAG
 0765   REF   4  LAST  511   24,3031   00126 1            ADRES   NORRMON
 0766   REF  41  LAST  525   24,3032  0 6060 1            TC      INTPRET
 0767                        24,3033   77624 1            CALL                       INPUT (RRTARGET UPDATED BY LPS20.1)
 0768   REF   1              24,3034   52364 1                    RRDESSM            DESIGNATE ROUTINE
 0769                        24,3035   77776 1            EXIT
 0770   REF   1              24,3036  0 3065 1            TC      R21LEM4            LOS NOT IN MODE 2 COVERAGE
A0771                                                                                ON LUNAR SURFACE
 0772   REF   3  LAST  520   24,3037  0 2167 0            TC      P20LEMA            VEHICLE MANEUVER REQUIRED.
 0773   REF 135  LAST  525   24,3040  0 4607 1            TC      BANKCALL           NO VEHICLE MANEUVER REQUIRED
 0774   REF   6  LAST  525   24,3041   17733 0            CADR    RADSTALL           WAIT FOR DESIGNATE COMPLETE - LOCKON OR
 0775                        24,3042  0 3044 1            TC      +2                 BADEND-LOCKON NOT ACHIEVED IN 60 TRIES
 0776   REF   1              24,3043  0 3053 1            TC      R21END             EXIT ROUTINE RETURN TO P20 (LOCK-ON)
 0777   REF   1              24,3044  3 3063 1  R21-503   CAF     ALRM503            ISSUE ALARM 503
 0778   REF 136  LAST  525   24,3045  0 4607 1            TC      BANKCALL
 0779   REF   3  LAST  521   24,3046   21572 1            CADR    PRIOLARM
 0780   REF   7  LAST  521   24,3047  0 6043 0            TC      GOTOV56            TERMINATE EXITS P20 VIA V56 CODING
 0781   REF   1              24,3050  0 3060 1            TC      R21SRCH            PROC
 0782   REF   3  LAST  515   24,3051  0 2267 0            TC      P20LEMC3
 0783   REF  82  LAST  523   24,3052  0 5146 1            TC      ENDOFJOB
 0784   REF  43  LAST  525   24,3053  0 5520 0  R21END    TC      DOWNFLAG
 0785   REF   3  LAST  525   24,3054   00041 1            ADRES   LOSCMFLG           RESET LOSCMFLG
 0786   REF   8  LAST  524   24,3055  0 2751 0            TC      LUNSFCHK           ARE WE ON LUNAR SURFACE
 0787   REF   4  LAST  523   24,3056  0 2310 1            TC      P20LEMWT           YES - BYPASS V 50 N 72 DISPLAY
 0788   REF   1              24,3057  0 3207 1            TC      R21DISP            PUT UP VERIFY MAIN LOBE LOCKON DISPLAY
 0789  REF  21  LAST  523   24,3060  0 5355 1  R21SRCH  TC      PHASCHNG
 0790                       24,3061   04022 0           OCT     04022
 0791  REF   1              24,3062  0 3271 0           TC      R24LEM          SEARCH ROUTINE
 0792                       24,3063   00503 1  ALRM503  OCT     00503
 0793                       24,3064   00527 1  ALRM527  OCT      527


 0794  REF   2  LAST  511   24,3065  0 6032 0  R21LEM4  TC      CLRADMD1        CLEAR BITS 10 & 15 IN RADMODES
 07945 REF   2  LAST  525   24,3066  3 2366 0           CAF     MAXTRIES        SET UP COUNTER FOR
 0795  REF   2  LAST  145   24,3067  55'423 1           TS      REPOSCNT        60 PASSES (APPROX 600 SECS.)
 0796  REF  28  LAST  525   24,3070  0 5506 1           TC      UPFLAG
 0797  REF   1              24,3071   00032 0           ADRES   FRSTIME         SET FIRST TIME FLAG
 0798  REF  44  LAST  525   24,3072  0 5520 0           TC      DOWNFLAG        RESET LOS BEING
 0799  REF   4  LAST  525   24,3073   00041 1           ADRES   LOSCMFLG        COMPUTED FLAG
 0800  REF  42  LAST  525   24,3074  0 6060 1           TC      INTPRET
 0801                       24,3075   77634 0  R21LEM12 RT8
 0802  REF  10  LAST  525   24,3076   21603 1                   LOADTIME
 0803                       24,3077   77615 0  R21LEM00 DAD
 0804  REF   1              24,3100   11204 1                   TENSEC          TIME T = T + 10 SECS.
 0805  REF   2  LAST  145   24,3101   03425 1           STORE   REPOSTM         SAVE FOR LONGCALL AND UPPSV
 0806  REF  13  LAST  525   24,3102   34041 0           STCALL  TDEC1
 0807  REF   3  LAST  525   24,3103   51337 1                   LPS20.1         COMPUTE LOS AT TIME T
 0808                       24,3104   77624 1           CALL
 0809  REF   2  LAST  525   24,3105   52364 1                   RRDESSM
 0810                       24,3106   77776 1           EXIT
 0811  REF   1              24,3107  0 3121 0           TC      R21LEM13        LOS NOT IN MODE 2 COVERAGE
 0812  REF  83  LAST  525   24,3110  0 5146 1           TC      ENDOFJOB        VEHICLE MANEUVER REQUIRED
 0813  REF   2  LAST  239   24,3111  0 6050 1           TC      KILLTASK
 0814  REF   1              24,3112   52564 1           CADR    BEGDES
 0815  REF  43  LAST  526   24,3113  0 6060 1           TC      INTPRET
 0816                       24,3114   43014 0           BOF     CLRGO
 0817  REF   2  LAST  526   24,3115   00753 0                   FRSTIME         FIRST TIME THRU PREPOSITION
 0818  REF   1              24,3116   51131 0                   R21LEM8         NO-GO TO CONTINUOUS DESIGNATE
 0819  REF   3  LAST  526   24,3117   00633 1                   FRSTIME         YES - RESET FIRST TIME FLAG
 0820  REF   1              24,3120   51126 0                   R21LEM50
 0821  REF   3  LAST  526   24,3121  11'423 1  R21LEM13 CCS     REPOSCNT        HAVE WE TRIED 60 TIMES?
 0822  REF   1              24,3122  0 3124 0           TC      R21LEM7         NO-ADD 10 SECS. RECOMPUTE LOS
 0823  REF   1              24,3123  0 3173 1           TC      R21LEM11        YES-PUT OUT ALARM 530
 0824  REF   4  LAST  526   24,3124  55'423 1  R21LEM7  TS      REPOSCNT
 0825  REF  44  LAST  526   24,3125  0 6060 1           TC      INTPRET
 0826                       24,3126   52145 0  R21LEM50 DLOAD   GOTO
 0827  REF   3  LAST  526   24,3127   03425 1                   REPOSTM
 0828  REF   1              24,3130   51077 0                   R21LEM00
 0829                       24,3131   77745 1  R21LEM8  DLOAD
 0830  REF   4  LAST  526   24,3132   03425 1                   REPOSTM
 0831  REF  14  LAST  526   24,3133   34041 0           STCALL  TDEC1
 0832  REF   2  LAST  514   24,3134   50374 1                   UPPSV
 0833                       24,3135   77776 1           EXIT
 0834  REF  29  LAST  526   24,3136  0 5506 1           TC      UPFLAG          SET RADMODES BIT 15 FOR
 0835  REF   2  LAST  284   24,3137   00264 1           ADRES   CDESFLAG        CONTINUOUS DESIGNATION
 0836    REF  45  LAST  526    24,3140  0 5520 0             TC      DOWNFLAG
 0837    REF   5  LAST  525    24,3141   00012 1             ADRES   LOKONSW
 0838    REF  30  LAST  526    24,3142  0 5506 1             TC      UPFLAG
 0839    REF   5  LAST  525    24,3143   00126 1             ADRES   NORRMON
 0840    REF 137  LAST  525    24,3144  0 4607 1             TC      BANKCALL
 0841    REF   3  LAST  525    24,3145   52466 1             CADR    RRDESNB
 0842                          24,3146  0 3147 0             TC      +1
 0843    REF  45  LAST  526    24,3147  0 6060 1             TC      INTPRET
 0844                          24,3150   44234 1             RTB     BDSU
 0845    REF  11  LAST  526    24,3151   21603 1                     LOADTIME        COMPUTE DELTA TIME
 0846    REF   5  LAST  526    24,3152   03425 1                     REPOSTM         FOR LONGCALL
 0847    REF   1               24,3153   03427 0             STORE   DELTATM
 0848                          24,3154   77776 1             EXIT
 0849                          24,3155  0 0006 1             EXTEND
 0850    REF   2  LAST  527    24,3156  3 1427 1             DCA     DELTATM
 0851    REF   2  LAST  386    24,3157  0 5301 0             TC      LONGCALL
 0852    REF  16  LAST  525    E7,1456                       EBANK=  LOSCOUNT
 0853    REF   1               24,3160   03163 0             2CADR   R21LEM9
 0853    REF   1               24,3161   50067 0
 0854    REF  84  LAST  526    24,3162  0 5146 1             TC      ENDOFJOB
 0855    REF   3  LAST  526    24,3163  0 6050 1  R21LEM9    TC      KILLTASK
 0856    REF   1               24,3164   52573 1             CADR    STDESIG
 0857    REF   6  LAST  300    24,3165  0 6027 1             TC      CLRADMOD
 0858    REF   7  LAST  522    24,3166  3 7735 1             CAF     PRIO26
 0859    REF  20  LAST  519    24,3167  0 5076 0             TC      FINDVAC
 0860    REF  17  LAST  527    E7,1456                       EBANK=  LOSCOUNT
 0861    REF   2  LAST  524    24,3170   03011 1             2CADR   R21LEM10
 0861                          24,3171   50067 0
 0862    REF  21  LAST  519    24,3172  0 5263 0             TC      TASKOVER
 0863    REF   1               24,3173  3 3202 1  R21LEM11   CAF     ALRM530         ALARM 530-LOS NOT IN COVERAGE
 0864    REF 138  LAST  527    24,3174  0 4607 1             TC      BANKCALL        AFTER TRYING TO DESIGNATE FOR
 0865    REF   4  LAST  525    24,3175   21572 1             CADR    PRIOLARM        600 SECS.
 0866    REF   8  LAST  525    24,3176  0 6043 0             TC      GOTOV56
 0867    REF   9  LAST  527    24,3177  0 6043 0             TC      GOTOV56
 0868    REF  10  LAST  527    24,3200  0 6043 0             TC      GOTOV56
 0869    REF  85  LAST  527    24,3201  0 5146 1             TC      ENDOFJOB
 0870                          24,3202   00530 1  ALRM530    OCT     00530
 0871                          24,3203   00000 1  TENSEC     2DEC    1000 B-28
 0871                          24,3204   01750 1
 0872                          24,3205   00000 1  HALFSEC    2DEC    50
 0872                          24,3206   00062 0
 0873    REF  22  LAST  526    24,3207  0 5355 1  R21DISP    TC      PHASCHNG
 0874                          24,3210   04022 0             OCT     04022
 0875    REF   1               24,3211  3 3217 0             CAF     V50N72          FLASH V50N72 MONITOR -PLEASE PERFORM RR
 0876    REF 139  LAST  527    24,3212  0 4607 1             TC      BANKCALL        MAIN LOBE LOCKON VERIFICATION
 0877    REF   1               24,3213   20326 1             CADR    PRIOMONR        THIS IS A PRIORITY DISPLAY
 0878    REF  11  LAST  527    24,3214  0 6043 0             TC      GOTOV56         TERMINATE EXITS VIA V 56
 0879    REF   5  LAST  525    24,3215  0 2310 1             TC      P20LEMWT        PROCEED CONTINUES TO R22
 0880                          24,3216  0 3211 0             TC      -5              ENTER ILLEGAL
 0884                          24,3217   14510 0  V50N72     VN      05072
```

```
R0885    MANUAL ACQUISITION ROUTINE R23LEM
R0886    PROGRAM DESCRIPTION
R0887    MOD NO - 2
R0888    BY P VOLANTE
R0889    FUNCTIONAL DESCRIPTION
R0890
R0891      TO ACQUIRE THE CSM BY MANUAL OPERATION OF THE RENDEZVOUS RADAR
R0892    CALLING SEQUENCE -
R0893              TC      R23LEM
R0894    SUBROUTINES CALLED
R0895      BANKCALL          R61LEM
R0896      SETMINDB          GOPERF1
R0897    NORMAL EXIT MODES -
R0898      IN RESPONSE TO THE GOPERF1 ,SELECTION OF ENTER WILL RECYCLE R23
R0899                                 ,SELECTION OF PROC  WILL CONTINUE R23
R0900                                 ,SELECTION OF TERM  WILL TERMINATE R23 +P20
R0901    ALARM OR ABORT EXIT MODES -
R0902      SEE NORMAL EXIT MODES ABOVE
R0903    OUTPUT
R0904      N.A.
R0905    ERASABLE INITIALIZATION REQUIRED-
R0906      ACMODFLG MUST BE SET TO 1 (MANUAL MODE)
 0907   REF   1                   1142                          EBANK= GENRET
 0908   REF   1                                                 COUNT* $$/R23
 0909   REF  31  LAST  527   24,3220  0 5506 1  R23LEM    TC      UPFLAG           SET NO ANGLE MONITOR FLAG
 0910   REF   6  LAST  527   24,3221   00126 1            ADRES   NORRMON
 0911                        24,3222  0 0004 0            INHINT
 0912   REF  17  LAST  346   24,3223  0 4665 0            TC      IBNKCALL         SELECT MINIMUM DEADBAND
 0913   REF   1              24,3224   40141 1            CADR    SETMINDB
 0914                        24,3225  0 0003 1            RELINT
 0915   REF  50  LAST  524   24,3226  3 4727 1  R23LEM1   CAF     BIT14            ENABLE TRACKER
 0916                        24,3227  0 0006 1            EXTEND
 0917   REF  26  LAST  524   24,3230  05 012 1            WOR     CHAN12
 0918   REF   1              24,3231  3 3270 1            CAF     OCT205
 0919   REF 140  LAST  527   24,3232  0 4607 1            TC      BANKCALL
 0920   REF   2  LAST  513   24,3233   20635 0            CADR    GOPERF1
 0921   REF   1              24,3234  0 3261 1            TC      R23LEM2          TERMINATE
 0922   REF   1              24,3235  0 3237 1            TC      R23LEM11         PROCEDE
 0923   REF   1              24,3236  0 3264 1            TC      R23LEM3          ENTER- DO ANOTHER MANUVER
 0924                        24,3237  0 0004 0  R23LEM11  INHINT
 0925   REF   2  LAST  198   24,3240  0 4514 0            TC      RRLIMCHK         YES - CHECK IF ANTENNA IS WITHIN LIMITS
 0926   REF   7  LAST  328   24,3241   00035 1            ADRES   COUT
 0927   REF   1              24,3242  0 3251 1            TC      OUTOFLIM         NOT WITHIN LIMITS
 0928   REF  18  LAST  528   24,3243  0 4665 0            TC      IBNKCALL         RESTORE DEADBAND TO
 0929   REF   4  LAST  307   24,3244   40115 0            CADR    RESTORDB         ASTRONAUT SELECTED VALUE
 0930                        24,3245  0 0003 1            RELINT
 0931   REF  46  LAST  527   24,3246  0 5520 0            TC      DOWNFLAG         CLEAR NO ANGLE MONITOR FLAG
 0932   REF   7  LAST  528   24,3247   00126 1            ADRES   NORRMON
 0933   REF   1              24,3250  0 2241 1            TC      P20LEMB1         RADAR IS LOCKED ON CONTINUE IN P20
 0934                        24,3251  0 0003 1  OUTOFLIM  RELINT
 0935   REF   1                 24,3252  3 3267 1            CAF      OCT501PV
 0936   REF 141  LAST  528      24,3253  0 4607 1            TC       BANKCALL         ISSUE ALARM - RR ANTENNA NOT WITHIN
 0937   REF   5  LAST  527      24,3254   21572 1            CADR     PRIOLARM         LIMITS
 0938   REF   2  LAST  528      24,3255  0 3261 1            TC       R23LEM2          TERMINATE - EXIT R23 TO R00 (GO TO POOH)
 0939   REF   2  LAST  528      24,3256  0 3252 1            TC       OUTOFLIM +1      PROCEED ILLEGAL
 0940   REF   2  LAST  528      24,3257  0 3264 1            TC       R23LEM3          RECYCLE- DO ANOTHER MANUVER
 0941   REF  86  LAST  527      24,3260  0 5146 1            TC       ENDOFJOB
 0942   REF  47  LAST  528      24,3261  0 5520 0  R23LEM2   TC       DOWNFLAG         CLEAR NO ANGLE MONITOR FLAG
 0943   REF   8  LAST  528      24,3262   00126 1            ADRES    NORRMON
 0944   REF  12  LAST  527      24,3263  0 6043 0            TC       GOTOV56          AND EXIT VIA V56
 0945   REF 142  LAST  529      24,3264  0 4607 1  R23LEM3   TC       BANKCALL
 0946   REF   3  LAST  521      24,3265   46116 0            CADR     R61LEM
 0947   REF   1                 24,3266  0 3226 1            TC       R23LEM1


 0948                           24,3267   00501 0  OCT501PV  OCT      501
 0949                           24,3270   00205 0  OCT205    OCT      205
```

```
R0950   SEARCH ROUTINE R24LEM
R0951   PROGRAM DESCRIPTION
R0952   MOD NO - 2
R0953   BY  P. VOLANTE
R0954   FUNCTIONAL DESCRIPTION
R0955
R0956     TO ACQUIRE THE CSM BY A SEARCH PATTERN WHEN THE RENDEZVOUS RADAR HAS
R0957   FAILED TO ACQUIRE THE CSM IN THE AUTOMATIC TRACKING MODE AND TO ALLOW
R0958   THE ASTRONAUT TO CONFIRM THAT REACQUISITION HAS NOT BEEN BY SIDELOBE.
R0959   CALLING SEQUENCE
R0960             CAF     PRIONE
R0961             TC      FINDVAC
R0962             EBANK=  DATAGOOD
R0963             2CADR   R24LEM
R0964   SUBROUTINES CALLED
R0965     FLAGUP          FLAGDOWN        BANKCALL
R0966     R61LEM          GOFLASHR        FINDVAC
R0967     ENDOFJOB        NOVAC           LSR24.1
R0968   NORMAL EXIT MODES-
R0969     ASTRONAUT RESPONSE TO DISPLAY OF OMEGA AND DATAGOOD.HE CAN EITHER
R0970   REJECT BY TERMINATING (SEARCH OPTION AND RESELECTING P20) OR ACCEPT BY
R0971   PROCEEDING (EXIT ROUTINE AND RETURN TO AUTO MODE IN P20)
R0972   ALARM OR ABORT EXIT MODES-
R0973     SEE NORMAL EXIT MODES ABOVE
R0974   OUTPUT -
R0975     SEE OUTPUT FROM LSR24.1 + R61LEM
R0976   ERASABLE INITIALIZATION REQUIRED
R0977     SEE INPUT FOR LSR24.1
R0978   FLAGS SET + RESET
R0979     SRCHOPT,ACMODFLG
 0980   REF   3  LAST  326    E7,1733                          EBANK=  DATAGOOD
 0981   REF   1                                                COUNT*  $$/R24
 0982   REF  32  LAST  528    24,3271  0 5506 1  R24LEM        TC      UPFLAG
 0983   REF   4  LAST  514    24,3272   00037 0                ADRES   SRCHOPTN          SET SRCHOPT FLAG
 0984   REF  48  LAST  529    24,3273  0 5520 0                TC      DOWNFLAG          RESET LOS BEING COMPUTED FLAG TO MAKE
 0985   REF   5  LAST  526    24,3274   00041 1                ADRES   LOSCMFLG          SURE DODES DOESN'T GO TO R21
 0986   REF 109  LAST  524    24,3275  3 4746 0  R24LEM1       CAF     ZERO
 0987   REF   4  LAST  530    24,3276  55'733 0                TS      DATAGOOD          ZERO OUT DATA INDICATOR
 0988   REF   2  LAST  328    24,3277  55'734 1                TS      OMEGAD            ZERO OMEGA DISPLAY REGS
 0989   REF   3  LAST  530    24,3300  55'735 0                TS      OMEGAD +1         ZERO OMEGA DISPLAY REGS
 0990   REF  23  LAST  527    24,3301  0 5355 1  R24LEM2       TC      PHASCHNG
 0991                         24,3302   04022 0                OCT     04022
 0992   REF   1               24,3303  3 3336 1                CAF     V16N80
 0993   REF 143  LAST  529    24,3304  0 4607 1                TC      BANKCALL
 0994   REF   1               24,3305   20477 1                CADR    PRIODSPR
 0995   REF  13  LAST  529    24,3306  0 6043 0                TC      GOTOV56
 0996   REF   1               24,3307  0 3313 0                TC      R24END            PROCEED EXIT R24 TO P20LEM1


 0997   REF   1               24,3310  0 3317 1                TC      R24LEM3           RECYCLE - CALL R61 TO MANEUVER S/C
 0998   REF 144  LAST  530   24,3311  0 4607 1            TC       BANKCALL
 0999   REF   1              24,3312   55441 0            CAOR     LRS24.1
 1000   REF   4  LAST  527   24,3313  0 6050 1  R24END    TC       KILLTASK
 1001   REF   1              24,3314   55642 1            CADR     CALLDGCH
 1002   REF   7  LAST  527   24,3315  0 6027 1            TC       CLRADMOD      CLEAR BITS 10 & 15 OF RADMODES.
 1003   REF   1              24,3316  1 2065 1            TCF      P20LFM1       AND GO TO 400 MI. RANGF CHECK IN P20.

 1004                           6027                      BLOCK    3
 1005   REF   1                 6000                      SETLOC   FFTAG6
 1006                           6027                      BANK
 1007   REF   1                                           COUNT*   $$/R24

 1008   REF  29  LAST  520      6027  4 4743 1  CLRAOMOD  CS       BIT2          DISABLE RR ERROR CNTRS
 1009                           6030  0 0006 1            EXTEND
 1010   REF  27  LAST  528      6031  03 012 1            WANO     CHAN12
 1011   REF   1                 6032  4 6037 1  CLRADMD1  CS       BIT10+15      KNOCK DOWN DESIGNATE ANO

 10113  REF   1                 4733            REFTAG3   =        DESIGBIT
 10116  RFF   1                 4726            REFTAG4   =        CDESBIT
 1012                           6033  0 0004 0            INHINT                    CONTINUOUS DESIGNATE FLAGS
 1013   REF  36  LAST  524      6034  7 0110 0            MASK     RADMODES
 1014   REF  37  LAST  531      6035  54 110 0            TS       RADMOOES
 1015   REF 149  LAST  523      6036  0 0002 0            TC       Q


 1016                           6037   41000 1  BIT10+15  OCT      41000


 1017                        24,3317                      BANK     24
 1018   REF   3  LAST  510   24,2000                      SETLOC   P20S
 1019                        24,3317                      BANK
 1020   REF   2 LAST  530 TO  531:    22     22*          COUNT*   $$/R24

 1021   REF  24  LAST  530   24,3317  0 5355 1  R24LEM3   TC       PHASCHNG
 1022                        24,3320   04022 0            OCT      04022
 1023   REF   5  LAST  531   24,3321  0 6C50 1            TC       KILLTASK
 1024   REF   2  LAST  531   24,3322   55642 1            CAOR     CALLDGCH      KILL WAITLIST FOR NEXT POINT IN PATTERN
 1025   REF   8  LAST  531   24,3323  0 6027 1            TC       CLRADMOD      CLEAR BITS 10 + 15 OF RADMODES
 1026   REF   1              24,3324  3 4765 1            CAF      .5SEC
 1027   REF 145  LAST  531   24,3325  0 4607 1            TC       BANKCALL      WAIT FOR DESIGNATE LOOP TO DIF
 1028   REF  10  LAST  514   24,3326   01736 1            CAOR     DELAYJOB
 1029   RFF   9  LAST  525   24,3327. 0 2751 0            TC       LUNSFCHK      CHECK IF ON LUNAR SURFACE
 1030   REF   1              24,3330  0 3333 1            TC       R24LEM4       YES-DONT DO ATTITUDE MANEUVER
 1031   RFF 146  LAST  531   24,3331  0 4607 1            TC       BANKCALL      CALL R61 TO DO PREFERREO TRACKING
 1032   REF   4  LAST  529   24,3332   46116 0            CADR     R61LEM        ATTITUDE MANEUVER
 1033   REF 110  LAST  530   24,3333  3 4746 0  R24LFM4   CAF      ZERO          ZERO OUT RAOCAOR (WHICH WAS SET BY
 1034   RFF   2  LAST  233   24,3334  55'303 1            TS       RADCAOR       ENDRADAR WHEN DESIGNATE STOPPED) SO THAT
A1035                                                                            RROESSM  WILL RETURN TO CALLER
 1036   REF   1              24,3335  0 3301 0            TC       R24LEM2       AND GO BACK TO PUT UP V16 N80 OISPLAY
 1037                     24,3336   04120 0  V16N80   VN      01680
```

```
R1038    PREFERRED TRACKING ATTITUDE ROUTINE R61LEM
R1039    PROGRAM DESCRIPTION
R1040    MOD NO : 3                          DATE : 4-11-67
R1041    MOD BY : P VOLANTE  SDC


R1042    FUNCTIONAL DESCRIPTION-
R1043      TO COMPUTE THE PREFERRED TRACKING ATTITUDE OF THE LM TO ENABLE RR
R1044    TRACKING OF THE CSM AND TO PERFORM THE MANEUVER TO THE PREFERRED
R1045    ATTITUDE.
R1046    CALLING SEQUENCE-
R1047              TC      BANKCALL
R1048              CADR    R61LEM
R1049    SUBROUTINES CALLED
R1050        LPS20.1         VECPOINT
R1051        KALCMAN3


R1052    NORMAL EXIT MODES-
R1053      NORMAL RETURN IS TO CALLER + 1
R1054    ALARM OR ABORT EXIT MODES-
R1055      TERMINATE P20 + R61 BY BRANCHING TO P20END IF BOTH TRACKFLAG +
R1056    RENDEZVOUS FLAG ARE NOT SET.
R1057    OUTPUT -
R1058      SEE OUTPUT FOR LPS20.1 + ATTITUDE MANEUVER ROUTINE (R60)
R1059    ERASABLE INITIALIZATION REQUIRED
R1060      GENRET USED TO SAVE Q FOR RETURN
R1061    FLAGS SET + RESET
R1062      3AXISFLG
R1063    DEBRIS
R1064      SEE SUBROUTINES
 1065    REF   1                23,2000                       SETLOC R61
 1066                           23,2116                       BANK
 1067    REF  18  LAST  527     E7,1456                       EBANK= LOSCOUNT
 1068    REF   1                                              COUNT* $$/R61
 1069    REF   4  LAST  492     23,2116  0 4636 0  R61LEM     TC     MAKECADR
 1070    REF   2  LAST  528     23,2117  55'142 0             TS     GENRET
 1071    REF  33  LAST  530     23,2120  0 5506 1             TC     UPFLAG            SET R61 FLAG
 1072    REF   1                23,2121   00024 1             ADRES  R61FLAG
 1073    REF   1                23,2122  0 2152 0             TC     R61C+L02
 1074    REF   5  LAST  533     23,2123  0 4636 0  R65LEM     TC     MAKECADR
 1075    REF   3  LAST  533     23,2124  55'142 0             TS     GENRET
 1076    REF  49  LAST  530     23,2125  0 5520 0             TC     DOWNFLAG          RESET R61 FLAG
 1077    REF   2  LAST  533     23,2126   00024 1             ADRES  R61FLAG
 107702  REF  51  LAST  528     23,2127  3 4727 1             CA     BIT14             RESET AGS CODE WORD (=20000).  DON'T USE
 107704  REF   5  LAST  524     23,2130  55'073 0             TS     AGSCODE             PGNCS DOWNLINKED RADAR DATA.
 1078    REF  25  LAST  531     23,2131  0 5355 1  R61C+L01   TC     PHASCHNG          RESTARTS DURING OR AFTER R65 WILL
 10782                          23,2132   04022 0             OCT    04022                RETURN HERE.
 10784   REF  25  LAST  483     23,2133  3 4741 1             CAF    BIT4              BYPASS RADAR READING IF DATA
 1079                           23,2134  0 0006 1             EXTEND                   GOOD NOT PRESENT
```

```
1080   REF  10  LAST 520   23,2135  02 033 0             RAND    CHAN33
1081   REF 164  LAST 524   23,2136  10 000 0             CCS     A
1082   REF   2  LAST 533   23,2137  1 2152 1             TCF     R61C+L02        NO DATA GOOD
1085   REF 147  LAST 531   23,2140  0 4607 1             TC      BANKCALL        READ RR RANGE AND ROOT
1086   REF   3  LAST 523   23,2141   53072 1             CADR    RRRDOT           EVERY R65 PASS (3 TIMES
1087   REF 148  LAST 534   23,2142  0 4607 1             TC      BANKCALL         BEFORE FIRST MARK, ONCE
1088   REF   7  LAST 525   23,2143   17733 0             CADR    RADSTALL         DURING ANY MARK PROCESSING,
1089                       23,2144  12 145 1             NOOP
1090   REF 149  LAST 534   23,2145  0 4607 1             TC      BANKCALL
1091   REF   2  LAST 506   23,2146   53074 1             CADR    RRRANGE
1092   REF 150  LAST 534   23,2147  0 4607 1             TC      BANKCALL
1093   REF   8  LAST 534   23,2150   17733 0             CADR    RADSTALL
1094                       23,2151  12 152 1             NOOP
1097   REF  13  LAST 521   23,2152  3 4740 0  R61C+L02   CAF     TRACKBIT        TRACKFLAG
1098   REF  36  LAST 520   23,2153  7 0075 1             MASK    STATE +1
1099                       23,2154  0 0006 1             EXTEND
1100   REF   1             23,2155  1 2312 1             BZF     R65WAIT         NOT SET
1101   REF  46  LAST 527   23,2156  0 6060 1  R61C+L03   TC      INTPRET
1102                       23,2157   77775 1             VLOAD
1103   REF   4  LAST 503   23,2160   06477 0                     HIUNITZ
1104   REF  21  LAST 498   23,2161   03765 0             STORE   SCAXIS          TRACK AXIS UNIT VECTOR
1105                       23,2162   43234 0  R61LEM1    RTB     DAD
1106   REF  12  LAST 527   23,2163   21603 1                     LOADTIME        EXTRAPOLATE FORWARD TO CENTER
1107   REF   1             23,2164   15712 1                     3SECONDS        SIX SECOND PERIOD.
1108   REF  15  LAST 526   23,2165   34041 0             STCALL  TDEC1
1109   REF   4  LAST 526   23,2166   51337 1                     LPS20.1         LOS DETERMINATION + VEH ATTITUDE
1110                       23,2167   77775 1             VLOAD
1111   REF   2  LAST 106   23,2170   01101 0                     RRTARGET
1112   REF   6  LAST 496   23,2171   03773 1             STORE   POINTVSM
1113                       23,2172   45034 1             RTB     CALL               GET DESIRED CDU'S FOR VECPNT1
1114   REF   1             23,2173   46320 1                     READCDUD
1115   REF   1             23,2174   56032 0                     VECPNT1         COMPUTES FINAL ANGLES FROM PRESENT CDUDS
1116   REF   8  LAST 492   23,2175   00322 1             STORE   CPHI            STORE FINAL ANGLES - CPHI,CTHETA,CPSI
1117                       23,2176   77776 1             EXIT
1120   REF  14  LAST 534   23,2177  3 4740 0             CAF     TRACKBIT         IS TRACK FLAG SET
1121   REF  26  LAST 522   23,2200  7 0075 1             MASK    FLAGWRD1
1122                       23,2201  0 0006 1             EXTEND
1123   REF   2  LAST 534   23,2202  1 2312 1             BZF     R65WAIT
1124   REF 151  LAST 534   23,2203  0 4607 1             TC      BANKCALL
1125   REF   2  LAST 489   23,2204   54267 0             CADR    G+N,AUTO        CHECK FOR AUTO MODE
1126   REF 165  LAST 534   23,2205  10 000 0             CCS     A
1127   REF   1             23,2206  0 2300 0             TC      R61C+L04        NOT IN AUTO
1128   REF  47  LAST 534   23,2207  0 6060 1             TC      INTPRET
1129                       23,2210   45175 0             VLOAD   CALL
1130   REF   3  LAST 534   23,2211   01101 0                     RRTARGET
1131   REF   1             23,2212   47640 0                     CDU*SMNB
1132                       23,2213   45345 1             DLOAD   DSU             GET PHI - ARCCOS OF Z-COMPONENT OF LOS
1133   REF 243  LAST 521   23,2214   00162 1                     MPAC +5
1134   REF   1             23,2215   06316 0                     COS15DEG
1135                       23,2216   77440 1  R61LEM2    BMN     EXIT            BRANCH - PHI > 15 DEGREES
```

```
 1136   REF   1               23,2217   46234 0                  R61C+L05         PHI GRE 10DEG
 1137   REF  12  LAST  381    E6,1634                   EBANK=   CDUXD
 1138   REF   4  LAST  306    23,2220  3 5006 1         CAF      EBANK6
 1139   REF  19  LAST  475    23,2221  54 003 0         TS       EBANK
 1140                         23,2222  0 0004 0         INHINT
 1141                         23,2223  0 0006 1         EXTEND
 1142   REF   9  LAST  534    23,2224  3 0322 1         DCA      CPHI
 1143   REF  13  LAST  535    23,2225  53'635 1         DXCH     CDUXD
 1144   REF   4  LAST  493    23,2226  3 0323 0         CA       CPSI
 1145   REF   5  LAST  381    23,2227  55'636 1         TS       CDUZD
 1146                         23,2230  0 0003 1         RELINT
 1147   REF  19  LAST  533    E7,1456                   EBANK=   LOSCOUNT
 1148   REF   3  LAST  399    23,2231  3 5007 0         CAF      EBANK7
 1149   REF  20  LAST  535    23,2232  54 003 0         TS       EBANK
 1150   REF   1               23,2233  0 2257 0         TC       R61C+L06
 1151                         23,2234   77776 1 R61C+L05 EXIT
 1152                         23,2235  0 0004 0         INHINT
 1153   REF  19  LAST  528    23,2236  0 4665 0         TC       IBNKCALL
 1154   REF   3  LAST  375    23,2237   40154 0         FCADR    ZATTEROR
 1155   REF  20  LAST  535    23,2240  0 4665 0         TC       IBNKCALL
 1156   REF   2  LAST  528    23,2241   40141 1         FCADR    SETMINDB         REDUCE ATTITUDE ERROR
 1157   REF  50  LAST  533    23,2242  0 5520 0         TC       DOWNFLAG
 1158   REF   5  LAST  500    23,2243   00124 0         ADRES    3AXISFLG
 1159   REF  34  LAST  533    23,2244  0 5506 1         TC       UPFLAG
 1160   REF   2  LAST  490    23,2245   00114 0         ADRES    PDSPFLAG         SET PRIORITY DISPLAY FLAG
 1161   REF 152  LAST  534    23,2246  0 4607 1         TC       BANKCALL
 1162   REF   3  LAST  500    23,2247   54125 0         CADR     R60LEM
 1163                         23,2250  0 0004 0         INHINT
 1164   REF  21  LAST  535    23,2251  0 4665 0         TC       IBNKCALL
 1165   REF   5  LAST  528    23,2252   40115 0         FCADR    RESTORDB
 1166   REF  26  LAST  533    23,2253  0 5355 1         TC       PHASCHNG
 1167                         23,2254   04022 0         OCT      04022
 1168   REF  51  LAST  535    23,2255  0 5520 0         TC       DOWNFLAG
 1169   REF   3  LAST  535    23,2256   00114 0         ADRES    PDSPFLAG         RESET PRIORITY DISPLAY FLAG
 1170   REF  27  LAST  534    23,2257  3 0075 0 R61C+L06 CA       FLAGWRD1
 1171   REF   1               23,2260  7 4733 0         MASK     R61FLBIT
 1172   REF 166  LAST  534    23,2261  10 000 0         CCS      A
 1173   REF   1               23,2262  0 2303 0         TC       R61C+L4
 1174   REF   4  LAST  523    23,2263  11'745 1         CCS      R65CNTR
 1175                         23,2264  0 2266 1         TC       +2
 1176   REF   2  LAST  535    23,2265  0 2303 0         TC       R61C+L4          R65CNTR = 0 - EXIT ROUTINE
 1177   REF   5  LAST  535    23,2266  55'745 1         TS       R65CNTR
 1178   REF   1               23,2267  3 2317 0         CAF      06SEC
 1179   REF   9  LAST  519    23,2270  0 5175 1         TC       TWIDDLE
 1180   REF   1               23,2271   02273 0         ADRES    R61C+L2
 1181   REF  87  LAST  529    23,2272  0 5146 1         TC       ENDOFJOB
 1182   REF   8  LAST  527    23,2273  3 7735 1 R61C+L2  CAF      PRIO26
 1183   REF  21  LAST  527    23,2274  0 5076 0         TC       FINDVAC
 1184   REF  20  LAST  535    E7,1456                   EBANK=   LOSCOUNT
 1185   REF   1               23,2275   02131 0         2CADR    R61C+L01
 1185   REF   1               23,2276   46067 1
 1186   REF  22  LAST  527   23,2277  0 5263 0             TC      TASKOVER
 1187   REF 153  LAST  535   23,2300  0 4607 1  R61C+L04  TC      BANKCALL        TO CONVERT ANGLES TO FDAI
 1188   REF   4  LAST  489   23,2301   54300 0             CADR    BALLANGS
 1189   PEF   2  LAST  535   23,2302  0 2257 0             TC      R61C+L06
 1190   REF   4  LAST  533   23,2303  31'142 1  R61C+L4   CAE     GENRET
 1191   REF   8  LAST  494   23,2304  1 4631 0             TCF     BANKJUMP        EXIT R61
 1192   REF   1              23,2305  3 2314 0  R61C+L1   CAF     BIT7+9PV        IS RENDEZVOUS OR P25FLAG SET
 1193   REF  37  LAST  534   23,2306  7 0074 0             MASK    STATE
 1194                        23,2307  0 0006 1             EXTEND
 1195   REF  88  LAST  535   23,2310  1 5146 0             BZF     ENDOFJOB        NO-EXIT ROUTINE AND PROGRAM.
 1196   REF   3  LAST  536   23,2311  0 2257 0             TC      R61C+L06        YES EXIT ROUTINE
 1197   REF  37  LAST  484   23,2312  0 4626 1  R65WAIT   TC      POSTJUMP
 1198   REF   6  LAST, 527   23,2313   50310 0             CADR    P20LEMWT


 1199                        23,2314   C0500 1  BIT7+9PV OCT     00500
 1200                        23,2315   17350 1  COS15DEG 2DEC    0.96593 B-1
 1200                        23,2316   34602 1
 1201                        23,2317   01130 1  06SEC    DEC     600
 1202                           0024            PHI      EQUALS  20D
 1203                        23,2320  0 0004 0  READCDUD INHINT                  READS DESIRED CDU'S AND STORES IN
 1204   REF   5  LAST  535   23,2321  3 5006 1           CAF     EBANK6          MPAC TP EXITS WITH MODE SET TO TP
 1205   RFF  21  LAST  535   23,2322  56 C03 1           XCH     EBANK
 1206   REF  16  LAST  234   23,2323  54 C70 1           TS      RUPTREG1
 1207   REF  14  LAST  535   E6,1634                     EBANK=  CDUXD
 1208   REF  15  LAST  536   23,2374  3 1634 1           CA      CDUXD
 1209   REF 244  LAST  534   23,2325  54 154 0           TS      MPAC
 1210                        23,2326  0 CC06 1           EXTEND
 1211   REF   6  LAST  381   23,2327  3 1636 0           DCA     CDUYD
 1212   REF 245  LAST  536   23,2330  52 156 1           DXCH    MPAC +1
 1213   REF  17  LAST  536   23,2331  3 CC70 0           CA      RUPTREG1
 1214   REF  22  LAST  536   23,2332  54 003 0           TS      EBANK
 1215                        23,2333  0 CC03 1           RELINT
 1216   REF   1              23,2334  1 6520 1           TCF     TMODE
 1217                           4503                     BLOCK   02
 1218   REF   1                 4000                     SETLOC  RADARFF
 1219                           4503                     BANK

 1220   PEF  21  LAST  535   E7,1456                     EBANK=  LOSCOUNT
 1221   REF   1                                          COUNT*  $$/RRSUB
```

```
P1222   THE FOLLOWING SUBROUTINE RETURNS TO CALLER + 2 IF THE ABSOLUTE VALUE OF VALUE OF C(A) IS GREATER THAN THE
R1224   NEGATIVE OF THE NUMBER AT CALLER +1. OTHERWISE IT RETURNS TO CALLER +3. MAY BE CALLED IN RUPT OR UNDER EXEC.

 1226                              4503  0 0006 1  MAGSUB   EXTEND
 1227                              4504  6 4506 0           BZMF    +2
 1228                              4505  1 4507 0           TCF     +2
 1229                              4506  4 0000 0           COM

 1230   REF 150  LAST  531         4507  50 002 0           INDEX   Q
 1231                              4510  6 0000 1           AD      0
 1232                              4511  0 0006 1           EXTEND
 1233   REF   1                    4512  6 6762 1           BZMF    Q+2              ABS(A) <= CONST  GO TO L+3
 1234   REF   4  LAST  489         4513  1 6760 1           TCF     Q+1              ABS(A) >  CONST  GO TO L+2
```

```
P1235    PROGRAM NAME_  RRLIMCHK                                           ARE IN THE LIMITS OF THE CURRENT MODE.

R1237    FUNCTIONAL DESCRIPTION_
R1238    RRLIMCHK CHECKS RR DESIRED GIMBAL ANGLES TO SEE IF THEY ARE WITHIN
R1239    THE LIMITS OF THE CURRENT MODE. INITIALLY THE DESIRED TRUNNION AND
R1240    SHAFT ANGLES ARE STORED IN ITEMP1 AND ITEMP2. THE CURRENT RR
R1241    ANTENNAE MODE (RADMODES BIT 12) IS CHECKED WHICH IS = 0 FOR
R1242    MODE 1 AND =1 FOR MODE 2.
R1243    MODE 1 - THE TRUNNION ANGLE IS CHECKED AT MAGSUB TO SEE IF IT IS
R1244    BETWEEN -55 AND +55 DEGREES. IF NOT, RETURN TO L +2. IF WITHIN LIMITS,
R1245    THE SHAFT ANGLE IS CHECKED TO SEE IF IT IS BETWEEN -70 AND +59 DEGREES.
R1246    IF NOT, RETURN TO L +2. IF IN LIMITS, RETURN TO L +3.
R1247    MODE 2 - THE SHAFT ANGLE IS CHECKED AT MAGSUB TO SEE IF IT IS
R1248    BETWEEN -139 AND -25 DEGREES. IF NOT, RETURN TO L +2. IF WITHIN
R1249    LIMITS, THE TRUNNION ANGLE IS CHECKED TO SEE IF IT IS BETWEEN +125
R1250    AND -125 (+235) DEGREES. IF NOT, RETURN TO L +2. IF IN LIMITS, RETURN
R1251    TO L +3.

R1252    CALLING SEQUENCE:
R1253    L  TC  RRLIMCHK (WITH INTERRUPT INHIBITED)
R1254    L +1  ADRES  T,S  (DESIRED TRUNNION ANGLE ADDRESS)

R1255    ERASABLE INITIALIZATION REQUIRED:
R1256    RADMODES, MODEA, MODEB (OR DESIRED TRUNNION AND SHAFT
R1257    ANGLES ELSEWHERE IN CONSECUTIVE LOCATIONS - UNSWITCHED ERASABLE OR
R1258    CURRENT EBANK).

R1259    SUBROUTINES CALLED_  MAGSUB

R1260    JOBS OR TASKS INITIATED_  NONE

R1261    ALARMS_  NONE

R1262    EXIT_  L + 2 (EITHER OR BOTH ANGLES NOT WITHIN LIMITS OF CURRENT MODE)
R1263    L + 3 (BOTH ANGLES WITHIN LIMITS OF CURRENT MODE)

 1264                               4514  0 0006 1  RRLIMCHK EXTEND
 1265    REF 151  LAST  537         4515  5 0002 0           INDEX  Q
 1266                               4516  5 0000 1           INDEX  0
 1267                               4517  3 0001 0           DCA    0
 1268    REF 152  LAST  538         4520  24 002 0           INCR   Q
 1269    REF   6  LAST  271         4521  52 062 1           DXCH   ITEMP1
 1270    REF 153  LAST  538         4522  22 002 0           LXCH   Q                  L(CALLER +2) TO L.

 1271    REF   2  LAST  335         4523  3 4731 0           CAF    ANTENBIT           SEE WHICH MODE RR IS IN.
 1272    REF  38  LAST  531         4524  7 0110 0           MASK   RADMODES
 1273    REF 167  LAST  535         4525  10 000 0           CCS    A
 1274    REF   1                    4526  1 4541 1           TCF    MODE2CHK

 1275    REF   7  LAST  538         4527  3 0061 0           CA     ITEMP1             MODE 1 IS DEFINED AS
 1276   REF   1                   4530  0 4503 0              TC      MAGSUB               1. ABS(T) L 55 DEGS.
 1277                             4531   66161 1              DEC     -.30555              2. ABS(S + 5.5 DEGS) L 64.5 DEGS
 1278   REF  64   LAST  479       4532  0 0001 0              TC      L                       (SHAFT LIMITS AT +59, -70 DEGS)

 1279   REF   1                   4533  3 4553 0              CAF     5.5DEGS
 1280   REF   3   LAST   97       4534  6 0062 0              AD      ITEMP2          S
 1281   REF   2   LAST  539       4535  0 4503 0              TC      MAGSUB
 1282                             4536   64420 0              DEC     -.35833         64.5 DEGS
 1283   REF  65   LAST  539       4537  0 0001 0              TC      L
 1284   REF   1                   4540  0 4551 1              TC      RRLIMOK         IN LIMITS.

 1285   REF   1                   4541  3 4554 1  MODE2CHK    CAF     82DEGS          MODE 2 IS DEFINED AS
 1286   REF   4   LAST  539       4542  6 0062 0              AD      ITEMP2               1. ABS(T) G 125 DEGS.
 1287   REF   3   LAST  539       4543  0 4503 0              TC      MAGSUB               2. ABS(S + 82 DEGS) L 57 DEGS
 1288                             4544   65673 0              DEC     -.31667                 (SHAFT LIMITS AT -25, -139 DEGS)
 1289   REF  66   LAST  539       4545  0 0001 0              TC      L

 1290   REF   8   LAST  538       4546  3 0061 0              CA      ITEMP1
 1291   REF   4   LAST  539       4547  0 4503 0              TC      MAGSUB
 1292                             4550   51615 1              DEC     -.69444         125 DEGS

 1293   REF  67   LAST  539       4551  50 001 0  RRLIMOK     INDEX   L
 1294   REF  68   LAST  539       4552  0 0001 0              TC      L               ( = TC 1)

 1295                             4553   00765 0  5.5DEGS     DEC     .03056
 1296                             4554   16450 1  82DEGS      DEC     .45556
```

```
P1297    PROGRAM NAME_  SETTRKF                                                          . IF EITHER:

R1299    FUNCTIONAL DESCRIPTION_
R1300    SETTRKF UPDATES THE TRACKER FAIL LAMP ON THE DSKY.                              HER THE ALT OR VEL INFORMATION.
R1302    INITIALLY THE LAMP TEST FLAG (IMODES33 BIT 1) IS CHECKED.
R1303    IF A LAMP TEST IS IN PROGRESS, THE PROGRAM EXITS TO L +1.
R1304    IF NO LAMP TEST THE FOLLOWING IS CHECKED SEQUENTIALLY_
R1305    1) RR CDU:S BEING ZEROED, RR CDU OK, AND RR NOT IN
R1306    AUTO MODE (RADMODES BITS 13, 7, 2).
R1307    2) LR VEL DATA FAIL AND NO LR POS DATA (RADMODES BITS
R1308    8,5)
R1309    3) NO RR DATA (RADMODES BIT 4)
R1310    THE ABSENCE OF ALL THREE SIMULTANEOUSLY IN (1), THE PRESENCE OF BOTH
R1311    IN (2), AND THE PRESENCE OF (3) RESULTS IN EITHER THE TRACKER FAIL
R1312    LAMP (DSPTAB +11D BIT 8) BEING TURNED ON OR LEFT ON. OTHERWISE,
R1313    THE TRACKER FAIL LAMP IS TURNED OFF OR IS LEFT OFF. THEREFORE, THE
R1314    TRACKER FAIL LAMP IS TURNED ON IF_
R1315    A ) RR CDU FAILED WITH RR IN AUTO MODE AND RR CDU:S NOT BEING ZEROED.
R1316    B) N SAMPLES OF LR DATA COULD NOT BE TAKEN IN 2N TRIES WITH
R1317    EITHER THE ALT OR VEL INFORMATION
R1318    C) N SAMPLES OF RR DATA COULD NOT BE OBTAINED FROM 2N TRIES
R1319    WITH EITHER THE AL

R1320    CALLING SEQUENCE:
R1321    L  TC  SETTRKF

R1322    ERASABLE INITIALIZATION REQUIRED: IMODES33, RADMODES, DSPTAB +11D
R1323    SUBROUTINES CALLED_  NONE

R1324    JOBS OR TASKS INITIATED_  NONE

R1325    ALARMS_  TRACKER FAIL LAMP

R1326    EXIT_  L +1 (ALWAYS)                                                            ED.

 1328    REF  27  LAST  432      4555  3 4744 1  SETTRKF  CAF     BIT1                   NO ACTION IF DURING LAMP TEST.
 1329    REF  32  LAST  485      4556  7 1300 1           MASK    IMODES33
 1330    REF 168  LAST  538      4557  10 000 0           CCS     A
 1331    REF 154  LAST  538      4560  0 0002 0           TC      Q

 1332    REF  25  LAST  346      4561  3 4735 1  RRTRKF   CA      BIT8
 1333    REF  69  LAST  539      4562  54 001 1           TS      L

 1334    REF   2  LAST  196      4563  3 4606 0           CAF     13,7,2                 SEE IF CDU FAILED.
 1335    REF  39  LAST  538      4564  7 0110 0           MASK    RADMODES
 1336                            4565  0 0006 1           EXTEND
 1337    REF   1                 4566  1 4572 1           BZF     TRKFLON                CONDITION 3 ABOVE.

 1338    REF   1                 4567  3 4741 1  RRCHECK  CAF     RRDATABT               SEE IF RR DATA FAILED.
 1339    REF  40  LAST  540      4570  7 0110 0           MASK    RADMODES
 1340    REF 169  LAST  540      4571  10 000 0                  CCS      A
 1341    REF  7C  LAST  540      4572  3 0001 0  TRKFLON         CA       L
 1342    REF  46  LAST  486      4573  6 1035 0                  AD       DSPTAB +11D      HALF ADD DESIRED AND PRESENT STATES.
 1343    REF  71  LAST  541      4574  7 0C01 1                  MASK     L
 1344                            4575  0 0006 1                  EXTEND
 1345    REF   4  LAST  286      4576  1 6763 1                  BZF      TCQ              NO CHANGE.

 1346    REF  47  LAST  541      4577  3 1035 0  FLIP            CA       DSPTAB +11D      CANT USE LXCH DSPTAB +11D (RESTART PROB)
 1347                            4600  0 0006 1                  EXTEND
 1348    REF   8  LAST  227      4601  06 C01 0                  RXOR     LCHAN
 1349    REF  11  LAST  447      4602  7 4724 0                  MASK     POSMAX
 1350    REF  32  LAST  524      4603  6 4726 0                  AD       BIT15
 1351    REF  48  LAST  541'     4604  55'035 1                  TS       DSPTAB +11D
 1352    REF 155  LAST  540      4605  0 0002 0                  TC       -Q

 1353                            4606   10102 0  13,7,2          OCT      10102
 1354                            4607            FNDRMODF        EQUALS
```

MIT CHARLES STARK DRAPER LABORATORY
THE DIGITAL ENTOMOLOGIST

"Semper Heteroptera Softwaris"

No. 30 October 1972

TABLE OF CONTENTS

I. GPSS: A Simulation Program 1

II. Notes from Operations 2

III. New Version of VTOCLIST. 4

IV. General Least Square, Least Power and Chebyshev Function Fitting MAC Subroutines for Discrete Point Sets 5

V. New Version of CalComp PLOTS Routine 6

VI. Calling FORTRAN Subroutines from MAC Programs 8

VII. AUTOFLOW 9

VIII. DCG Memo No. 449A: Selective Printing Facility for TSOLIST . . 10

IX. Notes from the Consulting Office 12

X. TSO Notes 13

XI. Alternate Form of the IDENTIFY SVC Parameter List 16

EYLES, DONALD E.
DL7-238C
MAIL STATION 64

EDITOR's NOTES: All persons having information useful to others, whether it be a sentence, paragraph, or page(s) are urged to submit it to M. Pennell (DL 7-116B). Our publication dates are flexible (i.e., whenever we have contributions). If you are not on our mailing list, see Martha Pennell (DL 7-116B).

GPSS: A Simulation Program

Julia Hsia DL 7-105, Extension 8-1156

GPSS, a simulation language for discrete modeling, is an IBM program product which we would like more users to take advantage of. Programmers working on simulations should be aware of its good features and consider using GPSS (General Purpose Simulation System) in their simulation work instead of, for example, FORTRAN which is cumbersome as a general modeling tool. I have gathered much useful material which will help the user get started in GPSS. For example, there is a bibliography on simulation languages in general, including articles in computer journals and several books. In addition, I have lecture notes on a GPSS course with problem sets and their solutions. There are also complete listings of both simple and more sophisticated programs written in GPSS. I'll be glad to show these materials to anyone interested. Hopefully, in a couple of months, I'll give an introductory talk on GPSS. In the meantime, I'll be happy to talk informally with any programmers interested in using GPSS.

* * * *

New Version of VTOCLIST

Richard Tavan DL 7-349, Extension 8-1469

A new version of VTOCLIST is now available with some helpful features:

1. Any DD card that does not specify a DSNAME will result in a normal VTOC being printed. The EXEC card parameters PDS, MAP, and DUMP will be handled normally. DDnames JOBLIB, STEPLIB, SYSUDUMP, SYSABEND, SYSPRINT and SYSIN will be ignored. Therefore, it is not necessary for DDnames to begin "VOL".

2. If a valid DD card specified DSN=PDSNAME, a VTOC will be printed listing only the specified PDS and its members, regardless of EXEC card parameters. This is very useful when you wish to inspect the condition of a volume and of a single PDS without expanding the PDS directories of everyone else's datasets.

3. Any characters other than PDS, MAP, or DUMP in the PARM field are assumed to be a DDname indicating a request to process only a specific volume on the single DD card with that name. This is useful when you wish to CALL or LINK the VTOCLIST from another program which is using voluminous JCL.

To use the new program, specify in your JCL:

```
// stepname         EXEC PGM=VTOCLIST,PARM='parameters'
// STEPLIB          DD   DSN=DIGDEV.OLLS.LOAD,DISP=SHR
// SYSPRINT         DD   SYSOUT=A
// ddnamea          DD   VOL=SER=serial,UNIT=UNIT,DISP=SHR
                                         (lists entire volume)
                    .
                    .
                    .
// ddnamez          DD   DSN=pdsname, DISP=SHR
                                      (lists pds members only)
```

* * * *

General Least Square, Least Power and Chebyshev Function Fitting MAC Subroutines for Discrete Point Sets

William M. Robertson DL 7-204, Extension 8-1263

It is frequently desired to approximate a function f(X), which may only be known in the form of tabular data, by a linear combination of several appropriately chosen functions $\phi_i(X)$:

$$F(X) \approx \sum_{I=0}^{M} C_i \ \phi_i(X)$$

Three MAC programs are now available which for arbitrary "fitting" functions $\phi_i(X)$ specified by the user will determine the coefficients C_i such that the above approximation is "best" over a finite set of points A_o, X_1, X_2, . . ., X_N in the sense of (1) weighted least squares, (2) unweighted least powers, or (3) Chebyshev (minimax).

23A SGA Memorandum No. 4-72 provides a description of the call and resume lists and the preliminary data-file initializations required for the use of these three MAC subroutines which are named WMR.LEASTSQR, WMR.LEASTPWR and WMR.CHEBSHEV. Copies of this memorandum are available from its author, Bill Robertson, Extension 8-1263.

* * * *

New Version of CalComp PLOTS Routine

David A. Lynde DL 7-116B, Extension 8-1147

On August 28, a new version of the CalComp-FPLOT interface routine, PLOTS, was placed in the CalComp plotting routine library, SYS1.CCPLTLIB, and the cataloged procedures FORTPCLG and FORTPLG were altered to reflect changes in the new version of PLOTS. This routine contains the entry points: PLOTS, FACTOR, OFFSET, WHERE, and PLOT.

Several improvements were made in the new version. The maximum length of a single FPLOT frame has been extended from 60 inches to 240 inches to facilitate job setups more compatible with outside installations. Several changes were made which allow calls to close the plot data set (call PLOT (x,y,999)) to be followed by subsequent PLOT calls. In such cases, the subsequent PLOT calls constitute a new plot "job". This feature should be used sparingly since such a job setup may not work at outside installations. It might be used for "saving" plot output in extremely long runs, however. The single user code previously issued in cases of abnormal termination within PLOTS has been replaced by a separate user code for each cause of abnormal termination. The user codes which may be issued by PLOTS are listed below with an explanation of the condition which caused the abnormal termination to be taken.

200x

Return code issued by DELETE macro when deleting FPLOT non-zero x=DELETE return code (decimal). (At present, the only non-zero return code issued by the DELETE macro is 4.)

3000 + x

Return code issued by FPLOT non-zero x = FPLOT return code (decimal).

40xx

Return code issued by IDENTIFY macro when identifying MCLINK non-zero xx = IDENTIFY return code (decimal) $0 \leq xx \leq 32$.

4092

Invalid MACLINK function code (the acceptable codes (presented to MACLINK in general register 8) are 8 for "file read scalar" and 12 for "set file read".)

4093

No PLOTxxxx DD statement in step.

4094

Excessive number of PLOTS, FACTOR, OFFSET, WHERE, or PLOT parameter list entries.

4095

Missing or incomplete PLOTS, OFFSET, WHERE, or PLOT parameter list.

Changes were made in the method of PLOTS-FPLOT linkage. One result of this change is that programs containing calls to the CalComp plotting routines may now be brought into main storage for execution by non-standard means, such as the PLAN (Problem Language ANalyzer) loader.

* * * *

Calling FORTRAN Subroutines from MAC Programs

David A. Lynde DL 7-116B, Extension 8-1447

DCG Memorandum No. 179 (available from Rita Asare, DL 7-107, Extension 8-1445) explains the procedure to be followed in calling FORTRAN subroutines from within MAC programs. A number of MAC programmers have recently tried to implement this procedure and have had some difficulty understanding the memorandum.

An extensively annotated sample job, which illustrates how a FORTRAN subroutine is called from a MAC program, is now available for examination in the Consulting Office (DL 7-116, Extension 8-1107). This sample job employs one of the routines in the FORTRAN Scientific Subroutine Package to find the roots of an n-th order polynominal. The listings include all the required JCL, MAC, and FORTRAN statements and include the computational results.

* * * *

AUTOFLOW

David Crocker DL 7-127, Extension 8-1383

AUTOFLOW, an automatic flowcharting program for BAL, FORTRAN and PL/I, has been installed on our IBM 360/75. A seminar on AUTOFLOW is planned for early in October — exact time and date to be announced. Meanwhile, if you would like to try AUTOFLOW on one of your programs, use the following JCL.

BAL

```
//       JOB . . .REGION=150K,TIME=1
//       EXEC AUTOFLOW
//SYSIN  DD  *
*        ASSEMBLY
FOLLOWED BY YOUR BAL PROGRAM
```

FORTRAN

```
//       JOB . . .REGION=150K,TIME=1
//       EXEC AUTOFLOW
//SYSIN  DD  *
*        FORTRAN
FOLLOWED BY YOUR FORTRAN PROGRAM
```

PL/I

```
//       JOB . . .REGION=150K,TIME=1
//       EXEC AUTOFLOW
//SYSIN  DD  *
*        PLI
FOLLOWED BY YOUR PL/I PROGRAM
```

Note that the "*" preceding the language type must be in Column one.

* * * *

DCG Memo No. 449A: Selective Printing Facility for TSOLIST

Nicholas Pippenger DL 7-105, Extension 8-1156

The program TSOLIST (which is usually invoked through the cataloged procedure TLIBLIST) has been furnished with a facility for selective printing. Formerly, this program printed all datasets (except those, such as load modules, which are unprintable) in the catalog or catalogs specified by the PARM field (or the ID parameter of the cataloged procedure). This mode of operation remains available while a new one, in which the datasets to be printed are specified in a SYSIN dataset, has been added. For a complete description, see DCG Memorandum 449A.

Here are a few examples of the use of the new facility. The general form of the job step is as follows.

```
//       EXEC TLIBLIST
//SYSIN   DD   *
  control cards
/*
```

Examples of the control cards are as follows. To print all datasets from the index NJP1156:

```
NJP1156.@*
```

To print the catalog structure and partitioned dataset directories from the index NJP1156 (but not the datasets or members themselves):

```
NJP1156
```

To print the sequential datasets NJP1156.SORT.ASM and NJP1156.MERGE.ASM:

```
NJP1156.<SORT|MERGE>.ASM
```

To print all the members in the partitioned dataset NJP1156.MACRO.ASM:

```
NJP1156.MACRO.ASM(@)
```

To print the members READ and WRITE in the partitioned dataset NJP1156.MACRO.ASM:

```
NJP1156.MACRO.ASM(<READ|WRITE>)
```

To print all sequential datasets and partitioned dataset members from the index NJP1156 having names which do not contain ASM:

```
NJP1156.@*&¬<@*.ASM.@*>
```

As a final example, to print all MAC saved symbolic decks with MAC names beginning NJP1156:

```
MACSYMB.NJP1156.@
```

Because of the size of the MAC catalog, this last example will require a region of at least 130K.

* * * *

Notes from the Consulting Office

Martha Pennell DL 7-116B, Extension 8-1107

I. Consulting Office

The Consulting Office DL 7-116, Extension 8-1107, is open from nine to noon and one to five Mondays through Fridays. Users with problems are asked to visit (or call) there first before consulting with other DCG personnel.

II. CAMLST Changes in OS Release 21

In about a month, it is expected that Release 21 of the Operating System will be installed on our machine. In this new release, IBM has made a change in the special system macros CAMLST, LOCATE, OBTAIN, INDEX, CATALOG, RENAME, SCRATCH and the related SVC routines. Any users having programs utilizing these facilities should contact the Consulting Office (DL 7-116, Extension 8-1107) as soon as possible.

III. Calling CalComp Routines from PL/1

DCG Memorandum No. 450 by Kathy Lloyd discusses the use of the CalComp plotting routines via PL/1. Copies of this memorandum are available from Rita Asare, Extension 8-1445.

IV. Index to DCG Memoranda and Entomologist Articles

DCG Memorandum No. 434A is an index to articles of general interest. Copies of this memorandum are available from Rita Asare, Extension 8-1445.

V . Change in Definition of FORTRAN Real Constant

FORTRAN programmers should be aware of the revision in the definition of basic real constant (i.e., floating point single precision) found on page 13 of IBM FORTRAN IV language manual GC28-6515-8. Previously, a real constant of more than seven digits was automatically double precision. Since Release 20 such constants are treated as single precision (i.e., effectively truncated) unless a D exponent is appended. This information was obtained via the courtesy of the MIT/IPC newsletter "The Bulletin".

* * * *

TSO Notes

TSO Users

1. Shutdown

Effective Monday, September 18, for at least the next two weeks, TSO will be shut down at 7:30 p.m.

Donated by: Joe Mori

2. "IEU999I Assembly Terminated . . . WRNG.LEN.RECORD"

This message was obtained after using the ASM TSO command with the LIB option. The reason for the above message is the following. The LIB option allows user datasets to be scanned for a macro instruction or a COPY command ahead of the standard system macro library SYS1.MACLIB (if the keyword MACLIB is specified either explicitly or by default). In other words, SYS1.MACLIB is concatenated onto the user libraries. A problem arises however, in that the system uses the blocksize of the first concatenated dataset as the size of the user I/O buffer. Thus, if the blocksize of any subsequent concatenated dataset is larger than the blocksize of the first and if the user program reads a record from such a subsequent dataset, then the assembly will terminate with the above message. Users should note that SYS1.MACLIB has a blocksize=3520; consequently, to avoid the above problem, the blocksize of your LIB library must be >=3520.

Donated by: Sheff Bryant

3. Data Set Migration

The current policy is the following: unused TSO files will remain on disk for approximately one month and then they will be migrated to tape to remain there for approximately an additional four months at which time they will be removed permanently. Use the "RECOVER" command to restore migrated datasets to disk and the "VANISH" command to delete datasets migrated to tape (type 'HELP RECOVER' or 'HELP VANISH' for details).

DCG is currently investigating alternating methods which will allow long-term retention of user files on tape.

Donated by: Gary Vining

4. Anomaly in "FORTGC filename," Command

FORTGC is a TSO command (DCG Memorandum No. 427) to compile FORTRAN programs. It has two operands: the first is the filename, the second directs output either to the terminal (*) or to a data set. If the terminal (*) option is used, because of an anomaly in the structure of the CLIST command, TSO looks for a /* (i.e., an end-of-file) from the terminal. So if the terminal seems "to die" in the middle (or at the end of) your FORTRAN printout and if READY is not forthcoming, type /* followed by a carriage return.

Donated by: Martha Pennell

5. Write-to-Programmer Messages Unavailable under TSO

Under the current release, the write-to-programmers messages are unavailable. The practical effect of this restriction is that if the TSO user has forgotten to allocate his file(s) before running his program, he will receive no error message(s). In contrast, under batch, the user receives the message "...ddstatement missing" in his JCL messages.

Donated by: Martha Pennell

6. How To Run a FORTRAN Program Without Recompiling

The following commands are typical of those used to run a FORTRAN program under TSO without recompiling each time. (There are several other variations that will work also.) Assume F2 is a filename containing FORTRAN source code.

a.

```
FORTGC F2,*
```

(See DCG Memorandum No. 427)

b.

```
ALLOC DA(FORT.LOAD) NEW SPACE (5,5) BLOCK(7294) DIR(5)
```

This allocates space for a pds library to contain your load module; thus, step need be done only once — your library can hold several load modules. FORT.LOAD is an arbitrary name.

c.

```
LINK F2.OBJ LOAD(FORT.LOAD(F2))FORTLIB LIB('SYS1.FORTSSP')
```

This takes your object module (created under step (a)) and link edits it into a load module named F2 (this is arbitrary) and places the load module into the library FORT.LOAD which you allocated in step (b).

d.

```
ALLOCATE DATASET(*) FILE (FT06F001)
ALLOCATE DATASET (*) FILE (FT05F001)
```

This allocates unit reference numbers 5 and 6 to the terminal, i.e., your input and output will be from the terminal if you have used the standard unit reference numbers. If you forget to do this step, you will receive no error messages (contrary to batch). See comments under item 5 above.

e.

```
CALL FORT.LOAD(F2)
```

This command executes your program. At your next console session, you need only repeat steps (d) and (e).

Donated by: Martha Pennell

* * * *

Alternate Form of the IDENTIFY SVC Parameter List

David A. Lynde DL 7-116B, Extension 8-1447

DCG Memorandum No. 541 describes an alternate form of the IDENTIFY SVC parameter list which can be used in certain circumstances which preclude the use of the standard form of the parameter list.

When this alternate form of the parameter list is used, the IDENTIFY SVC can be used within a program brought into main storage by some non-standard means, such as by the PLAN loader. In addition, when the alternate form is used, the IDENTIFY SVC creates a major CDE, rather than a minor CDE. This major CDE is removed from the contents directory when the named module is deleted by the DELETE SVC. (A minor CDE can only be removed from the contents directory by removing its "owning" major CDE.)

The alternate form of the parameter list described in DCG Memorandum No. 451 is not fully described in any IBM document. Copies of the memorandum are available from Rita Asare, DL 7-107, Extension 8-1455.

* * * *

```
P1355     PROGRAM NAME_  RRTURNON

R1356     FUNCTIONAL DESCRIPTION_

R1357     RRTURNON IS THE TURN-ON SEQUENCE WHICH, ALONG WITH
R1358     RRZEROSB, ZEROS THE CDU:S AND DETERMINES THE RR MODE.
R1359     INITIALLY, CONTROL IS TRANSFERRED TO RRZEROSB FOR THE
R1360     ACTUAL TURN-ON SEQUENCE. UPON RETURN THE PROGRAM
R1361     WAITS 1 SECOND BEFORE REMOVING THE TURN-ON FLAG
R1362     (RADMODES BIT1) SO THE REPOSITION ROUTINE WON:T
R1363     INITIATE PROGRAM ALARM 00501. A CHECK IS THEN MADE
R1364     TO SEE IF A PROGRAM IS USING THE RR (STATE BIT 7). IF
R1365     SO, THE PROGRAM EXITS TO ENDRADAR SO THAT THE RR CDU
R1366     FAIL FLAG (RADMODES BIT 7) CAN BE CHECKED BEFORE
R1367     RETURNING TO THE WAITING PROGRAM. IF NOT, THE PROGRAM EXITS
R1368     TO TASKOVER.

R1369     CALLING SEQUENCE: WAITLIST TASK FROM RRAUTCHK IF THE RR POWER ON AUTO
R1370     BIT (CHAN 33 BIT 2) CHANGES TO 0 AND NO PROGRAM WAS USING
R1371     THE RR (STATE BIT 7).

R1372     ERASABLE INITIALIZATION REQUIRED:
R1373     RADMODES, STATE

R1374     SUBROUTINES CALLED_  RRZEROSB, FIXDELAY, TASKOVER, ENDRADAR

R1375     JOBS OR TASKS INITIATED_
R1376     NONE

R1377     ALARMS_  NONE (SEE RRZEROSB)

R1378     EXIT_  TASKOVER, ENDRADAR (WAITING PROGRAM)

 1379                          24,3337                       BANK    24
 1380     REF   1              25,2000                       SETLOC  P20S1
 1381                          25,2053                       BANK

 1382     REF  22  LAST  536   E7,1456                       EBANK=  LOSCOUNT
 1383     REF   1                                            COUNT*  $$/RSUB
 1384     REF   1              25,2053   0 2062 1  RRTURNON  TC      RRZEROSB
 1385     REF   3  LAST  515   25,2054   0 5223 1            TC      FIXDELAY         WAIT 1 SEC BEFORE REMOVING TURN ON FLAG
 1386                          25,2055    00144 0            DEC     100              SO A MONITOR REPOSITION WONT ALARM.
 1387     REF   1              25,2056   4 4744 0            CS      TURNONBT
 1388     REF  41  LAST  540   25,2057   7 0110 0            MASK    RADMODES
 1389     REF  42  LAST  542   25,2060  54 110 0             TS      RADMODES
 1390     REF  23  LAST  536   25,2061   1 5263 1            TCF     TASKOVER
```

```
P1391     PROGRAM NAME_  RRZEROSB

R1392     FUNCTICNAL DESCRIPTICN_
R1393     RRZERCSB IS A CLOSED SUBROUTINE TO ZERO THE RR CDU:S,
R1394     DETERMINE THE RR MODE, AND TURNS ON THE TRACKER FAIL
R1395     LAMP IF REQUIRED. INITIALLY THE RR CDU ZERO BIT (CHAN 12
R1396     BIT 1) IS SET. FOLLOWING A 20 MILLISECOND WAIT, THE LGC
R1397     RR CDU COUNTERS (OPTY, OPTX) ARE SET = 0 AFTER
R1398     WHICH THE RR CDU ZERO DISCRETE (CHAN 12 BIT 1) IS
R1399     REMOVED. A 4 SECOND WAIT IS SET TO ALL THE RR CDU:S
R1400     TO REPEAT THE ACTUAL TRUNNION AND SHAFT ANGLES. THE
R1401     RR CDU ZERO FLAG (RADMODES BIT 13) IS REMOVED. THE
R1402     CONTENTS OF OPTY IS THEN CHECKED TO SEE IF THE TRUNNION
R1403     ANGLE IS LESS THAN 90 DEGREES. IF NOT, BIT 12 OF
R1404     RADMODES IS SET = 1 TO INDICATE RR ANTENNA MODE 2.
R1405     IF LESS THAN 90 DEGREES, BIT 12 OF RADMODES IS SET = 0 TO
R1406     INDICATE RR ANTENNA MODE 1. SETTRKF IS THEN CALLED TO
R1407     SEE IF THE TRACKER FAIL LAMP SHOULD BE TURNED ON.

R1408     CALLING SEQUENCE: L   TC   RRZEROSB (FROM RRTURNON AND RRZERO)
R1409     ERASABLE INITIALIZATION REQUIRED:
R1410     RADMODES (BIT 13 SET), DSPTAB +11D

R1411     SUBROUTINES CALLED_  FIXDELAY, MAGSUB, SETTRKF

R1412     JOBS OR TASKS INITIATED_
R1413     NONE

R1414     ALARMS_  TRACKER FAIL

R1415     EXIT_  L +1 (ALWAYS)

 1416                             25,2062  0 0006 1  RRZEROSB EXTEND
 1417     REF   2  LAST  110      25,2063  23'312 0           QXCH    RRRET
 1418     REF  28  LAST  540      25,2064  3 4744 1           CAF     BIT1             BIT 13 OF RADMODES MUST BE SFT BEFORF
 1419                             25,2065  0 0C06 1           FXTEND                   COMING HERE.
 1420     REF  28  LAST  531      25,2066  05 012 1           WOR     CHAN12           TURN ON ZERO RR CDU
 1421     REF   4  LAST  542      25,2067  0 5223 1           TC      FIXDELAY
 1422                             25,2070   0C002 0           DEC     2

 1423     REF 111  LAST  531      25,2071  3 4746 0           CAF     ZERO
 1424     REF   8  LAST  528      25,2072  54 035 0           TS      CDUT
 1425     REF   5  LAST  328      25,2073  54 036 0           TS      CDUS
 1426     REF  65  LAST  523      25,2074  4 4744 0           CS      ONE              REMOVE ZEROING BIT.
 1427                             25,2075  0 0C06 1           EXTEND
 1428     REF  29  LAST  543      25,2076  03 012 1           WAND    CHAN12
 1429     REF   5  LAST  543      25,2077  0 5223 1           TC      FIXDELAY
 1430                             25,2100   01750 1           DEC     1000             RESET FAIL INHIBIT IN 10 SECS - D.281

 1431     REF   3  LAST  521      25,2101  4 4730 0           CS      RCDUOBIT         REMOVE ZEROING IN PROCESS BIT.
 1432   REF  43  LAST  542   25,2102  7 0110 0              MASK   RADMODES
 1433   REF  44  LAST  544   25,2103  54 110 0              TS     RADMODES

 1434   REF   9  LAST  543   25,2104  3 0035 1              CA     CDUT
 1435   REF   5  LAST  539   25,2105  0 4503 0              TC     MAGSUB
 1436                        25,2106   57777 1              DEC    -.5
 1437                        25,2107  1 2112 0              TCF    +3              IF MODE 2.

 1438   REF 112  LAST  543   25,2110  3 4746 0              CAF    ZERO
 1439                        25,2111  1 2113 1              TCF    +2
 1440   REF   3  LAST  538   25,2112  3 4731 0              CAF    ANTENBIT
 1441   REE  45  LAST  544   25,2113  56 110 1              XCH    RADMODES
 1442   REF   1              25,2114  7 7762 1              MASK   -BIT12
 1443   REE  46  LAST  544   25,2115  26 110 0              ADS    RADMODES

 1444   REF   2  LAST  196   25,2116  0 4555 0              TC     SETTRKF         TRACKER LAMP MIGHT GO ON NOW.

 1445   REF   3  LAST  543   25,2117  0 1312 0              TC     RRRET           DONE.

 1446   REF   1                 7762            -BIT12      EQUALS -1/8            IN SPROOT
```

```
R1447    PROGRAM NAME_  DORREPOS
R1448    FUNCTIONAL DESCRIPTION_
R1449    DORREPOS IS A SEQUENCE OF TASKS TO DRIVE THE RENDEZVOUS RADAR
R1450    TO A SAFE POSITION. INITIALLY SETRRECR IS CALLED WHERE THE RR
R1451    ERROR COUNTERS (CHAN 12 BIT 2) ARE ENABLED AND LASTYCMD
R1452    AND LASTXCMD SET = 0 TO INDICATE THE DIFFERENCE BETWEEN THE
R1453    DESIRED STATE AND PRESENT STATE OF THE COMMANDS. THE RR
R1454    TURN-ON FLAG (RADMODES BIT 1) IS CHECKED AND IF NOT PRESENT,
R1455    PROGRAM ALARM 00501 IS REQUESTED BEFORE CONTINUING. IN EITHER
R1456    CASE, FOLLOWING A 20 MILLISECOND WAIT THE PROGRAM CHECKS THE CURRENT
R1457    RR ANTENNA MODE (RADMODES BIT 12). RRTONLY IS THEN CALLED
R1458    TO DRIVE THE TRUNNION ANGLE TO 0 DEGREES IF IN MODE 1 AND TO 180
R1459    DEGREES IF IN MODE 2. UPON RETURN, THE CURRENT RR ANTENNA
R1460    MODE (RADMODES BIT 12) IS AGAIN CHECKED. RRSONLY IS THEN
R1461    CALLED TO DRIVE THE SHAFT ANGLE TO 0 DEGREES IF IN MODE 1 AND TO
R1462    -90 DEGREES IF IN MODE 2. IF DURING RRTONLY OR RRSONLY A
R1463    REMODE HAS BEEN REQUESTED (RADMODES BIT 14), AND ALWAYS
R1464    FOLLOWING COMPLETION OF RRSONLY, CONTROL IS TRANSFERRED TO
R1465    REPOSRPT. HERE THE REPOSITION FLAG (RADMODES BIT 11) IS
R1466    REMOVED. A CHECK IS THEN MADE ON THE DESIGNATE FLAG (RADMODES
R1467    BIT 10). IF PRESENT, CONTROL IS TRANSFERRED TO BEGDES. IF NOT PRESENT
R1468    INDICATING NO FURTHER ANTENNA CONTROL REQUIRED, THE RR ERROR
R1469    COUNTER BIT (CHAN 12 BIT 2) IS REMOVED AND THE ROUTINE EXITS TO
R1470    TASKOVER.

R1471    CALLING SEQUENCE:
R1472    WAITLIST CALL FROM RRGIMON IF TRUNNION AND SHAFT CDU ANGLES
R1473    NOT WITHIN LIMITS OF CURRENT MODE.

R1474    ERASABLE INITIALIZATION REQUIRED:
R1475    RADMODES

R1476    SUBROUTINES CALLED_
R1477    RRTONLY, RRSONLY, BEGDES (EXIT)

R1478    JOBS OR TASKS INITIATED_
R1479    NONE

R1480    ALARMS-  NONE

R1481    EXIT_  TASKOVER, BEGDES

 1482    REF   1              25,2120   0 2147 1  DORREPOS TC      SETRRECR         SET UP RR CDU ERROR COUNTERS.

R1483    ALARM 501 DELETED IN DANCE 279 PER PCR 97.

 1484    REF   6  LAST  543   25,2121   0 5223 1           TC      FIXDELAY
 1485                         25,2122    00002 0           DEC     2

 1486    REF   4  LAST  544   25,2123   3 4731 0           CAF     ANTENBIT         MANEUVER TRUNNION ANGLE TO NOMINAL POS.
 1487   REF  47   LAST  544   25,2124   7 0110 0            MASK    RADMODES
 1488   REF 170   LAST  541   25,2125  10 000 0             CCS     A
 1489   REF  33   LAST  541   25,2126   3 4726 0            CAF     BIT15            0 FOR MODE 1 AND 180 FOR MODE 2.
 1490   REF   1               25,2127   0 2232 0            TC      RRTONLY

 1491   REF   5   LAST  545   25,2130   3 4731 0            CAF     ANTENBIT         NOW PUT SHAFT IN RIGHT POSITION
 1492   REF  48   LAST  546   25,2131   7 0110 0            MASK    RADMODES
 1493   REF 171   LAST  546   25,2132  10 000 0             CCS     A
 1494   REF   5   LAST  525   25,2133   4 4727 0            CS      HALF             -90 FOR MODE 2.
 1495   REF   1               25,2134   0 2235 1            TC      RRSONLY

 1496   REF   4   LAST  233   25,2135   4 4732 1   REPOSRPT CS      REPOSBIT         RETURNS HERE FROM RR1AXIS IF REMODE
A1497                                                                                REQUESTED DURING REPOSITION.
 1498   REF  49   LAST  546   25,2136   7 0110 0            MASK    RADMODES         REMOVE REPOSITION BIT.
 1499   REF  50   LAST  546   25,2137  54 110 0             TS      RADMODES
 1500   REF   2   LAST  531   25,2140   7 4733 0            MASK    DESIGBIT         SEE IF SOMEONE IS WAITING TO DESIGNATE.
 1501   REF 172   LAST  546   25,2141  10 000 0             CCS     A
 1502   REF   2   LAST  526   25,2142   1 2564 0            TCF     BEGDES
 1503   REF  30   LAST  531   25,2143   4 4743 1            CS      BIT2             IF NO FURTHER ANTENNA CONTROL REQUIRED,
 1504                         25,2144   0 0006 1            EXTEND                   REMOVE ERROR COUNTER ENABLE.
 1505   REF  30   LAST  543   25,2145  03 012 1             WAND    CHAN12
 1506   REF  24   LAST  542   25,2146   1 5263 1            TCF     TASKOVER

 1507   REF  31   LAST  546   25,2147   3 4743 0   SETRRECR CAF     BIT2             SET UP RR ERROR COUNTERS.
 1508                         25,2150   0 0006 1            EXTEND
 1509   REF  31   LAST  546   25,2151  02 012 0             RAND    CHAN12
 1510   REF 173   LAST  546   25,2152  10 000 0             CCS     A                DO NOT CLEAR LAST COMMAND IF
 1511   REF 156   LAST  541   25,2153   0 0002 0            TC      Q                ERROR COUNTERS ARE ENABLED.

 1512   REF   9   LAST  214   25,2154  54 112 1             TS      LASTYCMD
 1513   REF   7   LAST  215   25,2155  54 113 0             TS      LASTXCMD
 1514   REF  32   LAST  546   25,2156   3 4743 0            CAF     BIT2
 1515                         25,2157   0 0006 1            EXTEND
 1516   REF  32   LAST  546   25,2160  05 012 1             WOR     CHAN12           ENABLE RR CDU ERROR COUNTERS.
 1517   REF 157   LAST  546   25,2161   0 0002 0            TC      Q
```

```
P1518    PROGRAM NAME_  REMODE                                                     IVES SHAFT TO -45, AND FINALLY DRIVES

R1520    FUNCTIONAL DESCRIPTION_                                                   S DONE WITH SINGLE AXIS ROTATIONS (SEE
R1522    REMODE IS THE GENERAL REMODING SUBROUTINE. IT DRIVES THE
R1523    TRUNNION ANGLE TO 0 DEGREES IF THE CURRENT MODE IS MODE 1,
R1524    180 DEGREES FOR MODE 2, THEN DRIVES THE SHAFT ANGLE TO -45
R1525    DEGREES, AND FINALLY DRIVES THE TRUNNION ANGLE TO -130 DEGREES,
R1526    TO PLACE THE RR IN MODE 2, -50 DEGREES FOR MODE 1, BEFORE
R1527    INITIATING 2-AXIS CONTROL. ALL REMODING IS DONE WITH SINGLE
R1528    AXIS ROTATIONS (RR1AXIS). INITIALLY THE RR ANTENNA MODE FLAG
R1529    (RADMODES BIT 12) IS CHECKED. CONTROL IS THEN TRANSFERRED TO
R1530    RRTONLY TO DRIVE THR TRUNNION ANGLE TO 0 DEGREES IF IN MODE 1
R1531    OR 180 DEGREES IF IN MODE 2. RRSONLY IS THEN CALLED TO DRIVE
R1532    THE SHAFT ANGLE TO -45 DEGREES. THE RR ANTENNA MODE FLAG
R1533    (RADMODES BIT 12) IS CHECKED AGAIN. CONTROL IS AGAIN
R1534    TRANSFERRED TO RRTONLY TO DRIVE THE TRUNNION ANGLE TO -130
R1535    DEGREES TO PLACE THE RR IN MODE 2 IF CURRENTLY IN MODE 1 OR TO
R1536    -50 DEGREES IF IN MODE 2 TO PLACE THE RR IN MODE 1. RMODINV
R1537    IS THEN CALLED TO SET RADMODES BIT 12 TO INDICATE THE NEW
R1538    RR ANTENNA MODE. THE REMODE FLAG (RADMODES BIT 14)
R1539    IS REMOVED TO INDICATE THAT REMODING IS COMPLETE. THE PROGRAM
R1540    THEN EXITS TO STDESIG TO BEGIN 2-AXIS CONTROL.

R1541    CALLING SEQUENCE:
R1542    FROM EEGDES WHEN REMODE FLAG (RADMODES BIT 14) IS SET.
R1543    THIS FLAG MAY BE SET IN RRDESSM AND RRDESNB IF RRLIMCHK
R1544    DETERMINES THAT THE DESIRED ANGLES ARE WITHIN THE LIMITS OF THE
R1545    OTHER MODE.

R1546    ERASABLE INITIALIZATION REQUIRED:
R1547    RADMODES

R1548    SUBROUTINES CALLED_
R1549    RRTONLY, RRSONLY, RMODINV (ACTUALLY PART OF)

R1550    JOBS OR TASKS INITIATED_
R1551    NONE

R1552    ALARMS_  NONE

R1553    EXIT_  STDESIG

 1554    REF   6  LAST  546   25,2162  3 4731 0  REMODE    CAF     ANTENBIT          DRIVE TRUNNION TO 0 (180)
 1555    REF  51  LAST  546   25,2163  7 0110 0            MASK    RADMODES          (ERROR COUNTER ALREADY ENABLED)
 1556    REF 174  LAST  546   25,2164  10 000 0            CCS     A
 1557    REF  34  LAST  546   25,2165  3 4726 0            CAF     BIT15
 1558    REF   2  LAST  546   25,2166  0 2232 0            TC      RRTONLY

 1559    REF   1              25,2167  3 7761 0            CAF     -45DEGSR
 1560    REF   2  LAST  546   25,2170  0 2235 1            TC      RRSONLY
 1561   REF  52  LAST  547   25,2171  4 0110 0             CS      RADMODES
 1562   REF   7  LAST  547   25,2172  7 4731 1             MASK    ANTENBIT
 1563   REF 175  LAST  547   25,2173  10 000 0             CCS     A
 1564   REF   1              25,2174  3 2223 0             CAF     -80DEGSR        GO TO T = -130 (-50).
 1565   REF   1              25,2175  6 2222 1             AD      -50DEGSR
 1566   REF   3  LAST  547   25,2176  0 2232 0             TC      RRTONLY

 1567   REF  53  LAST  548   25,2177  4 0110 0             CS      RADMODES
 1568   REF   8  LAST  548   25,2200  7 4731 1             MASK    ANTENBIT
 1569   REF 176  LAST  548   25,2201  10 000 0             CCS     A
 1570   REF  35  LAST  547   25,2202  3 4726 0             CAF     BIT15           GO TO T = -180 (+0).
 1571   REF   4  LAST  548   25,2203  0 2232 0             TC      RRTONLY

 1572   REF  54  LAST  548   25,2204  4 0110 0             CS      RADMODES        GO TO S = -90 (+0).
 1573   REF   9  LAST  548   25,2205  7 4731 1             MASK    ANTENBIT
 1574   REF 177  LAST  548   25,2206  10 000 0             CCS     A
 1575   REF   6  LAST  546   25,2207  4 4727 0             CS      HALF
 1576   REF   3  LAST  547   25,2210  0 2235 1             TC      RRSONLY

 1577   REF   1              25,2211  0 2224 1             TC      RMODINV

 1578   REF   3  LAST  283   25,2212  4 4727 0             CS      REMODBIT        END OF REMODE.
 1579   REF  55  LAST  548   25,2213  7 0110 0             MASK    RADMODES
 1580   REF  56  LAST  548   25,2214  54 110 0             TS      RADMODES

 1581   REF   3  LAST  546   25,2215  3 4733 1             CAF     DESIGBIT        WAS REMODE CALLED DURING DESIGNATE?
 1582   REF  57  LAST  548   25,2216  7 0110 0             MASK    RADMODES        (BIT10 RADMODES = 1)
 1583                        25,2217  0 0006 1             EXTEND
 1584   REF   1              25,2220  1 3616 1             BZF     RGOODEND        NO-RETURN TO CALLER WAITING IN RADSTALL
 1585   REF   2  LAST  527   25,2221  0 2573 1             TC      STDESIG         YES - RETURN TO DESIGNATE
 1586   REF   2  LAST  294      7761           -45DEGSR    =       13,14,15
 1587                        25,2222   67070 1 -50DEGSR    DEC     -.27778
 1588                        25,2223   61615 1 -80DEGSR    DEC     -.44444

 1589   REF  58  LAST  548   25,2224  22 110 1 RMODINV     LXCH    RADMODES        INVERT THE MODE STATUS.
 1590   REF  10  LAST  548   25,2225  3 4731 0             CAF     ANTENBIT
 1591                        25,2226  0 0006 1             EXTEND
 1592   REF   9  LAST  541   25,2227  06 001 0             RXOR    LCHAN
 1593   REF  59  LAST  548   25,2230  54 110 0             TS      RADMODES
 1594   REF 158  LAST  546   25,2231  0 0002 0             TC      Q
```

```
P1595    PROGRAM NAMES_  RRTONLY, RRSONLY

R1596    FUNCTIONAL DESCRIPTION_
R1597    RRTONLY AND RRSONLY ARE SUBROUTINES FOR DOING SINGLE AXIS
R1598    RR MANEUVERS FOR REMODE AND REPOSITION. IT DRIVES TO
R1599    WITHIN 1 DEGREE. INITIALLY, AT RR1AX2, THE REMODE AND REPOSITION
R1600    FLAGS (RADMODES BITS 14, 11) ARE CHECKED. IF BOTH EXIST,
R1601    THE PROGRAM EXITS TO REPOSRPT (SEE DORREPOS). THIS INDICATES
R1602    THAT SOMEONE POSSIBLY REQUESTED A DESIGNATE (RADMODES BIT 10)
R1603    WHICH REQUIRES A REMODE (RADMODES BIT 14) AND THAT A
R1604    REPOSITION IS IN PROGRESS (RADMODES BIT 11). IF NONE
R1605    OR ONLY ONE OF THE FLAGS EXIST, REMODE OR REPOSITION, MAGSUB
R1606    IS CALLED TO SEE IF THE APPROPRIATE ANGLE IS WITHIN 1 DEGREE. IF YES,
R1607    CONTROL RETURNS TO THE CALLING ROUTINE. IF NOT, CONTROL IS
R1608    TRANSFERRED TO RROUT FOR SINGLE AXIS MANEUVERS WITH THE OTHER
R1609    ANGLE SET = 0. FOLLOWING A .5 SECOND WAIT, THE ABOVE PROCEDURE IS
R1610    REPEATED.

R1611    CALLING SEQUENCE: L-1 CAF *ANGLE*  (DESIRED ANGLE SCALED PI)
R1612    L  TC  RRTONLY (TRUNNION ONLY)
R1613    RRSONLY (SHAFT ONLY)
R1614    RRTONLY IS CALLED BY PREPOS29;
R1615    RRTONLY AND RRSONLY ARE CALLED BY DORREPOS AND REMODE

R1616    ERASABLE INITIALIZATION REQUIRED:
R1617    C(A) = DESIRED ANGLE, RADMODES

R1618    SUBROUTINES CALLED_
R1619    FIXDELAY, REPOSRPT, MAGSUB, RROUT

R1620    JOBS OR TASKS INITIATED_
R1621    NONE

R1622    ALARMS_  NONE

R1623    EXIT_  REPOSRPT (REMODE AND REPOSITION FLAGS PRESENT - RADMODES
R1624    BITS 14, 11)
R1625    L+1  (ANGLE WITHIN ONE DEGREE OR RR OUT OF AUTO MODE)

 1626    REF   2  LAST  110    25,2232  55'313 0  RRTONLY  TS      RDES             DESIRED TRUNION ANGLE.
 1627    REF 113  LAST  544    25,2233  3 4746 0           CAF     ZERO
 1628    REF   1               25,2234  1 2237 1           TCF     RR1AXIS

 1629    REF   3  LAST  549    25,2235  55'313 0  RRSONLY  TS      RDES             SHAFT COMMANDS ARE UNRESOLVED SINCE THIS
 1630    REF  66  LAST  543    25,2236  3 4744 1           CAF     ONE              ROUTINE ENTERED ONLY WHEN T = 0 OR 180.

 1631    REF   1               25,2237  55'314 1  RR1AXIS  TS      RRINDEX
 1632                          25,2240  0 0006 1           EXTEND
 1633    REF   4  LAST  544    25,2241  23'312 0           QXCH    RRRET
 1634    REF   1               25,2242  1 2245 1           TCF     RR1AX2
 1635   REF   7  LAST  545    25,2243   0 5223 1  NXTRR1AX TC      FIXDELAY
 1636                         25,2244    00062 0           DEC     50                 2 SAMPLES PER SECOND.

 1637   REF  60  LAST  548    25,2245   4 0110 0  RR1AX2   CS      RADMODES           IF SOMEONE REQUESTES AS DESIGNATE WHICH
 1638   REF   3  LAST  302    25,2246   7 7731 1           MASK    PRIO22             REQUIRES A REMODE AND A REPOSITION IS IN
 1639                         25,2247   0 0006 1           EXTEND                     PROGRESS, INTERRUPT IT AND START THE
 1640   REF   1               25,2250   1 2135 0           BZF     REPOSRPT           REMODE IMMEDIATELY.

 1641   REF   4  LAST  549    25,2251   3 1313 1           CA      RDES
 1642                         25,2252   0 0006 1           EXTEND
 1643   REF   2  LAST  549    25,2253   5 1314 0           INDEX   RRINDEX
 1644   REF  10  LAST  544    25,2254   20 035 0           MSU     CDUT
 1645   REF   9  LAST  539    25,2255   54 061 1           TS      ITEMP1             SAVE ERROR SIGNAL.
 1646                         25,2256   0 0006 1           EXTEND
 1647   REF   1               25,2257   7 2276 1           MP      RRSPGAIN           TRIES TO NULL .7 OF ERROR OVER NEXT .5
 1648   REF  72  LAST  541    25,2260   54 001 1           TS      L
 1649   REF  61  LAST  550    25,2261   3 0110 1           CA      RADMODES
 1650   REF   4  LAST  198    25,2262   7 4743 1           MASK    AUTOMBIT
 1651   REF  10  LAST  550    25,2263   56 061 0           XCH     ITEMP1             STORE RR-OUT-OF-AUTO-MODE BIT.
 1652   REF   6  LAST  544    25,2264   0 4503 0           TC      MAGSUB             SEE IF WITHIN ONE DEGREE.
 1653                         25,2265    77644 1           DEC     -.00555            SCALED IN HALF-REVS.

 1654   REF  11  LAST  550    25,2266   10 061 1           CCS     ITEMP1             NO.  IF RR OUT OF AUTO MODE, EXIT.
 1655   REF   5  LAST  549    25,2267   0 1312 0           TC      RRRET              RETURN TO CALLER.

 1656   REF   3  LAST  550    25,2270   11'314 1           CCS     RRINDEX            COMMAND FOR OTHER AXIS IS ZERO.
 1657                         25,2271   1 2273 1           TCF     +2                 SETTING A TO 0.
 1658   REF  73  LAST  550    25,2272   56 001 0           XCH     L
 1659   REF   1               25,2273   53'352 0           DXCH    TRUNNCMD
 1660   REF   1               25,2274   0 2277 1           TC      RROUT

 1661   REF   1               25,2275   1 2243 1           TCF     NXTRR1AX           COME BACK IN .5 SECONDS.

 1662                         25,2276    22715 1  RRSPGAIN DEC     .59062             NULL .7 ERROR IN .5 SEC.
```

```
P1663    PROGRAM NAME_  RROUT                                                   RROR COUNTER SCALING. RROUT LIMITS THEM

R1665    FUNCTICNAL DESCRIPTION_
R1666    RRCUT RECEIVES PR GYRO COMMANDS IN TANG, TANG +1 IN RR
R1667    ERROR CCUNTER SCALING. RROUT THEN LIMITS THEM AND
R1668    GENERATES COMMANDS TO THE CDU TO ADJUST THE ERROR COUNTERS
R1669    TO THE DESIRED VALUES. INITIALLY MAGSU8 CHECKS THE MAGNITUDE OF
R1670    THE CCMMAND (SHAFT ON 1ST PASS) TO SEE IF IT IS GREATER THAN
R1671    384 PULSES. IF NOT, CONTROL IS TRANSFERRED TO RROUTLIM TO
R1672    LIMIT THE COMMAND TO +384 OR -384 PULSES. THE DIFFERENCE IS
R1673    THEN CALCULATED BETWEEN THE DESIRED STATE AND THE PRESENT STATE OF
R1674    THE ERRCR COUNTER AS RECORDED IN LASTYCMD AND LASTXCMD.
R1675    THE RESULT IS STORED IN OPTXCMD (1ST PASS) AND OPTYCMD (2ND
R1676    PASS). FOLLOWING THE SECOND PASS, FOR THE TRUNNION COMMAND, THE
R1677    OCDUT AND OCDUS ERROR COUNTER DRIVE BITS (CHAN 14 BITS 12, 11)
R1678    ARE SET. THIS PROGRAM THEN EXITS TO THE CALLING PROGRAM.

R1679    CALLING SEQUENCE:
R1680    L TC RROUT (WITH RUPT INHI8ITED) RROUT IS CALLED BY
R1681    RRTONLY, RRSONLY, AND DODES

R1682    ERASABLE INITIALIZATION REQUIRED:
R1683    TANG, TANG +1 (DESIRED COMMANDS), LASTYCMD, LASTXCMD
R1684    (1ST PASS = 0), RR ERRCR COUNTER ENABLE SET (CHAN 12 8IT 2).

R1685    SUBROUTINES CALLED_
R1686    MAGSU8

R1687    JOBS OR TASKS INITIATED_
R1688    NONE

R1689    ALARMS_  NONE

R1690    EXIT_  L+1 (ALWAYS)                                                    SIRED VALUES. RUPT MUST 8E INHIBITED.

 1692    REF 159  LAST  548   25,2277  22 002 0  RROUT     LXCH    Q           SAVE RETURN.
 1693    REF  67  LAST  549   25,2300  3 4744 1            CAF     ONE         LOOP TWICE.
 1694    REF   5  LAST  539   25,2301  54 062 1  RROUT2    TS      ITEMP2
 1695    REF 178  LAST  548   25,2302  50 000 1            INDEX   A
 1696    REF   2  LAST  550   25,2303  3 1351 1            CA      TRUNNCMD
 1697    REF  12  LAST  550   25,2304  54 061 1            TS      ITEMP1      SAVE SIGN OF COMMAND FOR LIMITING.

 1698    REF   7  LAST  550   25,2305  0 4503 0            TC      MAGSU8      SEE IF WITHIN LMITS.
 1699                         25,2306   77177 0  -RRLIMIT  DEC     -384
 1700    REF   1              25,2307  1 2326 0            TCF     RROUTLIM    LIMIT COMMAND TO MAG OF 384.

 1701    REF  13  LAST  551   25,2310  3 0061 0  SETRRCTR  CA      ITEMP1      COUNT OUT DIFFERENCE BETWEEN DESIRED
 1702    REF   6  LAST  551   25,2311  50 062 0            INDEX   ITEMP2      STATE AND PRESENT STATE AS RECORDED IN
 1703    REF  10  LAST  546   25,2312  56 112 0            XCH     LASTYCMD    LASTYCMD AND LASTXCMD
 1704                         25,2313  4 0000 0            COM
 1705   REF  14  LAST  551   25,2314  6 0061 0            AD      ITEMP1
 1706   REF   9  LAST  242   25,2315  6 4745 0            AD      NEGO            PREVENT +0 IN OUTCOUNTER
 1707   REF   7  LAST  551   25,2316  50 062 0            INDEX   ITEMP2
 1708   REF   1              25,2317  54 053 0            TS      CDUTCMD

 1709   REF   8  LAST  552   25,2320  10 062 1            CCS     ITEMP2          PROCESS BOTH INPUTS.
 1710   REF   1              25,2321  1 2301 0            TCF     RROUT2

 1711   REF   1              25,2322  3 5011 1            CAF     PRIO6           ENABLE COUNTERS.
 1712                        25,2323  0 0006 1            EXTEND
 1713   REF   7  LAST  294   25,2324  05 014 1            WOR     CHAN14          PUT ON CDU DRIVES S AND T
 1714   REF  74  LAST  550   25,2325  0 0001 0            TC      L               RETURN.

 1715   REF  15  LAST  552   25,2326  10 061 1  RROUTLIM  CCS     ITEMP1          LIMIT COMMAND TO ABS VAL OF 384.
 1716   REF   1              25,2327  4 2306 1            CS      -RRLIMIT
 1717                        25,2330  1 2332 0            TCF     +2
 1718   REF   2  LAST  552   25,2331  3 2306 0            CA      -RRLIMIT
 1719   REF  16  LAST  552   25,2332  54 061 1            TS      ITEMP1
 1720   REF   1              25,2333  1 2311 1            TCF     SETRRCTR +1
```

```
P1721               ROUTINE TO ZERO THE RR CDUS AND DETERMINE THE ANTENNA MODE.

 1722   REF   1                   25,2334  3 2363 0  RRZERO    CAF    BIT11+1         SEE IF MONITOR REPOSITION OR NOT IN AUTO
 1723   REF  62  LAST  550        25,2335  7 0110 0            MASK   RADMODES        IF SO, DONT RE-ZERO CDUS.
 1724   REF 179  LAST  551        25,2336  10 C00 0            CCS    A
 1725   REF   1                   25,2337  1 3532 1            TCF    RADNOOP         (IMMEDIATE TASK TO RGOODEND).

 1726                             25,2340  0 0004 0            INHINT
 1727   REF   4  LAST  543        25,2341  4 4730 0            CS     RCDUOBIT        SET FLAG TO SHOW ZEROING IN PROGRESS.
 1728   REF  63  LAST  553        25,2342  7 0110 0            MASK   RADMODES
 1729   REF   5  LAST  553        25,2343  6 4730 1            AD     RCDUOBIT
 1730   REF  64  LAST  553        25,2344  54 110 0            TS     RADMODES

 1731   REF  68  LAST  551        25,2345  3 4744 1            CAF    ONE
 1732   REF  19  LAST  482        25,2346  0 5205 0            TC     WAITLIST
 1733   REF  23  LAST  542        E7,1456                      EBANK= LOSCOUNT
 1734   REF   1                   25,2347   02361 1            2CADR  RRZ2
 1734   REF   1                   25,2350   52067 1

 1735   REF  65  LAST  553        25,2351  4 0110 0            CS     RADMODES        SEE IF IN AUTO MODE.
 1736   REF   5  LAST  550        25,2352  7 4743 1            MASK   AUTOMBIT
 1737   REF 180  LAST  553        25,2353  10 C00 0            CCS    A
 1738   REF   1                   25,2354  1 2357 0            TCF    ROADBACK
 1739   REF  20  LAST  512        25,2355  0 5571 1            TC     ALARM           AUTO DISCRETE NOT PRESENT - TRYING
 1740                             25,2356   00510 0            OCT    510
 1741                             25,2357  0 0003 1  ROADBACK  RELINT
 1742   REF   4  LAST  413        25,2360  1 4622 1            TCF    SWRETURN

 1743   REF   2  LAST  542        25,2361  0 2062 1  RRZ2      TC     RRZEROSB        COMMON TO TURNON AND RRZERO.
 1744   REF   1                   25,2362  1 3607 1            TCF    ENDRADAR

 1745                             25,2363   02001 1  BIT11+1   OCT    02001
```

```
P1746    PROGRAM NAME_  RRDESSM                                                   R (HALF-UNIT) IN RRTARGET. REMODES IF

R1748    FUNCTIONAL DESCRIPTION_
R1749    THIS INTERPRETIVE ROUTINE WILL DESIGNATE, IF DESIRED ANGLES ARE
R1750    WITHIN THE LIMITS OF EITHER MODE, TO A LINE-OF SIGHT (LOS) VECTOR
R1751    (HALF-UNIT) KNOWN WITH RESPECT TO THE STABLE MEMBER PRESENT
R1752    ORIENTATION. INITIALLY THE IMU CDU:S ARE READ AND CONTROL
R1753    TRANSFERRED TO SMNB TO TRANSFORM THE LOS VECTOR FROM STABLE
R1754    MEMBER TO NAVIGATION BASE COORDINATES (SEE STG MEMO ¬699)
R1755    RRANGLES IS THEN CALLED TO CALCULATE THE RR GIMBAL ANGLES,
R1756    TRUNNION AND SHAFT, FOR BOTH THE PRESENT AND ALTERNATE MODE.
R1757    RRLIMCHK IS CALLED TO SEE IF THE ANGLES CALCULATED FOR THE
R1758    PRESENT MODE ARE WITHIN LIMITS. IF WITHIN LIMITS, THE RETURN
R1759    LOCATION IS INCREMENTED, INASMUCH AS NO VEHICLE MANEUVER IS
R1760    REQUIRED, BEFORE EXITING TO STARTDES. IF NOT WITHIN LIMITS OF THE
R1761    CURRENT MODE, TRYSWS IS CALLED. FOLLOWING INVERTING OF THE RR
R1762    ANTENNA MODE FLAG (RADMODES BIT 12), RRLIMCHK IS CALLED
R1763    TO SEE IF THE ANGLES CALCULATED FOR THE ALTERNATE MODE ARE WITHIN
R1764    LIMITS. IF YES, THE RR ANTENNA MODE FLAG IS AGAIN INVERTED,
R1765    THE REMODE FLAG (RADMODES BIT 14) SET, AND THE RETURN LOCATION
R1766    INCREMENTED, TO INDICATE NO VEHICLE MANEUVER IS REQUIRED, BEFORE
R1767    EXITING TO STARTDES. IF THESE ANGLES ARE NOT WITHIN LIMITS
R1768    OF THE ALTERNATE MODE, THE RR ANTENNA MODE FLAG (RADMODES
R1769    BIT 12) IS INVERTED BEFORE RETURNING DIRECTLY TO THE CALLING PROGRAM
R1770    TO INDICATE THAT A VEHICLE MANEUVER IS REQUIRED.

R1771    CALLING SEQUENCE:
R1772    L  STCALL  RRTARGET  (LOS HALF-UNIT VECTOR IN SM COORDINATES)
R1773    L+1  RRDESSM
R1774    L+2  BASIC  (VEHICLE MANEUVER REQUIRED)
R1775    L+3  BASIC  (NO VEHICLE MANEUVER REQUIRED)

R1776    ERASABLE INITIALIZATION REQUIRED:
R1777    RRTARGET, RADMODES

R1778    SUBROUTINES CALLED_
R1779    READCDUS, SMNB, RRANGLES, RRLIMCHK, TRYSWS (ACTUALLY
R1780    PART OF), RMODINV

R1781    JOBS OR TASKS INITIATED_
R1782    NONE

R1783    ALARMS_  NONE

R1784    EXIT_  L+2 (NEITHER SET OF ANGLES ARE WITHIN LIMITS OF RELATED MODE)
R1785    STARTDES (DESIGNATE POSSIBLE AT PRESENT VEHICLE ATTITUDE-RETURNS
R1786    TO L+3 FROM STARTDES)                                                     CAN BE DONE IN PRESENT VEH ATTITUDE.

 1788                          25,2364   43020 1  RRDESSM  STQ      CLEAR
 1789    REF   4  LAST  284    25,2365   01112 1                    DESRET
 1790   REF    1                25,2366    00271 0                       RRNBSW
 1791                           25,2367    77624 1             CALL                     COMPUTES SINES AND COSINES, ORDER Y Z X
 1792   REF    2  LAST   502    25,2370    47522 1                       CDUTRIG
 1793                           25,2371    45175 0             VLOAD     CALL           LOAD VECTOR AND CALL TRANSFORMATION
 1794   REF    4  LAST   534    25,2372    01101 0                       RRTARGET
 1795   REF    3  LAST   502    25,2373    47663 1                       *SMNB*

 1796                           25,2374    77624 1             CALL                     GET RR GIMBAL ANGLES IN PRESENT AND
 1797   REF    1                25,2375    26133 1                       RRANGLES       ALTERNATE MODE.
 1798                           25,2376    77776 1             EXIT

 1799                           25,2377   0 0004 0             INHINT
 1800   REF    3  LAST   528    25,2400   0 4514 0             TC        RRLIMCHK
 1801   REF    4  LAST   335    25,2401    01106 1             ADRES     MODEA          CONFIGURATION FOR CURRENT MODE.
 1802                           25,2402   0 2405 1             TC        +3             NOT IN CURRENT MODE
 1803   REF    5  LAST   554    25,2403   25'112 1   OKDESSM   INCR      DESRET         INCREMENT SAYS NO VEHICLE MANEUVER REQ.
 1804   REF    1                25,2404   0 2423 0             TC        STARTDES       SHOW DESIGNATE REQUIRED
 1805   REF    6  LAST   523    25,2405   4 0104 0             CS        FLAGWRD8
 1806   REF    4  LAST   523    25,2406   7 4735 0             MASK      SURFFBIT       CHECK IF ON LUNAR SURFACE (SURFFLAG=P22F
 1807                           25,2407   0 0006 1             EXTEND
 1808   REF    1                25,2410   1 2447 0             BZF       NORDSTAL       BRANCH-YES-CANNOT DESIGNATE IN MODE 2
 1809   REF    1                25,2411   0 2452 0             TC        TRYSWS


 1810   REF    7  LAST   555    25,2412   4 0104 0   LUNDESCH  CS        FLAGWRD8       OVERFLOW RETURN FROM RRANGLES
 1811   REF    5  LAST   555    25,2413   7 4735 0             MASK      SURFFBIT       CHECK IF ON LUNAR SURFACE
 1812                           25,2414   0 0006 1             EXTEND
 1813   REF    2  LAST   555    25,2415   1 2447 0             BZF       NORDSTAL       BRANCH-YES-RETURN TO CALLER - ALARM 527
 1814   REF   38  LAST   536    25,2416   3 0074 1             CA        STATE
 1815   REF    9  LAST   520    25,2417   7 4736 0             MASK      RNDVZBIT
 1816   REF  181  LAST   553    25,2420   10 000 0             CCS       A              TEST RNDVZFLG.
 1817   REF    1                25,2421   0 2462 0             TC        NODESSM        NOT ON MOON-CALL FOR ATTITUDE MANEUVER
 1818   REF   89  LAST   536    25,2422   1 5146 0             TCF       ENDOFJOB       ...BUT NOT IN R29.
```

```
P1819    PROGRAM NAME_  STARTDES                                                STORED AS A HALF-UNIT VECTOR IN RRTARGET

R1821    FUNCTIONAL DESCRIPTION_                                                CKON IS DESIRED. BIT14 OF RADMODES IS
R1823    STARTDES IS ENTERED WHEN WE ARE READY TO BEGIN DESIGNATION.           OR REPOSITION OPERATION. IN THIS
R1825    BIT 14 OF RADMODES IS ALREADY SET IF A REMODE IS REQUIRED.            THE REPOSITION WILL BE INTERRUPTED.
R1827    AT THIS TIME, THE RR ANTENNA MAY BE IN A REPOSITION                   GINS.
R1829    OPERATION. IN THIS CASE, IF A REMODE IS REQUIRED IT MAY HAVE
R1830    ALREADY BEGUN BUT IN ANY CASE THE REPOSITION WILL BE INTERRUPTED.
R1831    OTHERWISE, THE REPOSITION WILL BE COMPLETED BEFORE 2-AXIS
R1832    DESIGNATION BEGINS. INITIALLY DESCOUNT IS SET = 60 TO INDICATE
R1833    THAT 30 SECONDS WILL BE ALLOWED FOR THE RR DATA GOOD INBIT
R1834    (CHAN 33 BIT 4) IF LOCK-ON IS DESIRED (STATE BIT 5). BIT 10
R1835    OF RADMODES IS SET TO SHOW THAT A DESIGNATE IS REQUIRED.
R1836    THE REPOSITION FLAG (RADMODES BIT 11) IS CHECKED. IF SET,
R1837    THE PROGRAM EXITS TO L+3 OF THE CALLING PROGRAM (SEE RRDESSM
R1838    AND RRDESNB). THE PROGRAM WILL BEGIN DESIGNATING TO THE DESIRED
R1839    ANGLES FOLLOWING THE REPOSITION OR REMODE IF ONE WAS
R1840    REQUESTED. IF THE REPOSITION FLAG IS NOT SET, SETRRECR IS CALLED
R1841    WHICH SETS THE RR ERROR COUNTER ENABLE BIT (CHAN 12 BIT 2)
R1842    AND SETS LASTYCMD AND LASTXCMD = 0 TO INDICATE THE
R1843    DIFFERENCE BETWEEN THE PRESENT AND DESIRED STATE OF THE ERROR
R1844    COUNTERS. A 20 MILLISECOND WAITLIST CALL IS SET FOR BEGDES
R1845    AFTER WHICH THE PROGRAM EXITS TO L+3 OF THE CALLING PROGRAM.

R1846    CALLING SEQUENCE:
R1847    FROM RRDESSM AND RRDESNB WHEN ANGLES WITHIN LIMITS.

R1848    ERASABLE INITIALIZATION REQUIRED:
R1849    RADMODES, (SEE DODES)

R1850    SUBROUTINES CALLED_
R1851    SETRRECR, WAITLIST

R1852    JOBS OR TASKS INITIATED_
R1853    BEGDES

R1854    ALARMS_  NONE

R1855    EXIT_  L+3 OF CALLING PROGRAM (SEE RRDESSM)
R1856    L+2 OF CALLING PROGRAM (SEE RRDESNB)

 1857    REF    6  LAST  555   25,2423  25'112 1  STARTDES INCR    DESRET
 1858    REF   66  LAST  553   25,2424  4 0110 0           CS      RADMODES
 1859    REF    4  LAST  548   25,2425  7 4733 0           MASK    DESIGBIT
 1860    REF   67  LAST  556   25,2426  26 110 0           ADS     RADMODES
 1861    REF    5  LAST  546   25,2427  7 4732 1           MASK    REPOSBIT        SEE IF REPOSITIONING IN PROGRESS.
 1862    REF  182  LAST  555   25,2430  10 000 0           CCS     A
 1863    REF    1              25,2431  1 2437 1           TCF     DESRETRN        ECTR ALREADY SET UP.

 1864    REF    2  LAST  545   25,2432  0 2147 1           TC      SETRRECR        SET UP ERROR COUNTERS.
 1865    REF  37  LAST  523    25,2433  3 4743 0             CAF     TWO
 1866    REF  20  LAST  553    25,2434  0 5205 0             TC      WAITLIST
 1867    REF  24  LAST  553    E7,1456                       EBANK=  LOSCOUNT
 1868    REF   3  LAST  546    25,2435   02564 1             2CADR   BEGDES
 1868                          25,2436   52067 1

 1869    REF   3  LAST  531    25,2437  3 1303 0  DESRETRN CA      RADCADR          FIRST PASS THRU DESIGNATE
 1870                          25,2440  0 0006 1             EXTEND
 1871    REF   1               25,2441  1 2443 1             BZF     DESRTRN          YES   SET EXIT
 1872    REF  90  LAST  555    25,2442  0 5146 1             TC      ENDOFJOB         NO
 1873                          25,2443  0 0003 1  DESRTRN    RELINT
 1874    REF   7  LAST  556    25,2444  25'112 1             INCR    DESRET
 1875    REF   8  LAST  557    25,2445  3 1112 1             CA      DESRET
 1876    REF   9  LAST  536    25,2446  1 4631 0             TCF     BANKJUMP


 1877    REF 114  LAST  549    25,2447  3 4746 0  NORDSTAL CAF     ZERO             ZERO RADCADR TO WIPE  OUT ANYONE
 1878    REF   4  LAST  557    25,2450  55'303 1             TS      RADCADR          WAITING IN RADSTALL SINCE WE ARE NOW
 1879    REF   2  LAST  557    25,2451  1 2443 1             TCF     DESRTRN          RETURNING TO P20 AND MAY DO NEW RADSTALL
```

```
P1880             SEE IF RRDESSM CAN BE ACCOMPLISHED AFTER A REMODE.

 1881    REF   2  LAST  548   25,2452  0 2224 1  TRYSWS   TC       RMODINV         (NOTE RUPT INHIBIT)
 1882    REF   4  LAST  555   25,2453  0 4514 0           TC       RRLIMCHK        TRY DIFFERENT MODE.
 1883    REF   4  LAST  335   25,2454   01110 0           ADRES    MODEB
 1884    REF   2  LAST  555   25,2455  1 2462 1           TCF      NODESSM         VEHICLE MANEUVER REQUIRED.

 1885    REF   3  LAST  558   25,2456  0 2224 1           TC       RMODINV         RESET BIT12
 1886    REF   4  LAST  548   25,2457  3 4727 1           CAF      REMODBIT        SET FLAG FOR REMODE.
 1887    REF  68  LAST  556   25,2460  26 110 0           ADS      RADMODES

 1888    REF   1              25,2461  1 2403 0           TCF      OKDESSM

 1889    REF   4  LAST  558   25,2462  0 2224 1  NODESSM  TC       RMODINV         RE-INVERT MODE AND RETURN
 1890    REF   9  LAST  557   25,2463  25'112 1           INCR     DESRET          TO CALLER +2
 1891    REF   3  LAST  555   25,2464  1 2447 0           TCF      NORDSTAL

 1892                         25,2465   CC074 1  MAXTRYS  DEC      60
```

```
P1893                DESIGNATE TO SPECIFIC RR GIMBAL ANGLES (INDEPENDENT OF VEHICLE MOTION). ENTER WITH DESIRED ANGLES IN
R1895     TANG AND TANG +1.

 1896     REF    6  LAST  533    25,2466  0 4636 0  RRDESNB   TC      MAKECADR
 1897     REF   10  LAST  558    25,2467  55'112 0            TS      DESRET

 1898     REF   52  LAST  535    25,2470  0 5520 0            TC      DOWNFLAG          RESET FLAG TO PREVENT DODES FROM GOING
 1899     REF    6  LAST  530    25,2471   00041 1            ADRES   LOSCMFLG          BACK TO R21
 1900     REF    1               25,2472  3 2465 1            CA      MAXTRYS           SET TIME LIMIT COUNTER
 1901     REF    2  LAST  525    25,2473  55'113 1            TS      DESCOUNT          FOR DESIGNATE
 1902                            25,2474  0 0004 0            INHINT                    SEE IF CURRENT MODE OK.
 1903     REF    1               25,2475  0 2531 1            TC      RRLIMNB           DO SPECIAL V41 LIMIT CHECK
 1904     REF    8  LAST  525    25,2476   01106 1            ADRES   TANG
 1905     REF    1               25,2477  1 2514 1            TCF     TRYSWN            SEE IF IN OTHER MODE.

 1906                            25,2500  0 0003 1  OKDESNB   RELINT
 1907                            25,2501  0 0006 1            EXTEND
 1908     REF    9  LAST  559    25,2502  3 1107 0            DCA     TANG
 1909     REF    8  LAST  336    25,2503  53'753 0            DXCH    TANGNB
 1910     REF   48  LAST  534    25,2504  0 6060 1            TC      INTPRET

 1911                            25,2505   77624 1            CALL                      GET LOS IN NB COORDS.
 1912     REF    1               25,2506   46041 0                    RRNB
 1913     REF    5  LAST  555    25,2507   01101 0            STORE   RRTARGET

 1914                            25,2510   77414 0            SET     EXIT
 1915     REF    2  LAST  555    25,2511   00071 1                    RRNBSW

 1916                            25,2512  0 0004 0            INHINT
 1917     REF    2  LAST  555    25,2513  1 2424 0            TCF     STARTDES +1
 1918     REF    5  LAST  558    25,2514  0 2224 1  TRYSWN    TC      RMODINV           SEE IF OTHER MODE WILL DO.
 1919     REF    2  LAST  559    25,2515  0 2531 1            TC      RRLIMNB           DO SPECIAL V41 LIMIT CHECK
 1920     REF   10  LAST  559    25,2516   01106 1            ADRES   TANG
 1921     REF    1               25,2517  1 2524 1            TCF     NODESNB           NOT POSSIBLE.

 1922     REF    6  LAST  559    25,2520  0 2224 1            TC      RMODINV
 1923     REF    5  LAST  558    25,2521  3 4727 1            CAF     REMODBIT          CALL FOR REMODE.
 1924     REF   69  LAST  558    25,2522  26 110 0            ADS     RADMODES
 1925     REF    1               25,2523  1 2500 1            TCF     OKDESNB

 1926     REF    7  LAST  559    25,2524  0 2224 1  NODESNB   TC      RMODINV           REINVERT MODE BIT.
 1927     REF   21  LAST  553    25,2525  0 5571 1            TC      ALARM             BAD INPUT ANGLES.
 1928                            25,2526   00502 0            OCT     502
 1929     REF    9  LAST  531    25,2527  0 6027 1            TC      CLRADMOD
 1930     REF   91  LAST  557    25,2530  0 5146 1            TC      ENDOFJOB          AVOID 503 ALARM.

 1931     REF  160  LAST  551    25,2531  50 002 0  RRLIMNB   INDEX   Q                 THIS ROUTINE IS IDENTICAL TO RRLIMCHK
 1932                            25,2532  3 0000 1            CAF     0                 EXCEPT THAT THE MODE 1 SHAFT LOWER
 1933     REF  161  LAST  559    25,2533  24 002 0            INCR    Q                 LIMIT IS -85 INSTEAD OF -70 DEGREES
 1934                            25,2534  0 0006 1            EXTEND
 1935   REF 183  LAST  556    25,2535  5 0000 1            INDEX  A                 READ GIMBAL ANGLES INTO ITEMP STORAGE
 1936                         25,2536  3 0001 0            DCA    0
 1937   REF  17  LAST  552    25,2537  52 062 1            DXCH   ITEMP1
 1938   REF 162  LAST  559    25,2540  22 002 0            LXCH   Q                 L(CALLER +2) TO L

 1939   REF  11  LAST  548    25,2541  3 4731 0            CAF    ANTENBIT          SEE WHICH MODE RR IS IN.
 1940   REF  70  LAST  559    25,2542  7 0110 0            MASK   RADMODES
 1941   REF 184  LAST  560    25,2543  10 000 0            CCS    A
 1942   REF   2  LAST  538    25,2544  1 4541 1            TCF    MODE2CHK          MODE 2 CAN USE RRLIMCHK CODING
 1943   REF  18  LAST  560    25,2545  3 0061 0            CA     ITEMP1
 1944   REF   8  LAST  551    25,2546  0 4503 0            TC     MAGSUB            MODE 1 IS DEFINED AS
 1945                         25,2547   66161 1            DEC    -.30555             1. ABS(T) L 55 DEGS
 1946   REF  75  LAST  552    25,2550  0 0001 0            TC     L                   2  SHAFT LIMITS AT +59, -85 DEGS

 1947   REF   9  LAST  552    25,2551  3 0062 0            CA     ITEMP2            LOAD SHAFT ANGLE
 1948                         25,2552  0 0006 1            EXTEND
 1949   REF   1               25,2553  6 2561 1            BZMF   NEGSHAFT          IF NEGATIVE SHAFT ANGLE, ADD 20.5 DEGS
 1950   REF   2  LAST  539    25,2554  6 4553 0            AD     5.5DEGS
 1951   REF   9  LAST  560    25,2555  0 4503 0  SHAFTLIM  TC     MAGSUB
 1952                         25,2556   64420 0            DEC    -.35833           64.5 DEGREES
 1953   REF  76  LAST  560    25,2557  0 0001 0            TC     L                 NOT IN LIMITS
 1954   REF   2  LAST  539    25,2560  0 4551 1            TC     RRLIMOK           IN LIMITS
 1955   REF   1               25,2561  6 2563 0  NEGSHAFT  AD     20.5DEGS          MAKE NEGATIVE SHAFT LIMIT -85 DEGREES
 1956   REF   1               25,2562  1 2555 1            TCF    SHAFTLIM


 1957                         25,2563   03512 1  20.5DEGS  DEC    .11389
```

```
P1958    PROGRAM NAME_  BEGDES

R1959    FUNCTIONAL DESCRIPTION_
R1960    BEGDES CHECKS VARIOUS DESIGNATE REQUESTS AND REQUESTS THE
R1961    ACTUAL RR DESIGNATION. INITIALLY A CHECK IS MADE TO SEE IF A
R1962    REMODE (RADMODES BIT 14) IS REQUESTED OR IN PROGRESS. IF SO,
R1963    CONTROL IS TRANSFERRED TO STDESIG AFTER ROUTINE REMODE IS
R1964    EXECUTED. IF NO REMODE, STDESIG IS IMMEDIATELY CALLED WHERE
R1965    FIRST THE REPOSITION FLAG (RADMODES BIT 11) IS CHECKED. IF
R1966    PRESENT, THE DESIGNATE FLAG (RADMODES BIT 10) IS REMOVED
R1967    AFTER WHICH THE PROGRAM EXITS TO RDBADEND. IF THE REPOSITION
R1968    FLAG IS NOT PRESENT, THE CONTINUOUS DESIGNATE FLAG (RADMODES
R1969    BIT 15) IS CHECKED. IF PRESENT, ON EXECUTIVE CALL IS IMMEDIATELY
R1970    MADE FOR DODES AFTER WHICH A .5 SECOND WAIT IS INITIATED BEFORE
R1971    REPEATING AT STDESIG. IF THE RR SEARCH ROUTINE (LRS24.1) IS DESIGNATING
R1972    TO A NEW POINT (NEWPTFLG SET) THE CURRENT DESIGNATE TASK IS TERMINATED.
R1973    IF CONTINUOUS DESIGNATE IS NOT WANTED, THE DESIGNATE FLAG (RADMODES
R1974    BIT 10) IS CHECKED. IF NOT PRESENT, THE PROGRAM EXITS TO ENDRADAR TO
R1975    CHECK RR CDU FAIL BEFORE RETURNING TO THE CALLING PROGRAM. IF DESIGNATE
R1976    IS STILL REQUIRED, DESCOUNT IS CHECKED TO SEE IF THE 30 SECONDS HAS
R1977    EXPIRED BEFORE RECEIVING THE RR DATA GOOD (CHAN 33 BIT 4)
R1978    SIGNAL. IF OUT OF TIME, PROGRAM ALARM 00503 IS REQUESTED, THE
R1979    RR AUTO TRACKER ENABLE AND RR ERROR COUNTER ENABLE
R1980    (CHAN 12 BITS 14,2) BITS REMOVED, AND THE DESIGNATE FLAG
R1981    (RADMODES BIT 10) REMOVED BEFORE EXITING TO RDBADEND. IF
R1982    TIME HAS NOT EXPIRED, DESCOUNT IS DECREMENTED, THE
R1983    EXECUTIVE CALL MADE FOR DODES, AND A .5 SECOND WAIT INITIATED
R1984    BEFORE REPEATING THIS PROCEDURE AT STDESIG.

R1985    CALLING SEQUENCE:
R1986    WAITLIST CALL FROM STARTDES
R1987    TCF BEGDES FROM DORREPOS
R1988    TC STDESIG RETURNING, FROM REMODE

R1989    ERASABLE INITIALIZATION REQUIRED:
R1990    DESCOUNT, RADMODES

R1991    SUBROUTINES CALLED_
R1992    ENDRADAR, FINDVAC

R1993    JOBS OR TASKS INITIATED_  DODES

R1994    ALARMS_  PROGRAM ALARM 00503 (30 SECONDS HAVE EXPIRED) WITH NO RR DATA
R1995    GOOD (CHAN 33 BIT 4) RECEIVED WHEN LOCK-ON (STATE BIT 5) WAS REQUESTED.

R1996    EXIT_  TASKOVER (SEARCH PATTERN DESIGNATING TO NEW POINT)
R1997    ENDRADAR (NO DESIGNATE - RADMODES BIT 10)
R1998    RDBADEND (REPOSITION OR 30 SECONDS EXPIRED)

 1999    REF  71  LAST  560   25,2564  4 0110 0  BEGDES   CS      RADMODES
 2000    REF   6  LAST  559    25,2565   7 4727 0              MASK     REMODBIT
 2001    REF 185  LAST  560    25,2566  10 000 0               CCS      A
 2002    REF   3  LAST  548    25,2567   0 2573 1              TC       STDESIG
 2003    REF   1               25,2570   0 2162 0              TC       REMODE
 2004    REF   8  LAST  550    25,2571   0 5223 1   DESLOOP    TC       FIXDELAY         2 SAMPLES PER SECOND.
 2005                          25,2572    00062 0              DEC      50

 2006    REF   6  LAST  556    25,2573   3 4732 0   STDESIG    CAF      REPOSBIT
 2007    REF  72  LAST  561    25,2574   7 0110 0              MASK     RADMODES         SEE IF GIMBAL LIMIT MONITOR HAS FOUND US
 2008    REF 186  LAST  562    25,2575  10 000 0               CCS      A                OUT OF BOUNDS. IF SO, THIS BIT SHOWS A
 2009    REF   1               25,2576   1 2614 1              TCF      BADDES           REPOSITION TO BE IN PROGRESS.

 2010    REF  73  LAST  562    25,2577  10 110 0               CCS      RADMODES         SEE IF CONTINUOUS DESIGNATE WANTED.
 2011                          25,2600   1 2603 1              TCF      +3               IF SO, DONT CHECK BIT 10 TO SEE IF IN
 2012                          25,2601   1 2603 1              TCF      +2               LIMITS BUT GO RIGHT TO FINDVAC ENTRY.
 2013    REF   1               25,2602   1 2620 0              TCF      MOREDES +1

 2014    REF  74  LAST  562    25,2603   4 0110 0              CS       RADMODES         IF NON-CONTINUOUS, SEE IF END OF
 2015    REF   5  LAST  556    25,2604   7 4733 0              MASK     DESIGBIT         PROBLEM (DATA GOOD IF LOCK-ON WANTED OR
 2016    REF 187  LAST  562    25,2605  10 000 0               CCS      A                WITHIN LIMITS IF NOT). IF SO, EXIT AFTER
 2017    REF   2  LAST  553    25,2606   1 3607 1              TCF      ENDRADAR         CHECKING RR CDU FAIL.

 2018    REF   3  LAST  559    25,2607  11'113 1    STDESIG1   CCS      DESCOUNT         SEE IF THE TIME LIMIT HAS EXPIRED
 2019    REF   2  LAST  562    25,2610   1 2617 1              TCF      MOREDES

 2020    REF   1               25,2611   4 2625 0              CS       B14+B2           IF OUT OF TIME, REMOVE ECR ENABLE + TRKR
 2021                          25,2612   0 0006 1              EXTEND
 2022    REF  33  LAST  546    25,2613  03 012 1               WAND     CHAN12
 2023    REF  53  LAST  559    25,2614   0 5520 0   BADDES     TC       DOWNFLAG
 2024    REF   1               25,2615    00271 0              ADRES    DESIGFLG
 2025    REF   1               25,2616   1 3623 1              TCF      RDBADEND

 2026    REF   4  LAST  562    25,2617  55'113 1    MOREDES    TS       DESCOUNT
 2027    REF   9  LAST  535    25,2620   3 7735 1              CAF      PRIO26           UPDATE GYRO TORQUE COMMANDS.
 2028    REF  22  LAST  535    25,2621   0 5076 0              TC       FINDVAC
 2029    REF  25  LAST  557    E7,1456                         EBANK=   LUSCOUNT
 2030    REF   1               25,2622    02626 1              2CADR    DODES
 2030    REF   1               25,2623    52067 1

 2031    REF   1               25,2624   1 2571 1              TCF      DESLOOP

 2032                          25,2625    20002 1   B14+B2     OCT      20002
```

```
P2033   PROGRAM NAME_  DODES

R2034   FUNCTIONAL DESCRIPTION_
R2035   DODES CALCULATES AND REQUESTS ISSUANCE OF RR GYRO TORQUE
R2036   COMMANDS. INITIALLY THE CURRENT RR CDU ANGLES ARE STORED AND
R2037   THE LOS HALF-UNIT VECTOR TRANSFORMED FROM STABLE MEMBER TO
R2038   NAVIGATION BASE COORDINATES VIA SMNB IF NECESSARY. THE
R2039   SHAFT AND TRUNNION COMMANDS ARE THEN CALCULATED AS FOLLOWS_
R2040   + SHAFT = LOS  . (COS(S), 0, -SIN (S)) (DOT PRODUCT)
R2041   -TRUNNION = LOS  . (SIN (T) SIN (S), COS (T), SIN (T) COS (S) )
R2042   THE SIGN OF THE SHAFT COMMAND IS THEN REVERSED IF IN MODE 2
R2043   (RADMODES BIT 12) BECAUSE A RELAY IN THE RR REVERSES THE
R2044   POLARITY OF THE COMMAND. AT RRSCALUP EACH COMMAND IS
R2045   SCALED AND IF EITHER, OR BOTH, OF THE COMMANDS IS GREATER THAN
R2046   .5 DEGREES, MPAC +1 IS SET POSITIVE. IF A CONTINUOUS DESIGNATE
R2047   (RADMODES BIT 15) IS DESIRED AND THE SEARCH ROUTINE IS NOT OPERATING,
R2048   THE RR AUTO TRACKER ENABLE BIT (CHAN 12 BIT 14) IS CLEARED AND RROUT
R2049   CALLED TO PUT OUT THE COMMANDS PROVIDED NO REPOSITION (RADMODES BIT 11)
R2050   IS IN PROGRESS. IF A CONTINUOUS DESIGNATE AND THE SEARCH ROUTINE IS
R2051   OPERATING (SRCHOPT FLAG SET) THE TRACK ENABLE IS NOT CLEARED. IF NO
R2052   CONTINUOUS DESIGNATE AND BOTH COMMANDS ARE NOT LESS THAN .5 DEGREES AS
R2053   INDICATED BY MPAC +1, THE RR AUTO TRACKER ENABLE BIT (CHAN 12 BIT 14) IS
R2054   CLEARED AND RROUT CALLED TO PUT OUT THE COMMANDS PROVIDED NO REPOSITION
R2055   (RADMODES BIT 11) IS IN PROGRESS. IF BOTH COMMANDS ARE LESS THAN .5
R2056   DEGREES AS INDICATED BY MPAC+1, THE RR AUTO TRACKER ENABLE BIT
R2057   (CHAN 12 BIT 14) IS CLEARED AND RROUT CALLED TO PUT OUT THE
R2058   COMMANDS PROVIDED NO REPOSITION (RADMODES BIT 11) IS IN
R2059   PROGRESS. IF BOTH COMMANDS ARE LESS THAN .5 DEGREES, THE
R2060   LOCK-ON FLAG (STATE BIT 5) IS CHECKED. IF NOT PRESENT, THE
R2061   DESIGNATE FLAG (RADMODES BIT 10) IS CLEARED, THE RR ERROR
R2062   COUNTER ENABLE BIT (CHAN 12 BIT 2) IS CLEARED, AND ENDOFJOB
R2063   CALLED. IF LOCK-ON IS DESIRED, THE RR AUTO TRACKER (CHAN 12
R2064   BIT 14) IS ENABLED FOLLOWED BY A CHECK OF THE RECEIPT OF THE
R2065   RR DATA GOOD (CHAN 33 BIT 4) SIGNAL. IF RR DATA GOOD
R2066   PRESENT, THE DESIGNATE FLAG (RADMODES BIT 10) IS CLEARED,
R2067   THE RR ERROR COUNTER ENABLE BIT (CHAN 12 BIT 2) IS CLEARED,
R2068   AND ENDOFJOB CALLED. IF RR DATA GOOD IS NOT PRESENT, RROUT
R2069   IS CALLED TO PUT OUT THE COMMANDS PROVIDED NO REPOSITION
R2070   (RADMODES BIT 11) IS IN PROGRESS AFTER WHICH THE JOB IS TERMINATED
R2071   VIA ENDOFJOB.

R2072   CALLING SEQUENCE:
R2073   EXECUTIVE CALL EVERY .5 SECONDS FROM BEGDES.

R2074   ERASABLE INITIALIZATION REQUIRED:
R2075   RRTARGET (HALF-UNIT LOS VECTOR IN EITHER SM OR NB COORDINATES),
R2076   LOKONSW (STATE BIT 5), RRNBSW (STATE BIT 6), RADMODES

R2077   SUBROUTINES CALLED_
R2078   READCDUS, SMNB, CDULOGIC, MAGSUB, RROUT
```

```
R2079    JOBS OR TASKS INITIATED_
R2080    NONE

R2081    ALARMS_  NONE

R2082    EXIT_  ENDOFJOB (ALWAYS)

 2083                            25,2626   0 0006 1  DODES     EXTEND
 2084    REF  11  LAST  550      25,2627   3 0036 1            DCA     CDUT
 2085    REF  11  LAST  559      25,2630   53'107 1            DXCH    TANG

 2086    REF  49  LAST  559      25,2631   0 6060 1            TC      INTPRET

 2087                            25,2632    77201 1            SETPD   VLOAD
 2088                            25,2633    00001 0                    0
 2089    REF   6  LAST  559      25,2634    01101 0                    RRTARGET
 2090                            25,2635    74214 0            BON     VXSC
 2091    REF   3  LAST  559      25,2636    00311 1                    RRNBSW
 2092    REF   1                 25,2637    52651 1                    DONBRD          TARGET IN NAV-BASE COORDINATES
 2093    REF   1                 25,2640    01765 1                    MLOSV           MULTIPLY UNIT LOS BY MAGNITUDE
 2094                            25,2641    63372 1            VSL1    PDVL
 2095    REF   2  LAST  117      25,2642    01757 0                    LOSVEL
 2096                            25,2643    53361 0            VXSC    VAD             ADD ONE SECOND RELATIVE VELOCITY TO LOS
 2097    REF   1                 25,2644    13061 1                    MCTOMS
 2098                            25,2645    45056 0            UNIT    CALL
 2099    REF   3  LAST  555      25,2646    47522 1                    CDUTRIG
 2100                            25,2647    77624 1            CALL
 2101    REF   4  LAST  555      25,2650    47663 1                    *SMNB*

 2102                            25,2651    14041 1  DONBRD    STODL   32D
 2103    REF  12  LAST  564      25,2652    01110 0                    TANG +1
 2104                            25,2653    41434 1            RTB     PUSH            SHAFT COMMAND = V(32D).(COS(S), 0,
 2105    REF  11  LAST  386      25,2654    21606 1                    CDULOGIC             (-SIN(S)).
 2106                            25,2655    65356 1            SIN     PDDL            SIN(S) TO 0 AND COS(S) TO 2.
 2107                            25,2656    41546 0            COS     PUSH
 2108                            25,2657    65205 0            DMP     PDDL
 2109                            25,2660    00041 1                    32D
 2110                            25,2661    00045 0                    36D
 2111                            25,2662    44205 0            DMP     BDSU
 2112                            25,2663    00001 0                    0
 2113                            25,2664    77626 0            STADR
 2114    REF  13  LAST  564      25,2665    76667 1            STORE   TANG +1         SHAFT COMMAND

 2115                            25,2666    47135 0            SLOAD   RTB
 2116    REF  14  LAST  564      25,2667    01107 0                    TANG
 2117    REF  12  LAST  564      25,2670    21606 1                    CDULOGIC
 2118                            25,2671    71406 0            PUSH    COS             COS(T) TO 4.
 2119                            25,2672    73525 1            PDDL    SIN
 2120                            25,2673    41206 0            PUSH    DMP             SIN(T) TO 6.
 2121                            25,2674    00003 1                    2
 2122                        25,2675   65352 0        SL1     PDDL          DEFINE VECTOR U = (SIN(T)SIN(S))
 2123                        25,2676   00005 1                4                                 (COS(T)      )
 2124                        25,2677   41325 0        PDDL    DMP                               (SIN(T)COS(S))
 2125                        25,2700   00007 0                6
 2126                        25,2701   00001 0                0
 2127                        25,2702   55552 0        SL1     VDEF
 2128                        25,2703   77441 0        DOT     EXIT          DOT U WITH LOS TO GET TRUNNION COMMAND.
 2129                        25,2704   00041 1                32D
```

```
P2130            AT THIS POINT WE HAVE A ROTATION VECTOR IN DISH AXES LYING IN THE TS PLANE. CONVERT THIS TO A
R2132    COMMANDED RATE AND ENABLE THE TRACKER IF WE ARE WITHIN .5 DEGREES OF THE TARGET.

 2134    REF 246  LAST  536    25,2705  4 0154 0           CS      MPAC                DOT WAS NEGATIVE OF DESIRED ANGLE.
 2135                          25,2706  0 0006 1           EXTEND
 2136    REF   1               25,2707  7 3055 0           MP      RDESGAIN            SCALING ON INPUT ANGLE WAS 4 RADIANS.
 2137    REF   3  LAST  551    25,2710  55'351 0           TS      TRUNNCMD            TRUNNION COMMAND FOR RROUT
 2138    REF  75  LAST  562    25,2711  4 0110 0           CS      RADMODES            A RELAY IN THE RR REVERSES POLARITY OF
 2139    REF  22  LAST  524    25,2712  7 4731 1           MASK    BIT12               THE SHAFT COMMANDS IN MODE 2 SO THAT A
 2140                          25,2713  0 0006 1           EXTEND                      POSITIVE TORQUE APPLIED TO THE SHAFT
 2141                          25,2714  1 2717 0           BZF     +3                  GYRO CAUSES A POSITIVE CHANGE IN THE
 2142    REF  15  LAST  564    25,2715  3 1107 0           CA      TANG +1             SHAFT ANGLE. COMPENSATE FOR THIS SWITCH
 2143                          25,2716  1 2720 1           TCF     +2                  BY CHANGING THE POLARITY OF OUR COMMAND.
 2144    REF  16  LAST  566    25,2717  4 1107 1      +3   CS      TANG +1
 2145                          25,2720  0 0006 1           EXTEND
 2146    REF   2  LAST  566    25,2721  7 3055 0           MP      RDESGAIN            SCALING ON INPUT ANGLE WAS 4 RADIANS.
 2147    REF   1               25,2722  55'352 0           TS      SHAFTCMD            SHAFT COMMAND FOR RROUT
 2148    REF  50  LAST  564    25,2723  0 6060 1           TC      INTPRET

 2149                          25,2724   41345 0           DLOAD   DMP
 2150                          25,2725   00003 1                   2                   COS(S).
 2151                          25,2726   00005 1                   4                   COS(T).
 2152                          25,2727   65352 0           SL1     PDDL                Z COMPONENT OF URR.
 2153                          25,2730   65276 1           DCOMP   PDDL                Y COMPONENT = -SIN(T).
 2154                          25,2731   00001 0                   0                   SIN(S).
 2155                          25,2732   72405 0           DMP     SL1
 2156                          25,2733   00005 1                   4                   COS(T).
 2157                          25,2734   43066 0           VDEF    BON                 FORM URR IN NB AXES.
 2158    REF   4  LAST  564    25,2735   00311 1                   RRNBSW              BYPASS NBSM CONVERSION IN VERB 41.
 2159                          25,2736   52741 1                   +3
 2160                          25,2737   77624 1           CALL
 2161    REF   2  LAST  264    25,2740   47665 1                   *NBSM*              GET URR IN SM AXES.
 2162                          25,2741   77441 0           DOT     EXIT
 2163    REF   7  LAST  564    25,2742   01101 0                   RRTARGET            GET COSINE OF ANGLE BETWEEN RR AND LOS.

 2164                          25,2743  0 0006 1           EXTEND
 2165    REF   1               25,2744  4 3057 1           DCS     COS1/2DG
 2166    REF 247  LAST  566    25,2745  20 155 1           DAS     MPAC                DIFFERENCE OF COSINES, SCALED B-2.
 2167    REF 248  LAST  566    25,2746  10 154 0           CCS     MPAC
 2168    REF 115  LAST  557    25,2747  3 4746 0           CA      ZERO                IF COS ERROR BIGGER, ERROR IS SMALLER.
 2169                          25,2750  1 2752 1           TCF     +2
 2170    REF  69  LAST  553    25,2751  3 4744 1           CA      ONE
 2171    REF 249  LAST  566    25,2752  54 155 1           TS      MPAC +1             ZERO IF RR IS POINTED OK, ONE IF NOT.
```

```
P2172              SEE IF TRACKER SHOULD BE ENABLED OR DISABLED.

 2173    REF  76  LAST  566    25,2753  10 110 0           CCS     RADMODES        IF CONTINUOUS DESIGNATE WANTED, PUT OUT
 2174    REF   1               25,2754  1 2757 1           TCF     SIGNLCHK        COMMANDS WITHOUT CHECKING MAGNITUDE OF
 2175    REF   2  LAST  567    25,2755  1 2757 1           TCF     SIGNLCHK        ERROR SIGNALS
 2176    REF   1               25,2756  1 3007 1           TCF     DORROUT
 2177    REF 250  LAST  566    25,2757  10 155 1  SIGNLCHK CCS     MPAC +1         SEE IF BOTH AXES WERE WITHIN .5 DEGS.
 2178    REF   1               25,2760  1 2770 1           TCF     DGOODCHK
 2179    REF  39  LAST  555    25,2761  4 0074 0           CS      STATE           IF WITHIN LIMITS AND NO LOCK-ON WANTED,
 2180    REF   1               25,2762  7 4740 1           MASK    LOKONBIT        PROBLEM IS FINISHED.
 2181    REF 188  LAST  562    25,2763  10 000 0           CCS     A
 2182    REF   1               25,2764  1 2775 1           TCF     RRDESDUN

 2183    REF  52  LAST  533    25,2765  3 4727 1           CAF     BIT14           ENABLE THE TRACKER.
 2184                          25,2766  0 0006 1           EXTEND
 2185    REF  34  LAST  562    25,2767  05 012 1           WOR     CHAN12

 2186    REF  26  LAST  533    25,2770  3 4741 1  DGOODCHK CAF     BIT4            SEE IF DATA GOOD RECEIVED YET
 2187                          25,2771  0 0006 1           EXTEND
 2188    REF  11  LAST  534    25,2772  02 033 0           RAND    CHAN33
 2189    REF 189  LAST  567    25,2773  10 000 0           CCS     A
 2190    REF   2  LAST  567    25,2774  1 3007 1           TCF     DORROUT

 2191    REF  26  LAST  491    25,2775  4 4733 0  RRDESDUN CS      BIT10           WHEN PROBLEM DONE, REMOVE BIT 10 SO NEXT
 2192    REF  77  LAST  567    25,2776  7 0110 0           MASK    RADMODES        WAITLIST TASK WE WILL GO TO RGOODEND.
 2193                          25,2777  0 0004 0           INHINT
 2194    REF  78  LAST  567    25,3000  54 110 0           TS      RADMODES

 2195    REF  54  LAST  562    25,3001  0 5520 0           TC      DOWNFLAG        RESET LOSCMFLG TO PREVENT A
 2196    REF   7  LAST  559    25,3002   00041 1           ADRES   LOSCMFLG        RECOMPUTATION OF LOS AFTER DATA GOOD
 2197    REF  33  LAST  546    25,3003  4 4743 1           CS      BIT2            TURN OFF ENABLE RR ERROR COUNTER
 2198                          25,3004  0 0006 1           EXTEND
 2199    REF  35  LAST  567    25,3005  03 012 1           WAND    CHAN12
 2200    REF  92  LAST  559    25,3006  1 5146 0           TCF     ENDOFJOB        WITH ECTR DISABLED.

 2201    REF   8  LAST  513    25,3007  3 0076 0  DORROUT  CA      FLAGWRD2        IF BOTH LOSCMFLAG AND SEARCH FLAG ARE
 2202    REF   1               25,3010  7 7733 0           MASK    BIT12,14        ZERO, BYPASS VELOCITY ADJUSTMENT TO LOS
 2203                          25,3011  0 0006 1           EXTEND
 2204    REF   1               25,3012  1 3031 1           BZF     NOTP20
 2205    REF  51  LAST  566    25,3013  0 6060 1           TC      INTPRET
 2206                          25,3014   74375 0           VLOAD   VXSC            MULTIPLY UNIT LOS BY MAGNITUDE
 2207    REF   8  LAST  566    25,3015   01101 0                   RRTARGET
 2208    REF   2  LAST  564    25,3016   01765 1                   MLOSV
 2209                          25,3017   41572 1           VSL1    PUSH
 2210                          25,3020   74375 0           VLOAD   VXSC            ADD .5 SEC. OF VELOCITY
 2211    REF   3  LAST  564    25,3021   01757 0                   LOSVEL          TO LOS VECTOR
 2212    REF   2  LAST  564    25,3022   13061 1                   MCTOMS
 2213                          25,3023   53362 0           VSR1    VAD
 2214                          25,3024   77656 1           UNIT
 2215    REF   9  LAST  567    25,3025   15101 0           STODL   RRTARGET        STORE VELOCITY-CORRECTED LOS (UNIT)
 2216                              25,3026    00045 0                      36D
 2217     REF    3  LAST  567      25,3027    01765 1             STORE    MLOSV              AND STORE MAGNITUDE
 2218                              25,3030    77776 1             EXIT
 2219                              25,3031   0 0004 0  NOTP20     INHINT
 2220     REF   79  LAST  567      25,3032   4 0110 0             CS       RADMODES           PUT OUT COMMAND UNLESS MONITOR
 2221     REF    7  LAST  562      25,3033   7 4732 1             MASK     REPOSBIT           REPOSITION HAS TAKEN OVER.
 2222     REF  190  LAST  567      25,3034   10 000 0             CCS      A
 2223     REF    2  LAST  550      25,3035   0 2277 1             TC       RROUT

 2224     REF    9  LAST  567      25,3036   3 0076 0             CA       FLAGWRD2
 2225     REF    1                 25,3037   7 4731 1             MASK     LOSCMBIT           IF LOSCMFLG NOT SET, DON'T TEST
 2226                              25,3040   0 0006 1             EXTEND                      LOS COUNTER
 2227     REF   93  LAST  567      25,3041   1 5146 0             BZF      ENDOFJOB
 2228     REF   26  LAST  562      25,3042   11'456 0             CCS      LOSCOUNT           TEST LOS COUNTER TO SEE IF TIME TO GET
 2229     REF    1                 25,3043   0 3053 1             TC       DODESEND           A NEW LOS
 2230     REF    6  LAST  531      25,3044   0 6050 1             TC       KILLTASK           YES - KILL TASK WHICH SCHEDULES DODES
 2231     REF    2  LAST  562      25,3045    52573 1             CADR     DESLOOP +2
 2232                              25,3046   0 0003 1             RELINT
 2233     REF    4  LAST  390      25,3047   10 067 1             CCS      NEWJOB
 2234     REF    3  LAST  390      25,3050   0 5113 1             TC       CHANG1
 2235     REF  154  LAST  536      25,3051   0 4607 1             TC       BANKCALL
 2236     REF    1                 25,3052    51015 1             CADR     R21LEM2


 2237     REF   27  LAST  568      25,3053   55'456 0  DODESEND   TS       LOSCOUNT
 2238     REF   94  LAST  568      25,3054   0 5146 1             TC       ENDOFJOB


 2239                              25,3055    21122 0  RDESGAIN   DEC      .53624             TRIES TO NULL .5 ERROR IN .5 SEC.
 2240     REF    1                    7733             BIT12,14   EQUALS   PRIO24             OCT 24000
 2241                              25,3056    07777 1  COS1/2DG   2DEC     .999961923 B-2     COSINE OF 0.5 DEGREES.
 2241                              25,3057    33005 1
 2242                              25,3060    00310 0  MCTOMS     2DEC     100 B-13
 2242                              25,3061    00000 1
```

```
P2243    RADAR READ INITIALIZATION

R2244    THE FOLLOWING ROUTINES MUST BE CALLED BY BANKCALL

 2245    REF   1                 25,3062  0 3076 0  LRALT     TC       INITREAD
 2246                            25,3063   00017 1  ALLREAD   OCT      17

 2247    REF   2  LAST   569     25,3064  0 3076 0  LRVELZ    TC       INITREAD
 2248                            25,3065   00016 0            OCT      16

 2249    REF   3  LAST   569     25,3066  0 3076 0  LRVELY    TC       INITREAD
 2250                            25,3067   00015 0            OCT      15

 2251    REF   4  LAST   569     25,3070  0 3076 0  LRVELX    TC       INITREAD
 2252                            25,3071   00014 1            OCT      14

 2253    REF   5  LAST   569     25,3072  0 3076 0  RRRDOT    TC       INITREAD
 2254                            25,3073   00012 1            OCT      12

 2255    REF   6  LAST   569     25,3074  0 3076 0  RRRANGE   TC       INITREAD
 2256                            25,3075   00011 1            OCT      11


 2257                            25,3076  0 0004 0  INITREAD  INHINT
 2258    REF 163  LAST   560     25,3077  50 002 0            INDEX    Q
 2259                            25,3100  3 0000 1            CA       0
 2260    REF   1                 25,3101  0 3110 1            TC       PRERADAR
 2261    REF  27  LAST   504     25,3102  3 4742 1            CA       BIT3
 2262    REF   1                 25,3103  55'105 0            TS       TIMEHOLD +1       MIDPOINT OF READ IS ABOUT 40 MS AFTER
 2263                            25,3104  0 0006 1            EXTEND                     START OF READ
 2264    REF  15  LAST   477     25,3105  3 0025 0            DCA      TIME2
 2265    REF   2  LAST   569     25,3106  21'105 0            DAS      TIMEHOLD

 2266    REF   2  LAST   553     25,3107  1 2357 0            TCF      ROADBACK


 2267    REF   1                 25,3110  55'077 1  PRERADAR  TS       RADUSE            INDICATE RADAR READ ROUTINES IN USE.
 2268    REF 116  LAST   566     25,3111  3 4746 0            CA       ZERO
 2269    REF   1                 25,3112  55'110 1            TS       NSAMP
 2270    REF   3  LAST   505     25,3113  55'100 0            TS       SAMPLSUM
 2271    REF   4  LAST   569     25,3114  55'101 1            TS       SAMPLSUM +1
 2272    REF   3  LAST   569     25,3115  55'104 1            TS       TIMEHOLD

 2273    REF   1                 25,3116  3 3136 0            CA       DGBITS
 2274                            25,3117  0 0006 1            EXTEND
 2275    REF  12  LAST   567     25,3120  02 033 0            RAND     CHAN33
 2276    REF   1                 25,3121  55'112 0            TS       OLDATAGD

 22761   REF   2  LAST   569     25,3122  4 3136 1            CS       DGBITS            RESET DATA GOOD BITS OF RADMODES
 22762   REF  80  LAST   568     25,3123  7 0110 0            MASK     RADMODES
 22763  REF  81  LAST  569   25,3124  54 110 0              TS      RADMODES

 2277   REF   1              25,3125  4 3063 0              CS      ALLREAD
 2278                        25,3126  0 0006 1              EXTEND
 2279   REF   8  LAST  485   25,3127  03 013 0              WAND    CHAN13          CLEAR ALL RADAR BITS PRIOR TO READ

 2280                        25,3130  0 0006 1              EXTEND
 2281   REF  18  LAST  536   25,3131  22 070 0              QXCH    RUPTREG1

 2282   REF   2  LAST  569   25,3132  3 1077 0              CA      RADUSE
 2283   REF  22  LAST  535   25,3133  0 4665 0              TC      IBNKCALL
 2284   REF   1              25,3134   36000 1              CADR    RADSTART
 2285   REF  19  LAST  570   25,3135  0 0070 0              TC      RUPTREG1


 2286                        25,3136   00230 0  DGBITS      OCT     230             POSITION OF DATA GOOD BITS IN CHANNEL 33
 2287                        25,3137   00014 1  VBITS       OCT     14              VSELECT = 0 BEFORE X READ
 2288                        25,3140   00016 0              OCT     16              VSELECT = 1 BEFORE Z READ
 2289                        25,3141   00015 0              OCT     15              VSELECT = 2 BEFORE Y READ


 2290   REF   7  LAST  292   25,3142  4 0107 0  R12READ     CS      FLGWRD11
 2291   REF   1              25,3143  7 4733 0              MASK    NOLRRBIT        IF NOLRREAD FLAG IS SET , BYPASS R12
 2292                        25,3144  0 0006 1              EXTEND
 2293   REF  25  LAST  546   25,3145  1 5263 1              BZF     TASKOVER

 22931  REF   8  LAST  570   25,3146  4 0107 0  R12RDSET    CS      FLGWRD11        STOP R12 FROM
 22932  REF   2  LAST  231   25,3147  7 4742 0              MASK    R12RDBIT          ATTEMPTING UPDATE
 22933  REF   9  LAST  570   25,3150  26 107 0              ADS     FLGWRD11              BEFORE R12 READS ARE DONE

 2294   REF   2  LAST  213   25,3151  51'462 0              INDEX   VSELECT
 2295   REF   1              25,3152  3 3137 1              CA      VBITS
 2296   REF   2  LAST  569   25,3153  0 3110 1              TC      PRERADAR
 2297   REF  12  LAST  448   25,3154  3 6263 0              CA      SIX             RADAR RUPT USES THIS FOR R12 READ
 2298   REF   2  LAST  569   25,3155  55'110 1              TS      NSAMP
 2299   REF  26  LAST  570   25,3156  0 5263 0              TC      TASKOVER
```

```
P2300    RADAR RUPT READER (R20)

R2301    THIS ROUTINE, WHICH IS INITIATED BY A RADAR RUPT, PROCESSES THE RADAR DATA AND UPDATES THE APPROPRIATE
R2303    DSKY LIGHTS.

 2304    REF    2  LAST    42   25,2000                          SETLOC RADARUPT
 2305                           25,3157                          BANK

 2306    REF    2 LAST    42 TO   42:      3      3*             COUNT* $$/RRUPT

 2307    REF   15  LAST   328   E7,1453                          EBANK= TTOGO

 2308                           25,3157  0 0006 1  RADAREAD EXTEND                  CONTINUATION OF INTERRUPT LEAD-IN.
 2309    REF   10  LAST   471   25,3160  04 007 1           ROR    SUPERBNK         SUPERBNK MUST BE SAVED BECAUSE RUPT
 2310    REF    3  LAST   269   25,3161  54 016 1           TS     BANKRUPT         MAY EXIT VIA TASKOVER.
 2311                           25,3162  0 0006 1           EXTEND
 2312    REF    3  LAST   269   25,3163  22 012 1           QXCH   QRUPT


 2313    REF    9  LAST   519   25,3164  3 4750 1           CA     SEVEN            READ AND STORE RADAR SELECT BITS
 2314                           25,3165  0 0006 1           EXTEND
 2315    REF    9  LAST   570   25,3166  02 013 1           RAND   CHAN13
 2316    REF    1               25,3167  55'332 0           TS     RADBITS

 2317                           25,3170  0 0006 1           EXTEND                  IF RADAR SELECT BITS ARE ZERO, ALARM
 2318    REF    1               25,3171  1 3177 1           BZF    BADRUPT          WITHOUT READING DATA

 2319    REF    1               25,3172  3 0046 0           CA     RNRAD            STORE RAW DATA FOR DOWNLINK.
 2320    REF    2  LAST   571   25,3173  51'332 1           INDEX  RADBITS
 2321    REF    6  LAST   328   25,3174  55'327 1           TS     DNRRANGE -1

 2322    REF    3  LAST   570   25,3175  11'077 1           CCS    RADUSE           IF RADUSE IS ZERO, THIS IS A BAD RUPT
 2323    REF    1               25,3176  1 3203 1           TCF    WHICHRAD

 2324    REF    4  LAST   571   25,3177  55'077 1  BADRUPT  TS     RADUSE
 2325    REF   22  LAST   559   25,3200  0 5571 1           TC     ALARM
 2326                           25,3201   00520 0           OCT    520
 2327    REF   14  LAST   274   25,3202  0 5272 0           TC     RESUME

 2328    REF   18  LAST   525   25,3203  4 6266 1  WHICHRAD CS     THREE            IF RADBITS IS LESS THAN THREE,
 2329    REF    3  LAST   571   25,3204  6 1332 1           AD     RADBITS          THE RENDEZVOUS RADAR IS BEING READ.
 2330                           25,3205  0 0006 1           EXTEND
 2331    REF    1               25,3206  6 3273 1           BZMF   RENDRAD

 2332    REF   18  LAST   505   25,3207  4 0101 0  LANDRAD  CS     FLAGWRD5         THE LANDING RADAR IS BEING READ
 2333    REF    4  LAST   505   25,3210  7 4732 1           MASK   R77FLBIT
 2334                           25,3211  0 0006 1           EXTEND                  IF R77 IS RUNNING, EXIT HERE
 2335    REF    1               25,3212  1 3253 1           BZF    R77EXIT

 2336    REF   10  LAST   571   25,3213  4 4750 0           CS     SEVEN            IF RADBITS IS SEVEN, THE LANDING
 2337    REF    4  LAST  571      25,3214  6 1332 1             AD      RADBITS          RADAR ALITUDE IS BEING READ
 2338                             25,3215  0 0006 1             EXTEND
 2339    REF    1                 25,3216  1 3267 0             BZF     LRHEIGHT

 2340    REF   12  LAST  541      25,3217  3 4724 1  LRSPEED    CA      POSMAX           DECODE THE 15 BIT READING AND
 2341    REF    2  LAST  571      25,3220  7 0046 1             MASK    RNRAD            SUBTRACT THE BIAS.
 2342    REF    1                 25,3221  6 2000 0             AD      LVELBIAS
 2343    REF    5  LAST  271      25,3222  54 064 1             TS      ITEMP4
 2344    REF   77  LAST  560      25,3223  54 001 1             TS      L
 2345    REF    3  LAST  572      25,3224  3 0046 0             CA      RNRAD
 2346                             25,3225  6 0000 1             DOUBLE
 2347    REF   29  LAST  543      25,3226  7 4744 0             MASK    BIT1
 2348    REF    9  LAST  271      25,3227  54 063 0             TS      ITEMP3
 2349    REF    5  LAST  569      25,3230  21'101 1             DAS     SAMPLSUM         ACCUMULATE THE READING

 2350    REF   26  LAST  540      25,3231  3 4735 1             CA      BIT8             VOLOCITY DATA GOOD BIT
 2351    REF   19  LAST  560      25,3232  54 061 1  DGCHECK    TS      ITEMP1
 2352    REF    3  LAST  569      25,3233  3 3136 0  DGCHECK2   CA      DGBITS           UPDATE THE STATUS OF THE DATA GOOD BITS
 2353                             25,3234  0 0006 1             EXTEND
 2354    REF   13  LAST  569      25,3235  02 033 0             RAND    CHAN33
 2355    REF    2  LAST  569      25,3236  57'112 1             XCH     OLDATAGD
 2356    REF   20  LAST  572      25,3237  7 0061 1             MASK    ITEMP1
 2357    REF   78  LAST  572      25,3240  54 001 1             TS      L                OLD STATUS
 2358    REF   21  LAST  572      25,3241  3 0061 0             CA      ITEMP1
 2359    REF    3  LAST  572      25,3242  7 1112 0             MASK    OLDATAGD         CURRENT STATUS
 2360    REF   79  LAST  572      25,3243  6 0001 0             AD      L
 2361    REF  191  LAST  568      25,3244  10 000 0             CCS     A                BOTH SHOULD BE ZERO
 2362    REF    1                 25,3245  1 3256 1             TCF     BADRAD           DATA GOOD NOT PRESENT

 2363    REF    3  LAST  570      25,3246  11'110 1  GOODRAD    CCS     NSAMP            TEST FOR R12
 2364    REF    1                 25,3247  1 3403 1             TCF     R12EXIT

 2365    REF   10  LAST  572      25,3250  52 064 1             DXCH    ITEMP3           STORE DATA FOR CALLING ROUTINE
 2366    REF    6  LAST  572      25,3251  53'101 1             ~~DXCH~~    ~~SAMPLSUM~~
 2367    REF    1                 25,3252  0 3651 0             TC      RADLITES         UPDATE DSKY LIGHTS.

 2368    REF  117  LAST  569      25,3253  3 4746 0  R77EXIT    CA      ZERO             ZERO RADUSE
 2369    REF    5  LAST  571      25,3254  55'077 1             TS      RADUSE
 2370    REF    2  LAST  548      25,3255  0 3614 1             TC      RGOODEND -2


 2371    REF   82  LAST  570      25,3256  4 0110 0  BADRAD     CS      RADMODES         UPDATE RADMODES BIT ONLY IF DATA BAD
 23715   REF   22  LAST  572      25,3257  7 0061 1             MASK    ITEMP1
 2372    REF   83  LAST  572      25,3260  26 110 0             ADS     RADMODES

 2373    REF    4  LAST  572      25,3261  11'110 1             CCS     NSAMP            TEST FOR R12
 2374    REF    2  LAST  572      25,3262  1 3403 1             TCF     R12EXIT

 2375    REF    2  LAST  572      25,3263  0 3651 0             TC      RADLITES         UPDATE DSKY LIGHTS
 2376    REF  118  LAST  572      25,3264  3 4746 0  RRBADEND   CA      ZERO             ZERO RADUSE
 2377   REF   6  LAST  572   25,3265  55'077 1              TS      RADUSF
 2378   REF   2  LAST  562   25,3266  0 3621 1              TC      RDBADEND -2


 2379   REF  26  LAST  503   25,3267  3 4740 0  LRHEIGHT CA      BIT5              DATA GOOD BIT FOR ALTITUDE
 2380   REF  23  LAST  572   25,3270  54 061 1              TS      ITEMP1
 2381   REF  17  LAST  343   25,3271  3 4734 0              CA      BIT9              LO SCALE BIT FOR LR
 2382   REF   1              25,3272  0 3316 0              TC      SCALECHK

 2383                        25,3273  0 0006 1  RENDRAD  EXTEND
 2384   REF  16  LAST  571   25,3274  3 1454 0              DCA     TTOGO             LOAD TIME TO TIG
 2385   REF   2  LAST  328   25,3275  53'272 0              DXCH    TTOTIG            FOR R65 RADAR READING.

 2386   REF   8  LAST  568   25,3276  3 4732 0              CA      REPOSBIT          MAKE SURE ANTENNA HAS NOT
 2387   REF  84  LAST  572   25,3277  7 0110 0              MASK    RADMODES          GONE OUT OF LIMITS.
 2388   REF 192  LAST  572   25,3300  10 000 0              CCS     A
 2389   REF   1              25,3301  1 3264 0              TCF     RRBADEND

 2390   REF  85  LAST  573   25,3302  4 0110 0              CS      RADMODES          BE SURE RR CDU HASN'T FAILED.
 2391   REF   5  LAST  485   25,3303  7 4736 0              MASK    RCDUFBIT
 2392   REF 193  LAST  573   25,3304  10 000 0              CCS     A
 2393   REF   2  LAST  573   25,3305  1 3264 0              TCF     RRBADEND

 2394   REF  27  LAST  567   25,3306  3 4741 1              CA      BIT4              DATA GOOD BIT FOR RR
 2395   REF  24  LAST  573   25,3307  54 061 1              TS      ITEMP1

 2396   REF  30  LAST  572   25,3310  3 4744 1              CA      BIT1              TEST FOR RANGE OR RANGE RATE
 2397   REF   5  LAST  572   25,3311  7 1332 0              MASK    RADBITS
 2398   REF 164  LAST  569   25,3312  54 002 1              TS      Q                 SAVE FOR LATER TESTING
 2399                        25,3313  0 0006 1              EXTEND
 2400   REF   1              25,3314  1 3325 1              BZF     RADIN             IF ROOT, READ DATA

 2401   REF  28  LAST  569   25,3315  3 4742 1              CA      BIT3              LO SCALE BIT FOR RR.
 2402   REF  80  LAST  572   25,3316  54 001 1  SCALECHK TS      L
 2403   REF  86  LAST  573   25,3317  3 0110 1              CA      RADMODES          TEST THE SCALE BIT SPECIFIED IN L
 2404                        25,3320  0 0006 1              EXTEND                    TO SEE IF IT IS THE SMAE AS LAST
 2405   REF  14  LAST  572   25,3321  06 033 1              RXOR    CHAN33            TIME.
 2406   REF  81  LAST  573   25,3322  7 0001 1              MASK    L                 IF BIT IS THE SMAE IN RADMODES AND
 2407   REF 194  LAST  573   25,3323  10 000 0              CCS     A                 CHAN33, THEN A WILL BE ZERO
 2408   REF   1              25,3324  0 3364 0              TC      SCALCHNG          SCALE CHANGED

 2409   REF  13  LAST  572   25,3325  3 4724 1  RADIN    CA      POSMAX            UNPACK 15 BIT RADAR READING
 2410   REF   4  LAST  572   25,3326  7 0046 1              MASK    RNRAD
 2411   REF   6  LAST  572   25,3327  54 064 1              TS      ITEMP4

 2412   REF   5  LAST  573   25,3330  3 0046 0              CA      RNRAD
 2413                        25,3331  6 0000 1              DOUBLE
 2414   REF  31  LAST  573   25,3332  7 4744 0              MASK    BIT1
 2415   REF  11  LAST  572   25,3333  54 063 0              TS      ITEMP3
```

```
2416   REF 165  LAST  573   25,3334  1C 002 1            CCS     Q           TEST FOR RR RANGE RATE (Q = 0)
2417   REF   1              25,3335  1 3342 0            TCF     SCALADJ     RANGE OR LR HEIGHT . TEST SCALE

2418                        25,3336  0 0006 1            EXTEND              RR RANGE RATE - SUBTRACT BIAS
2419   REF   1              25,3337  4 2002 0            DCS     RDOTBIAS
2420   REF  12  LAST  573   25,3340  20 064 1  DASAMPL   DAS     ITEMP3
2421   REF   1              25,3341  1 3233 1            TCF     DGCHECK2    TEST DATA GOOD

2422   REF  87  LAST  573   25,3342  3 0110 1  SCALADJ   CA      RADMODES    TEST SCALE BIT
2423   REF  82  LAST  573   25,3343  7 0001 1            MASK    L
2424                        25,3344  0 0006 1            EXTEND
2425   REF   2  LAST  574   25,3345  1 3233 1            BZF     DGCHECK2    LO SCALE

2426   REF  29  LAST  573   25,3346  7 4742 0            MASK    BIT3        HI SCALE - TEST FOR LR
2427                        25,3347  0 0006 1            EXTEND              IF BIT3 = 0,THEN IT IS LR
2428   REF   1              25,3350  1 3357 1            BZF     LRSCK

2429   REF  13  LAST  574   25,3351  52 064 1            DXCH    ITEMP3      RESCALE RR DATA TO LO SCALING
2430                        25,3352  20 001 1            DDOUBL              MULTIPLY BY 8.
2431                        25,3353  20 001 1            DDOUBL
2432                        25,3354  20 001 1            DDOUBL
2433   REF  14  LAST  574   25,3355  52 064 1            DXCH    ITEMP3
2434   REF   3  LAST  574   25,3356  1 3233 1            TCF     DGCHECK2

2435                        25,3357  0 0006 1  LRSCK     EXTEND              RESCALE LR DATA TO LO SCALING
2436   REF  15  LAST  574   25,3360  3 0064 0            DCA     ITEMP3      MULTIPLY BY 5.
2437                        25,3361  20 001 1            DDOUBL
2438                        25,3362  20 001 1            DDOUBL
2439   REF   1              25,3363  1 3340 1            TCF     DASAMPL


2440   REF  88  LAST  574   25,3364  3 0110 1  SCALCHNG  CA      RADMODES
2441                        25,3365  0 0006 1            EXTEND              INVERT SCALE BIT IN RADMODES
2442   REF  10  LAST  548   25,3366  06 C01 0            RXOR    LCHAN
2443   REF  89  LAST  574   25,3367  54 110 0            TS      RADMODES

2444   REF   5  LAST  572   25,3370  11'110 1            CCS     NSAMP       TEST FOR R12
2445   REF   1              25,3371  1 3401 0            TCF     R12SCHNG

2446   REF  35  LAST  535   25,3372  0 5506 1            TC      UPFLAG      SET RNGSCFLG FOR LRS24.1
2447   REF   1              25,3373   00120 1            ADRES   RNGSCFLG

2448   REF   4  LAST  572   25,3374  3 3136 0            CA      DGBITS      UPDATE DATA GOOD BITS
2449                        25,3375  0 0006 1            EXTEND
2450   REF  15  LAST  573   25,3376  02 C33 0            RAND    CHAN33
2451   REF   4  LAST  572   25,3377  55'112 0            TS      OLDATAGD
2452   REF   3  LAST  573   25,3400  1 3264 0            TCF     RRBADEND


2453   REF   6  LAST  574   25,3401  55'110 1  R12SCHNG  TS      NSAMP       UPDATE NSAMP AND IGNORE READING.
```

```
 2454   REF    1                25,3402  1 3414 1             TCF     READVEL

 2455   REF    7  LAST   574    25,3403  55'110 1  R12EXIT    TS      NSAMP               UPDATE NSAMP
 2456                           25,3404  0 0006 1             EXTEND
 2457   REF    1                25,3405  1 3445 0             BZF     STORVEL

 2458   REF    1                25,3406  6 7766 1             AD      NEG3
 2459                           25,3407  0 0006 1             EXTEND
 2460   REF    1                25,3410  1 3425 0             BZF     STORALT

 2461   REF    2  LAST   230    25,3411  6 7770 0             AD      NEGONE
 2462                           25,3412  0 0006 1             EXTEND
 2463   REF    1                25,3413  1 3423 0             BZF     READALT
 2464   REF   11  LAST   571    25,3414  4 4750 0  READVEL    CS      SEVEN
 2465                           25,3415  0 0006 1             EXTEND
 2466   REF   10  LAST   571    25,3416  03 013 0             WAND    CHAN13
 2467   REF    7  LAST   573    25,3417  3 1077 0             CA      RADUST
 2468   REF   23  LAST   570    25,3420  0 4665 0  READALT2   TC      IBNKCALL
 2469   REF    2  LAST   570    25,3421   36000 1             CADR    RADSTART
 2470   REF   15  LAST   571    25,3422  0 5272 0             TC      RESUME


 2471   REF    2  LAST   570    25,3423  3 3063 1  READALT    CA      ALLREAD             SET UP LR ALTITUDE READ
 2472   REF    1                25,3424  1 3420 0             TCF     READALT2

 2473   REF   16  LAST   574    25,3425  52 064 1  STORALT    DXCH    ITEMP3
 2474   REF    3  LAST   250    25,3426  53'655 1             DXCH    HMEAS               STORE ALT IN HMEAS

 2475   REF   90  LAST   574    25,3427  4 0110 0             CS      RADMODES            TEST DATA GOOD
 2476   REF   27  LAST   573    25,3430  7 4740 1             MASK    BIT5
 2477                           25,3431  0 0006 1             EXTEND
 2478   REF    1                25,3432  1 3442 1             BZF     HBAD                DATA GOOD NOT PRESENT

 2479   REF    5  LAST   230    25,3433  11'674 1             CCS     STILBADH            IF DATA JUST GOOD,OR IG RESTART JUST
 2480   REF    1                25,3434  1 3443 0             TCF     HSTILBAD            OCCURRED,WAIT

 2481   REF   10  LAST   570    25,3435  4 0107 0             CS      FLGWRD11            SET FLAG FORR12.
 2482   REF    1                25,3436  7 4741 0             MASK    RNGEDBIT            (CANNOT USE UPFLAG BECAUSE ITEMP1 IS
 2483   REF   11  LAST   575    25,3437  26 107 0             ADS     FLGWRD11              DESTROYED)
 2484   REF    3  LAST   572    25,3440  0 3651 0  ALTEXIT    TC      RADLITES
 2485   REF    2  LAST   575    25,3441  1 3414 1             TCF     READVEL

 2486   REF   38  LAST   557    25,3442  3 4743 0  HBAD       CA      TWO                 SET STILBADH FOR FOUR SECOND DELAY
 2487   REF    6  LAST   575    25,3443  55'674 1  HSTILBAD   TS      STILBADH
 2488   REF    1                25,3444  1 3440 0             TCF     ALTEXIT

 2489   REF   91  LAST   575    25,3445  4 0110 0  STORVEL    CS      RADMODES            TEST DATA GOOD
 2490   REF   27  LAST   572    25,3446  7 4735 0             MASK    BIT8
 2491                           25,3447  0 0006 1             EXTEND
 2492   REF    1                25,3450  1 3506 0             BZF     VBAD                DATA GOOD NOT PRESENT
 2493    REF    4  LAST  231     25,3451  11'675 0                 CCS      STILBADV
 2494    REF    1                25,3452  1 3507 1                 TCF      VSTILBAD

 2495    REF   12  LAST  575     25,3453  4 0107 0                 CS       FLGWRD11           DATA IS GOOD, SET FLAG FOR R12
 2496    REF    1                25,3454  7 4736 0                 MASK     VELDABIT           (CANNOT USE UPFLAG BECAUSE ITEMP1 IS
 2497    REF   13  LAST  576     25,3455  26 107 0                 ADS      FLGWRD11             DESTROYED)
 2498    REF    3  LAST  570     25,3456  11'462 1  R12DL          CCS      VSELECT            UPDATE VSELECT
 2499                            25,3457  1 3461 0                 TCF      +2
 2500    REF   39  LAST  575     25,3460  3 4743 0                 CA       TWO
 2501    REF    4  LAST  576     25,3461  55'462 1                 TS       VSELECT

 2502    REF    7  LAST  572     25,3462  53'101 1                 DXCH     SAMPLSUM           STORE VFL DATA IN VMEAS
 2503    REF    3  LAST  213     25,3463  53'653 1                 DXCH     VMEAS

 2504                            25,3464  0 0006 1                 EXTEND
 2505    REF    4  LAST  575     25,3465  3 1655 0                 DCA      HMEAS              STORE HMEAS FOR DOWNLINK
 2506    REF    2  LAST  213     25,3466  53'777 0                 DXCH     HMEASDL

 2507                            25,3467  0 0006 1                 EXTEND
 2508    REF    3  LAST  206     25,3470  3 1561 1                 DCA      PIPTIME1           STORE TIME FOR DOWNLINK
 2509    REF    5  LAST  215     25,3471  53'755 0                 DXCH     MKTIME

 2510                            25,3472  0 0006 1                 EXTEND
 2511    REF    1                25,3473  3 1156 1                 DCA      CDUTEMPY           STORE CDUY,CDUZ FOR DOWNLINK
 2512    REF    5  LAST  214     25,3474  53'460 0                 DXCH     AIG

 2513    REF    1                25,3475  3 1154 0                 CA       CDUTEMPX           STORE CDUX FOR LINK
 2514    REF    6  LAST  214     25,3476  55'461 1                 TS       AOG

 2515    REF    4  LAST  575     25,3477  0 3651 0                 TC       RADLITES           UPDATE DSKY VFL LIGHT
 2516    REF  119  LAST  572     25,3500  3 4746 0                 CA       ZERO
 2517    REF    8  LAST  575     25,3501  55'077 1                 TS       RADUSE
A25171
 25173   REF    3  LAST  570     25,3502  4 4742 0  OKUPDATE CS             R12RDBIT           R12 READ IS DONE SO ALLOW R12 UPDATE
 25175   REF   14  LAST  576     25,3503  7 0107 0                 MASK     FLGWRD11
 25177   REF   15  LAST  576     25,3504  54 107 0                 TS       FLGWRD11

 2518    REF   16  LAST  575     25,3505  0 5272 0                 TC       RESUME

 2519    REF   40  LAST  576     25,3506  3 4743 0  VBAD           CA       TWO
 2520    REF    5  LAST  576     25,3507  55'675 0  VSTILBAD TS             STILBADV
 2521    REF    1                25,3510  1 3456 1                 TCF      R12DL
```

```
P2524              CODING TO PROTECT CHANNEL 13 WILL RADAR READ IS IN CRITICAL PERIOD


 2526   REF   1                 17,2000                      SETLOC C13BANK
 2527                           17,2000                      BANK

 2528   REF 166   LAST   574    17,2000   54 002 1  RADSTART TS      Q
 2529                           17,2001   0 0006 1     +1    EXTEND
 2530   REF   4   LAST   393    17,2002   00 004 0           READ    LOSCALAR          READ PRESENT TIME
 2531   REF  83   LAST   574    17,2003   54 001 1           TS      L

 2532   REF   8   LAST   459    17,2004   7 4337 0           MASK    LOW5              ONLY THE LOW 5 BITS MATTER
 2533                           17,2005   4 0000 0           COM
 2534   REF  36   LAST   506    17,2006   6 4737 0           AD      BIT6              COMPUTE DELTA TIME TO NEXT T5 TICK
 2535   REF   9   LAST   577    17,2007   7 4337 0           MASK    LOW5
 2536   REF   1                 17,2010   55'270 1           TS      RADDEL

 2537   REF   4   LAST   513    17,2011   6 7767 0           AD      NEG2              IF A TICKING OF T5 IS NEAR, WAIT UNTIL
 2538                           17,2012   0 0006 1           EXTEND                    IT HAS TICKED.  THE MAX DELAY HERE WILL
 2539   REF   3   LAST   575    17,2013   6 2001 1           BZMF    RADSTART +1       BE 937.5 MICROSECONDS

 2540   REF 167   LAST   577    17,2014   3 0002 0           CA      Q
 2541                           17,2015   0 0006 1           EXTEND                    IT IS SAFE TO SET THE ACTIVITY BIT NOW
 2542   REF  11   LAST   575    17,2016   05 013 0           WOR     CHAN13            BECAUSE OF THE ABOVE LOOP

 2543   REF  84   LAST   577    17,2017   4 0001 1           CS      L
 2544   REF   1                 17,2020   55'267 1           TS      RADTIME           SAVE NEGATIVE TIME OF READ
 2545   REF   1                 17,2021   0 4700 1           TC      ISWRETRN


 2546   REF   1                 17,2022   55'266 0  C13STAL1 TS      C13FSAV

 2547   REF  28   LAST   573    17,2023   3 4741 1           CA      BIT4
 2548                           17,2024   0 0006 1           EXTEND
 2549   REF  12   LAST   577    17,2025   02 013 1           RAND    CHAN13
 2550                           17,2026   0 0006 1           EXTEND
 2551   REF   1                 17,2027   1 2050 1           BZF     TCQSTAL           IF NO RADAR ACTIVITY, RETURN

 2552                           17,2030   12 031 0  C13SLOOP NOOP                      *** NECESSARY TO PREVENT A TC TRAP ***
 2553                           17,2031   0 0006 1           EXTEND
 2554   REF   5   LAST   577    17,2032   00 004 0           READ    LOSCALAR
 2555   REF   2   LAST   577    17,2033   6 1267 0           AD      RADTIME           COMPUTE DELTA T SINCE LAST RADAR READ
 2556   REF   7   LAST   548    17,2034   6 4727 1           AD      HALF
 2557   REF   8   LAST   577    17,2035   6 4727 1           AD      HALF              CORRECT FOR TIME OVERFLOW
 2558   REF  85   LAST   577    17,2036   56 001 0           XCH     L

 2559   REF   1                 17,2037   3 2053 0           CA      90MSCALR
 2560   REF   2   LAST   577    17,2040   6 1270 0           AD      RADDEL
 2561                           17,2041   0 0006 1           EXTEND
 2562   REF  86   LAST   577    17,2042   60 001 0           SU      L
 2563                          17,2043   0 0006 1                 EXTEND
 2564   REF    2  LAST  577    17,2044   6 2050 0                 BZMF     TCQSTAL          FORBIDDEN  ZONE IS PAST, RETURN

 2565   REF    1               17,2045   6 2054 1                 AD       -DTSCALR
 2566                          17,2046   0 0006 1                 EXTEND
 2567   REF    1               17,2047   6 2030 0                 BZMF     C13SLOOP         IN THE FORBIDDEN PERIOD, LOOP UNTIL O.K.

 2568   REF 168   LAST  577    17,2050  22 002 0   TCQSTAL        LXCH     Q                ALL IS WELL, RETURN
 2569   REF    2  LAST  577    17,2051   3 1266 1                 CA       C13FSAV
 2570                          17,2052  52 005 0                  DTCF

 2571                          17,2053   00440 1   90MSCALR OCT      440              90 MILLISEC IN SCALAR
 2572                          17,2054   77754 1   -DTSCALR OCT      77754            -5.9375 MS IN SCALAR

 2573   REF    2  LAST  531       6000                            SETLOC FFTAG6
 2574                             6040                            BANK

 2575   REF    1                  6040   3 7745 0  C13STALL CAF      PRIO36           PRIO36 = 36000 = FCADR (17,2000)
 2576   REF    3  LAST  479       6041  56 004 0                  XCH      FBANK
 2577   REF    1                  6042   1 2022 1                 TCF      C13STALL
```

```
P2578    THIS ROUTINE CHANGES THE LR POSITION, AND CHECKS THAT IT GOT THERE.

 2579                               25,3511                              BANK     25
 2580    REF    2  LAST   542       25,2000                              SETLOC  P20S1
 2581                               25,3511                              BANK
 2582    REF    2 LAST   542 TO    571:     580     580*                 COUNT*  $$/RSUB
 2583                               25,3511  0 0004 0  LRPOS2           INHINT

 2584    REF   92  LAST   575       25,3512  4 0110 0                    CS       RADMODES
 2585    REF    1                   25,3513  7 4737 1                    MASK     LRPOSBIT          SHOW DESIRED LR POSITION IS 2
 2586    REF   93  LAST   579       25,3514  26 110 0                    ADS      RADMODES

 2587    REF   24  LAST   490       25,3515  3 4736 1                    CAF      BIT7
 2588                               25,3516  0 0006 1                    EXTEND
 2589    REF   16  LAST   574       25,3517  02 033 0                    RAND     CHAN33            SEE IF ALREADY THERE.
 2590                               25,3520  0 0006 1                    EXTEND
 2591    REF    2  LAST   553       25,3521  1 3532 1                    BZF      RADNOOP

 2592    REF   22  LAST   438       25,3522  3 4730 1                    CAF      BIT13
 2593                               25,3523  0 0006 1                    EXTEND
 2594    REF   36  LAST   567       25,3524  05 012 1                    WOR      CHAN12            COMMAND TO POSITION 2
 2595    REF    1                   25,3525  3 3565 1                    CAF      6SECS             START SCANNING FOR INBIT AFTER 7 SECS.
 2596    REF   21  LAST   557       25,3526  0 5205 0                    TC       WAITLIST
 2597    REF   28  LAST   568       E7,1456                              EBANK=  LOSCOUNT
 2598    REF    1                   25,3527   03563 1                    2CADR    LRPOSCAN
 2598    REF    1                   25,3530   52067 1
 2599    REF    3  LAST   569       25,3531  0 2357 1                    TC       ROADBACK

 2600    REF   70  LAST   566       25,3532  3 4744 1  RADNOOP          CAF      ONE               NO FURTHER ACTION REQUESTED
 2601    REF   22  LAST   579       25,3533  0 5205 0                    TC       WAITLIST
 2602    REF   29  LAST   579       E7,1456                              EBANK=  LOSCOUNT
 2603    REF    3  LAST   572       25,3534   03616 0                    2CADR    RGOODEND
 2603                               25,3535   52067 1
 2604    REF    4  LAST   579       25,3536  0 2357 1                    TC       ROADBACK

 2608    REF    2  LAST   106       25,3537  55'077 1  LRPOSNXT         TS       SAMPLIM
 2609    REF    9  LAST   562       25,3540  0 5223 1                    TC       FIXDELAY          SCAN ONCE PER SECOND 5 TIMES MAX AFTER
 2610                               25,3541   00144 0                    DEC      100               INITIAL DELAY OF 7 SECONDS.

 2611    REF   25  LAST   579       25,3542  3 4736 1                    CAF      BIT7              SEE IF LR POS2 IS ON
 2612                               25,3543  0 0006 1                    EXTEND
 2613    REF   17  LAST   579       25,3544  02 033 0                    RAND     CHAN33
 2614                               25,3545  0 0006 1                    EXTEND
 2615    REF    1                   25,3546  1 3555 0                    BZF      LASTLRDT          IF THERE, WAIT FINAL SECOND FOR BOUNCE.

 2616    REF    3  LAST   579       25,3547  11'077 1                    CCS      SAMPLIM           SEE IF MAX TIME UP.
 2617    REF    1                   25,3550  1 3537 1                    TCF      LRPOSNXT

 2618    REF   23  LAST   579       25,3551  4 4730 0                    CS       BIT13             IF TIME UP, DISABLE COMMAND AND ALARM.
 2619                               25,3552  0 0006 1                    EXTEND
 2620    REF  37  LAST  579    25,3553  03 012 1             WAND    CHAN12
 2621    REF   3  LAST  573    25,3554  1 3623 1             TCF     RDBADEND

 2622    REF   1               25,3555  3 4771 1  LASTLRDT  CA      2SECS            WAIT TWO SECONDS AFTER RECEIPT OF INBIT
 2623    REF   3  LAST  175    25,3556  0 5226 1             TC      VARDELAY         TO WAIT FOR ANTENNA BOUNCE TO DIE OUT.

 2624    REF  24  LAST  579    25,3557  4 4730 0             CS      BIT13            REMOVE COMMAND
 2625                          25,3560  0 0006 1             EXTEND
 2626    REF  38  LAST  580    25,3561  03 012 1             WAND    CHAN12
 2627    REF   4  LAST  579    25,3562  1 3616 1             TCF     RGOODEND

 2628    REF   8  LAST  458    25,3563  3 4742 1  LRPOSCAN  CAF     FOUR
 2629    REF   2  LAST  579    25,3564  1 3537 1             TCF     LRPOSNXT
 2630                          25,3565   01130 1  6SECS     DEC     600

 2631    REF 155  LAST  568    25,3566  0 4607 1  LRP2COMM  TC      BANKCALL
 2632    REF   1               25,3567   53511 1             CADR    LRPOS2
 2633    REF 156  LAST  580    25,3570  0 4607 1             TC      BANKCALL
 2634    REF   9  LAST  534    25,3571   17733 0             CADR    RADSTALL
 2635    REF   1               25,3572  0 3574 1             TC      LP2ALM
 2636    REF   1               25,3573  1 3605 0             TCF     GOPINNER

 2637    REF  23  LAST  571    25,3574  0 5571 1  LP2ALM    TC      ALARM
 2638                          25,3575   00523 0             OCT     523
 2639    REF   2  LAST  580    25,3576  1 3605 0             TCF     GOPINNER

 2640    REF   4  LAST  535    25,3577  3 5007 0  V59GP63   CA      EBANK7
 2641    REF  23  LAST  536    25,3600  54 003 0             TS      EBANK
 2642    REF   1               E7,1427                       EBANK=  RPCRTIME
 2643    REF  14  LAST  573    25,3601  3 4724 1             CA      POSMAX
 2644    REF   2  LAST  580    25,3602  55'427 0             TS      RPCRTIME
 2645    REF  53  LAST  567    25,3603  4 4727 0             CS      BIT14
 2646    REF   1               25,3604  55'430 0             TS      RPCRTQSW
 2647    REF  38  LAST  536    25,3605  0 4626 1  GOPINNER  TC      POSTJUMP
 2648    REF   5  LAST  465    25,3606   21062 0             CADR    PINBRNCH
```

```
P2649             SEQUENCES TO TERMINATE RR OPERATIONS.

 2650   REF   6  LAST  573    25,3607  3 4736 1  ENDRADAR CAF      RCDUFBIT          PROLOG TO CHECK RR CDU FAIL BEFORE END.
 2651   REF  94  LAST  579    25,3610  7 0110 0           MASK     RADMODES
 2652   REF 195  LAST  573    25,3611  10 000 0           CCS      A
 2653   REF   5  LAST  580    25,3612  1 3616 1           TCF      RGOODEND
 2654   REF   4  LAST  580    25,3613  1 3623 1           TCF      RDBADEND
 2655   REF 120  LAST  576    25,3614  4 4746 1   -2      CS       ZERO              RGOODEND WHEN NOT UNDER WAITLIST CONTROL
 2656   REF   2  LAST  101    25,3615  54 332 1           TS       RUPTAGN

 2657   REF  41  LAST  576    25,3616  3 4743 0  RGOODEND CAF      TWO
 2658   REF  39  LAST  580    25,3617  0 4626 1           TC       POSTJUMP
 2659   REF   2  LAST  256    25,3620   17704 1           CADR     GOODEND

 2660   REF 121  LAST  581    25,3621  4 4746 1   -2      CS       ZERO              RDBADEND WHEN NOT UNDER WAITLIST.
 2661   REF   3  LAST  581    25,3622  54 332 1           TS       RUPTAGN
 2662   REF  42  LAST  581    25,3623  3 4743 0  RDBADEND CAF      TWO
 2663   REF  40  LAST  581    25,3624  0 4626 1           TC       POSTJUMP
 2664   REF   1               25,3625   17701 1           CADR     BADEND

 2665   REF  19  LAST  571       6266            BIN3     EQUALS   THREE
```

```
P2666   PROGRAM NAME_ LPS20.1 VECTOR EXTRAPOLATION AND LOS COMPUTATION
R2667   MOD. NO.  2       BY  J.D. COYNE    SDC     DATE   12-7-66

R2668   FUNCTIONAL DESCRIPTION_

R2669   1) EXTRAPOLATE THE LEM AND CSM VECTORS IN ACCORDANCE WITH THE TIME REFERED TO IN CALLER + 1.
R2671   2) COMPUTES THE LOS VECTOR TO THE CSM, CONVERTS IT TO STABLE MEMBER COORDINATES AND STORES IT IN RRTARGET.
R2673   3) COMPUTES THE MAGNITUDE OF THE LOS VECTOR AND STORES IT IN MLOSV

R2674   CALLING SEQUENCE        CALL
R2675                                   LPS20.1

R2676   SUBROUTINES CALLED_

R2677   LEMPREC,CSMPREC

R2678   NORMAL EXIT_ RETURN TO CALLER + 2

R2679   ERROR EXITS_ NONE

R2680   ALARMS_ NONE

R2681   OUTPUT_

R2682   LOS VECTOR (HALF UNIT) IN SM COORDINATES STORED IN RRTARGET
R2683   MAGNITUDE OF THE LOS VECTOR (METERS SCALED B-29) STORED IN MSLOV
R2684   RRNBSW CLEARED

R2685   INITIALIZED ERASEABLE

R2686   TDEC1 MUST CONTAIN THE TIME FOR EXTRAPOLATION
R2687   SEE ORBITAL INTEGRATION ROUTINE

R2688   DEBRIS_

R2689   MPAC DESTROYED BY THIS ROUTINE

 2690                         23,2335                 BANK    23
 2691   REF   4  LAST  531    24,2000                 SETLOC P20S
 2692                         24,3337                 BANK
 2693   REF   1                                               COUNT* $$/LPS20

 2694                        24,3337   43020 1  LPS20.1  STQ    BOFF
 2695   REF   3  LAST  516   24,3340   01755 1                  LS21X
 2696   REF   8  LAST  567   24,3341   01343 1                  LOSCMFLG          LOSCMFLG = 0 MEANS NOT CALLED BY R21
 2697   REF   1              24,3342   51346 1                  LMINT             SO CALL LEMCONIC TO GET LM STATE
 2698                        24,3343   77614 1           BON                      IF IN R21 AND ON LUNAR SURFACE
 2699   REF   7  LAST  516   24,3344   04307 1                  SURFFLAG          DON'T CALL LEMCONIC
 2700   REF   1              24,3345   51356 0                  CSMINT
 2701                        24,3346   77624 1  LMINT    CALL
 2702   REF   3  LAST  502   24,3347   27136 0                  LEMCONIC          EXTRAPOLATE LEM
 2703                        24,3350   77775 1           VLOAD
 2704   REF   5  LAST  502   24,3351   00001 0                  RATT
 2705   REF   2  LAST  516   24,3352   26343 1           STOVL  LMPOS             SAVE LM POSITION B-29
 2706   REF   1              24,3353   00007 0                  VATT
 2707   REF   2  LAST  516   24,3354   16351 1           STODL  LMVEL             SAVE LM VELOCITY B-7
 2708   REF   5  LAST  508   24,3355   00015 0                  TAT
 2709   REF  16  LAST  534   24,3356   34041 0  CSMINT   STCALL TDEC1
 2710   REF   2  LAST  351   24,3357   27124 0                  CSMCONIC           EXTRAPOLATE CSM
 2711                        24,3360   52375 1           VLOAD  VSU               COMPUTE RELATIVE VELOCITY V(CSM) - V(LM)
 2712   REF   2  LAST  583   24,3361   00007 0                  VATT
 2713   REF   3  LAST  583   24,3362   02351 1                  LMVEL
 27135  REF   2  LAST  511   24,3363   00017 1           STORE  VELLOS
 2714                        24,3364   76521 0           MXV    VSL1
 2715   REF  10  LAST  502   24,3365   01732 0                  REFSMMAT
 2716                        24,3366   77776 1           EXIT
 2717   REF   7  LAST  568   24,3367  0 6050 1           TC     KILLTASK          KILL THE TASK WHICH CALLS DODES SINCE
 2718   REF   3  LAST  568   24,3370   52573 1           CADR   DESLOOP +2        STORING INTO ERASEABLES DODES USES
 2719   REF  52  LAST  567   24,3371  0 6060 1           TC     INTPRET
 2720   REF   4  LAST  567   24,3372   25757 0           STOVL  LOSVEL
 2721   REF   6  LAST  583   24,3373   00001 0                  RATT
 2722                        24,3374   43051 1           VSU    BOFF
 2723   REF   3  LAST  583   24,3375   02343 1                  LMPOS
 27232  REF   3  LAST  518   24,3376   00350 1                  RNDVZFLG
 27234  REF   1              24,3377   51404 0                  NOTSHIFT
 2724   REF   2  LAST  511   24,3400   00025 0           STORE  RRANGE            RANGE FOR POSSIBLE ALARM B-29
 2725                        24,3401   54204 0           BOVB   VSL
 2726   REF   1              24,3402   57756 1                  TCDANZIG
 2727                        24,3403   20212 1                  9D
 2728                        24,3404   41056 1  NOTSHIFT UNIT   BOVB              IF OVERFLOW , RANGE MUST BE GREATER
 2729   REF   1              24,3405   50104 1                  526ALARM          THAN 400 N. M.
 2730                        24,3406   76521 0           MXV    VSL1
 2731   REF  11  LAST  583   24,3407   01732 0                  REFSMMAT          CONVERT TO STABLE MEMBER
 2732   REF  10  LAST  567   24,3410   15101 0           STODL  RRTARGET
 2733                        24,3411   00045 0                  36D               SAVE MAGNITUDE OF LOS VECTOR FOR
 2734   REF   4  LAST  568   24,3412   01765 1           STORE  MLOSV             VELOCITY CORRECTION IN DESIGNATE
 2735                        24,3413   77614 1           CLRGO
 2736   REF   5  LAST  566   24,3414   00231 1                  RRNBSW
 2737   REF   4  LAST  583   24,3415   01755 1                  LS21X
 2738                            0024           RRANGE   EQUALS 20D
 27385                          0016            VELLOS   EQUALS 14D
```

```
P27388  PROGRAM NAME : LPS20.2 400 N. MI. RANGE CHECK
R2739   MOD. NO. 2   BY J.D. COYNE   SDC    DATE  12-7-66

R2740   FUNCTIONAL DESCRIPTION_

R2741   COMPARES THE MAGNITUDE OF THE LOS VECTOR TO 400 NM

R2742   CALLING SEQUENCE      CALL
R2743                                   LPS20.2

R2744   SUBROUTINES CALLED_ NONE

R2745   NORMAL EXIT _ RETURN TO CALLER +1, MPAC EQ 0 (RANGE 400NM OR LESS.)

R2746   ERROR EXITS _ RETURN TO CALLER +1, MPAC EQ 1 (RANGE GREATER THAN 400NM)

R2747   ALARMS_ NONE

R2748   OUTPUT_ NONE

R2749   INITIALIZED ERASEABLE_

R2750   PDL 36D MUST CONTAIN THE MAGNITUDE OF THE VECTOR
R2751   DEBRIS

R2752   MPAC DESTROYED BY THIS ROUTINE

  2753  REF   3  LAST  579   25,2000                        SETLOC P20S1
  2754                       25,3626                        BANK
  2755  REF   1                                             COUNT* $$/LPS20

  2756                       25,3626   45345 1  LPS20.2   DLOAD  DSU
  2757  REF   5  LAST  583   25,3627   01765 1                   MLOSV            MAGNITUDE OF LOS
  2758  REF   1              25,3630   13641 0                   FHNM             OVER 400NM  _
  2759                       25,3631   77644 1            BPL
  2760  REF   1              25,3632   53635 1                   TOFAR
  2761                       25,3633   43535 0            SLOAD  RVQ
  2762  REF   1              25,3634   06505 1                   ZERO/SP
  2763                       25,3635   43535 0  TOFAR     SLOAD  RVQ
  2764  REF   1              25,3636   13640 1                   ONE/SP
  2765                       25,3637   00001 0  ONE/SP    DEC    1
```

```
 2766                         25,3640   26467 0  FHNM      2DEC    740800 B-20     400 NAUTICAL MILES IN METERS B-20
 2766                         25,3641   00000 1
```

```
P2767   PROGRAM NAME: LRS22.1 (DATA READ SUBROUTINE 1)
R2768   MOD. NO.: 1         BY:  P. VOLANTE  SDC             DATE: 11-15-66

R2769   FUNCTIONAL DESCRIPTION

R2770   1) READS RENDEZVOUS RADAR RANGE AND RANGE-RATE,TRUNION AND SHAFT ANGLES,THREE CDU VALUES AND TIME. CONVERTS THIS
R2772   DATA AND LEAVES IT FOR THE MEASUREMENT INCORPORATION ROUTINE (LSR22.3). CHECKS FOR THE RR DATA GOOD DISCRETE,FOR
R2774   RR REPOSITION AND RR CDU FAIL

R2775   2) COMPARES RADAR LOS WITH LOS COMPUTED FROM STATE VECTORS TO SEE IF THEY ARE WITHIN THREE DEGREES


R2777   CALLING SEQUENCE: BANKCALL FOR LRS22.1


R2778   SUBROUTINES CALLED: ,

R2779            RRRDOT   LPS20.1
R2780            RRRANGE  BANKCALL
R2781            RADSTALL CDULOGIC
R2782            RRNB     SMNB
R2783   NORMAL EXIT: RETURN TO CALLER+1 WITH MPAC SET TO +0


R2784   ERROR EXITS: RETURN TO CALLER+1 WITH ERROR CODE STORED IN MPAC AS FOLLOWS:

R2786                  00001-ERROR EXIT 1-RR DATA NO GOOD (NO RR DATA GOOD DISCRETE OR RR CDU FAIL OR RR REPOSITION)
R2788                  00002-ERROR EXIT 2-RR LOS NOT WITHIN THREE DEGREES OF LOS COMPUTED FROM STATE VECTORS


R2790   ALARMS:  521-COULD NOT READ RADAR DATA (RR DATA GOOD DISCRETE NOT PRESENT BEFORE AND AFTER READING THE RADAR)
R2792    (THIS ALARM IS ISSUED BY THE RADAREAD SUBROUTINE WHICH IS ENTERED FROM A RADARUPT)


R2794   OUTPUT: RRLOSVEC- THE RR LINE-OF-SIGHT VECTOR(USED BY LRS22.2)-A HALF-UNIT VECTOR
R2796           RM- THE RR RANGE READING(TO THE CSM) DP, IN METERS SCALED B-29(USED BY LRS22.2 AND LRS22.3)

R2798     ALL OF THE FOLLOWING OUTPUTS ARE USED BY LRS22.3:

R2799           RDOTM- THE RR RANGE-RATE READING,DP, IN METERS PER CENTISECOND, SCALED B-7
R2801           RRTRUN-RR TRUNION ANGLE,DP,IN REVOLUTIONS,SCALED B0
R2802           RRSHAFT-RR SHAFT ANGLE,DP,IN REVOLUTIONS,SCALED B0
R2803           AIG,AMG,AOG-THE CDU ANGLES,THREE SP WORDS
R2804           MKTIME-THE TIME OF THE RR READING,DP,IN CENTISECONDS


R2805   ERASABLE INITIALIZATION REQUIRED:

R2806     RNRAD,THE RADAR READ COUNTER FROM WHICH IS OBTAINED:
```

```
R2807        1)RR RANGE SCALED 9.38 FT. PER BIT ON THE LOW SCALE AND 75.04 FT. PER BIT ON THE HIGH SCALE
R2809        2)RR RANGE RATE,SCALED .6278 FT./SEC. PER BIT

R2810       THE CDU ANGLES FROM CDUX,CDUY,CDUZ AND TIME1 AND TIME2


R2811    DEBRIS:  LRS22.1X,A,L,Q,PUSHLIST


 2812                              32,2362                          BANK    32
 2813    REF   2  LAST    42       32,2000                          SETLOC LRS22
 2814                              32,2362                          BANK
 2815    REF   2 LAST   42 TO   42:      4     4*                   COUNT* $$/LRS22

 2816    REF    7  LAST  559    '32,2362  0 4636 0  LRS22.1    TC      MAKECADR
 2817    REF    3  LAST  520     32,2363  55'737 1             TS      LRS22.1X
 2818    REF   55  LAST  567     32,2364  0 5520 0             TC      DOWNFLAG
 2819    REF    2  LAST  574     32,2365   00120 1             ADRES   RNGSCFLG
 2820                             32,2366  0 0004 0             INHINT   .
 2821    REF   30  LAST  574     32,2367  3 4742 1             CAF     BIT3
 2822                             32,2370  0 0006 1             EXTEND                     GET RR RANGE SCALE
 2823    REF   18  LAST  579     32,2371  02 033 0             RAND    CHAN33             FROM CHANNEL 33 BIT 3
 2824    REF   87  LAST  577    '32,2372  54 001 1             TS      L
 2825    REF    1                32,2373  4 4742 0             CS      RRRSBIT
 2826    REF   95  LAST  581     32,2374  7 0110 0             MASK    RADMODES
 2827    REF   88  LAST  588     32,2375  6 0001 0             AD      L
 2828    REF   96  LAST  588     32,2376  54 110 0             TS      RADMODES
 2829                             32,2377  0 0003 1             RELINT
 2830    REF 157   LAST  580     32,2400  0 4607 1  READRDOT   TC      BANKCALL
 2831    REF    4  LAST  534     32,2401   53072 1             CADR    RRRDOT             READ RANGE-RATE (ONE SAMPLE)
 2832    REF 158   LAST  588     32,2402  0 4607 1             TC      BANKCALL
 2833    REF   10  LAST  580     32,2403   17733 0             CADR    RADSTALL           WAIT FOR DATA READ COMPLETION
 2834    REF    1                32,2404  1 2560 1             TCF     EREXIT1            COULD NOT READ RADAR-ERROR EXIT 1

 2835                             32,2405  0 0004 0             INHINT                     NO INTERRUPTS WHILE READING TIME AND CDU
 2836    REF    4  LAST  569     32,2406  53'105 0             DXCH    TIMEHOLD           SET MARK TIME EQUAL TO THE MID-POINT
 2837    REF 251   LAST  567     32,2407  52 162 0             DXCH    MPAC +5            TEMP BUFFER FOR DOWNLINK
 2838    REF    8  LAST  576     32,2410  53'101 1             DXCH    SAMPLSUM           SAVE RANGE-RATE READING
 2839    REF    3  LAST  152     32,2411  53'747 0             DXCH    RDOTMSAV
 2840                             32,2412  0 0006 1             EXTEND
 2841    REF    6  LAST  269     32,2413  3 0034 0             DCA     CDUY               SAVE ICDU ANGLES
 2842    REF 252   LAST  588     32,2414  52 160 1             DXCH    MPAC +3            TEMP BUFFER FOR DOWNLINK
 2843    REF   12  LAST  399     32,2415  3 0032 0             CA      CDUX
 2844    REF 253   LAST  588     32,2416  54 156 1             TS      MPAC +2            TEMP BUFFER FOR DOWNLINK
 2845                             32,2417  0 0006 1             EXTEND
 2846    REF   16  LAST  569     32,2420  3 0025 0             DCA     TIME2               SAVE TIME
 2847    REF 254   LAST  588     32,2421  52 155 1             DXCH    MPAC               SAVE TIME OF CDU READINGS IN MPAC
 2848                             32,2422  0 0006 1             EXTEND
 2849    REF   12  LAST  564     32,2423  3 0036 1             DCA     CDUT               SAVE TRUNION AND SHAFT ANGLES FOR RRNB
 2850    REF   17  LAST  566     32,2424  53'107 1             DXCH    TANG
 2851                         32,2425  0 0003 1            RELINT
 2852   REF 159  LAST  588    32,2426  0 4607 1            TC      BANKCALL
 2853   REF   3  LAST  534    32,2427   53074 1            CADR    RRRANGE        READ RR RANGE (ONE SAMPLE)
 2854   REF 160  LAST  589    32,2430  0 4607 1            TC      BANKCALL
 2855   REF  11  LAST  588    32,2431   17733 0            CADR    RADSTALL       WAIT FOR READ COMPLETE
 2856   REF   1               32,2432  0 2554 1            TC      CHEXERR        CHECK FOR ERRORS DURING READ
 2857                         32,2433  0 0004 0            INHINT                 COPY CYCLE FOR MARK DATA ON DOWNLINK
 2858                         32,2434  0 0006 1            EXTEND
 2859   REF   7  LAST  571    32,2435  3 1331 1            DCA     DNRRANGE       RANGE,RANGE RATE (RAW DATA)
 2860   REF   5  LAST  215    32,2436  53'761 1            DXCH    RANGRDOT
 2861   REF 255  LAST  588    32,2437  52 162 0            DXCH    MPAC +5
 2862   REF   6  LAST  576    32,2440  53'755 0            DXCH    MKTIME         MARK TIME
 2863   REF 256  LAST  589    32,2441  52 160 1            DXCH    MPAC +3
 2864   REF   6  LAST  576    32,2442  53'460 0            DXCH    AIG            CDUY, CDUZ
 2865                        ,32,2443  0 0006 1            EXTEND
 2866   REF  18  LAST  588    32,2444  3 1107 0            DCA     TANG           PRESERVE TANG
 2867   REF   9  LAST  559    32,2445  53'753 0            DXCH    TANGNB         TRUNNION AND SHAFT ANGLES
 2868   REF 257  LAST  589    32,2446  3 0156 0            CA      MPAC +2
 2869   REF   7  LAST  576    32,2447  55'461 1            TS      AOG            CDUX
 28711  REF  53  LAST  533    32,2450  0 6060 1            TC      INTPRET
 28712                        32,2451   14025 0            STODL   20D            SAVE TIME OF CDU READINGS IN 20D
 28713  REF   7  LAST  589    32,2452   03755 0                    MKTIME
 28714                       .32,2453   45225 0            DSU     DSU
 28715  REF   3  LAST  233    32,2454   01777 1                    OLDAGS
 28716  REF   1               32,2455   24567 0                    50SECS         50 SECS SINCE LAST AGS DOWNLIST?
 28717                        32,2456   77440 1            BMN     EXIT
 28718  REF   1               32,2457   64472 1                    NOAGS          NO

 2872   REF   2  LAST   87    32,2460  4 0110 0            CS      FLGWRD12       IS RR READING HIGH SCALE
 2873   REF   2  LAST  588    32,2461  7 4742 0            MASK    RRRSBIT
 2874   REF 196  LAST  581    32,2462  10 000 0            CCS     A
 2875   REF  15  LAST  580    32,2463  3 4724 1            CA      POSMAX         NO- LOW SCALE (SET CONFIG) AGSCODE=17776
 2876   REF   1               32,2464  6 2565 0            AD      OCT57776       YES- HI SCALE (SET CONFIG) AGSCODE=57776
 2877   REF   6  LAST  533    32,2465  55'073 0            TS      AGSCODE        SET AGS CODE WORD
 2878   REF  54  LAST  589    32,2466  0 6060 1            TC      INTPRET
 28781                        32,2467   77745 1            DLOAD
 28782  REF   8  LAST  589    32,2470   03755 0                    MKTIME
 28783  REF   4  LAST  589    32,2471   01777 1            STORE   OLDAGS         SAVE AGS DOWNLINK TIME

 2879                         32,2472   77745 1  NOAGS     DLOAD
 2880   REF   4  LAST  588    32,2473   03747 0                    RDOTMSAV       CONVERT RDOT UNITS AND SCALING
 2881                         32,2474   57261 0            SL      DMPR           START WITH READING SCALED B-28, -.6278
 2882                         32,2475   20217 1                    14D            FT./SECOND PER BIT
 2883   REF   1               32,2476   24002 0                    RDOTCONV       END WITH METERS/CENTISECOND, B-7
 2884   REF   3  LAST  152    32,2477   03751 1            STORE   RDOTM
 2885                         32,2500   47135 0            SLOAD   RTB
 2886   REF  19  LAST  539    32,2501   01107 0                    TANG           GET TRUNION ANGLE
 2887   REF  13  LAST  564    32,2502   21606 1                    CDULOGIC       CONVERT TO DP ONES COMP. IN REVOLUTIONS
 2888   REF   2  LAST  152    32,2503   03734 1            STORE   RRTRUN         AND SAVE FOR TMI ROUTINE (LSR22.3)
 2889                         32,2504   47135 0            SLOAD   RTB
 2890   REF  20  LAST  589   32,2505   01110 0                  TANG +1       DITTO FOR SHAFT ANGLE
 2891   REF  14  LAST  589   32,2506   21606 1                  CDULOGIC
 2892   REF   2  LAST  152   32,2507   17736 0         STODL    RRSHAFT
 2893   REF   9  LAST  588   32,2510   01101 0                  SAMPLSUM
 2894                        32,2511   66405 0         DMP      SL2R          CONVERT UNITS AND SCALING OF RANGE
 2895   REF   1              32,2512   24004 0                  RANGCONV      PER BIT, END WITH METERS,SCALED -29
 2897   REF   3  LAST  158   32,2513   37757 0         STCALL   RM
 2898   REF   2  LAST  559   32,2514   46041 0                  RRNB          COMPUTE RADAR LOS USING RRNB
 2899   REF   3  LAST  152   32,2515   17741 0         STODL    RRBORSIT      AND SAVE
 2900                        32,2516   00025 0                  20D
 2901   REF  17  LAST  583   32,2517   34041 0         STCALL   TDEC1         GET STATE VECTOR LOS AT TIME OF CDU READ
 2902   REF   5  LAST  534   32,2520   51337 1                  LPS20.1
 2903                        32,2521   77776 1         EXIT
 2904   REF   7  LAST  589   32,2522  3 1457 0         CA       AIG           STORE IMU CDU ANGLES AT MARKTIME
 2905   REF  11  LAST  493   32,2523  54 765 1         TS       CDUSPOT       IN CDUSPOT FOR TRG*SMNB
 2906   REF   4  LAST  215   32,2524  3 1460 1         CA       AMG
 2907   REF  12  LAST  590   32,2525  54 767 0         TS       CDUSPOT +2
 2908   REF   8  LAST  589   32,2526  3 1461 0         CA       AOG
 2909   REF  13  LAST  590   32,2527  54 771 1         TS       CDUSPOT +4
 2910   REF  55  LAST  589   32,2530  0 6060 1         TC       INTPRET
 2911                        32,2531   45175 0         VLOAD    CALL          LOAD VECTOR AND CALL TRANSFORMATION
 2912   REF  11  LAST  583   32,2532   01101 0                  RRTARGET
 2913   REF   1              32,2533   47643 0                  TRG*SMNB      ROTATE LOS AT MARKTIME FROM SM TO NB.
 2914                        32,2534   77641 1         DOT                    DOT WITH RADAR LOS TO GET ANGLE
 2915   REF   4  LAST  590   32,2535   03741 0                  RRBORSIT
 2916                        32,2536   65552 0         SL1      ACOS          BETWEEN THEM
 2917   REF  19  LAST  455   32,2537   01045 1         STORE    DSPTEM1       STORE FOR POSSIBLE DISPLAY
 2918                        32,2540   50025 0         DSU      BMN           IS IT LESS THAN 3 DEGREES
 2919   REF   1              32,2541   24564 0                  THREEDEG
 2920   REF   1              32,2542   64547 0                  NORMEXIT      YES-NORMAL EXIT

 2921                        32,2543   77776 1         EXIT                   ERROR EXIT 2
 2922   REF  34  LAST  567   32,2544  3 4743 0         CAF      BIT2          SET ERROR CODE
 2923   REF 258  LAST  589   32,2545  54 154 0         TS       MPAC
 2924   REF   1              32,2546  1 2552 0         TCF      OUT22.1

 2925                        32,2547   77776 1 NORMEXIT EXIT                  NORMAL EXIT-SET MPAC EQUAL ZERO
 2926   REF 122  LAST  581   32,2550  3 4746 0         CAF      ZERO
 2927   REF 259  LAST  590   32,2551  54 154 0         TS       MPAC
 2928   REF   4  LAST  588   32,2552  31 737 0 OUT22.1  CAE      LRS22.1X      EXIT FROM LRS22.1
 2929   REF  10  LAST  557   32,2553  0 4631 1         TC       BANKJUMP
 2930   REF  19  LAST  571   32,2554  30 101 1 CHEXERR  CAE      FLAGWRD5
 2931   REF   1              32,2555  7 4733 0         MASK     RNGSCBIT
 2932   REF 197  LAST  589   32,2556  10 000 0         CCS      A             CHECK IF RANGE SCALE CHANGED
 2933   REF   1              32,2557  1 2400 0         TCF      READRDOT      YES-TAKE ANOTHER READING

 2934   REF  32  LAST  573   32,2560  3 4744 1 ERREXIT1 CA       BIT1          SET ERROR CODE
 2935   REF 260  LAST  590   32,2561  54 154 0         TS       MPAC
 2936   REF   2  LAST  590   32,2562  0 2552 1         TC       OUT22.1
 2937                        32,2563   00210 1 THREEDEG 2DEC     .008333333    THREE DEGREES,SCALED  REVS,B0
 2937                        32,2564   21042 1
 29375                        32,2565   57776 0  OCT57776 OCT     57776          AGS CODE WORD - HIGH RANGE SCALE - SET
 29376                        32,2566   00000 1  50SECS   2DEC    5000
 29376                        32,2567   11610 0
```

```
P2938    PROGRAM NAME - LRS22.2 (DATA READ SUBROUTINE 2)

R2939    MOD. NO. : 1        BY: P VOLANTE  SDC            DATE    4-11-67
R2940    EUNCTICNAL DESCRIPTICN-
R2941       2) CHECKS IE THE RR LOS (I.E. THE RADAR BORESIGHT VECTOR) IS WITHIN 30 DEGREES OF THE LM +Z AXIS

R2943    CALLING SEQUENCE- BANKCALL FOR LRS22.2

R2944    SUBROUTINES CALLED: G+N,AUTO   SETMAXDB
R2945    NORMAL EXIT - RETURN TO CALLER WITH MPAC SET TO +0 (VIA SWRETURN)

R2946    ERROR EXIT - RETURN TO CALLER WITH MPAC SET TO 00001 -RADAR LOS NOT WITHIN 30 DEGREES OF LM +Z AXIS

R2948    ALARMS - NONE                                                    IN THE AUTO MODE

R2950    ERASABLE INITIALIZATION REQUIRED -
R2951         RRLOSVEC - THE RR LINE-OE-SIGHT VECTOR-A HALE UNIT VECTOR COMPUTED BY LRS22.1
R2953         RM - RR RANGE, METERS B-29, EROM LRS22.1
R2954         BIT 14 CHANNEL 31 -INDICATES AUTOPILOT IS IN AUTO MODE

R2955    DEBRIS -  A,L,Q MPAC -PUSHLIST AND PUSHLOC ARE NOT CHANGED BY THIS ROUTINE

 2957    REF   5  LAST  582   24,2000                      SETLOC P20S
 2958                         24,3416                      BANK
 2959    REF   8  LAST  588   24,3416  0 4636 0  LRS22.2   TC     MAKECADR
 2960    REF   5  LAST  590   24,3417  55'737 1            TS     LRS22.1X
 2961    REE  56  LAST  590   24,3420  0 6060 1            TC     INTPRFT
A2962                                                                          CHECK IE RR LOS IS WITHIN 30 DEG OF
 2963                         24,3421   65545 0  30DEGCHK  DLOAD  ACOS         THE SPACECRAFT +Z AXIS
 2964    REF   5  LAST  590   24,3422   03745 1                   RRBORSIT +4  BY TAKING ARCCOS OF Z-COMP. OF THE RR
A2965                                                                          LOS VECTOR,A HALF UNIT VECTOR
A2966                                                                          IN NAV BASE AXES)
 2967                         24,3423   50025 0            DSU    BMN
 2968    REE   1              24,3424   11440 1                   30DEG
 2969    REF   1              24,3425   51432 0                   OKEXIT       NORMAL EXIT-WITHIN 30 DEG.
 2970                         24,3426   77776 1            FXIT                ERROR EXIT-NOT WITHIN 30 DEG.
 2971    REF  33  LAST  590   24,3427  3 4744 1            CAE    BIT1         SET ERROR CODE IN MPAC
 2972    REF 261  LAST  590   24,3430  54 154 0            TS     MPAC
 2973    REF   1              24,3431  1 3435 1            TCF    OUT22.2
 2974                         24,3432   77776 1  OKEXIT    EXIT                NORMAL EXIT-SET MPAC = ZERO
 2975    REF 123  LAST  590    24,3433  3 4746 0             CAF     ZERO
 2976    REF 262  LAST  592    24,3434  54 154 0             TS      MPAC
 2977    REF   6  LAST  592    24,3435  31'737 0  OUT22.2    CAE     LRS22.1X
 2978    REF  11  LAST  590    24,3436  0 4631 1             TC      BANKJUMP

 2979                          24,3437   02525 1  30DEG      2DEC    .083333333       THIRTY DEGREES,SCALED REVS,B0
 2979                          24,3440   12525 0
```

```
P2980   PROGRAM NAME - LSR22.3                                                  DATE - 29 MAY 1967
R2982   MOD. NO 3                                                               LOG SECTION - P20-25
R2984   MOD. BY - DANFORTH                                                      ASSEMBLY LEMP20S REV 10
R2986
R2987   FUNCTIONAL DESCRIPTION

R2988   THIS ROUTINE COMPUTES THE B-VECTORS AND DELTA Q FOR EACH OF THE QUANTITIES MEASURED BY THE RENDEZVOUS
R2990   RADAR.(RANGE,RANGE RATE,SHAFT AND TRUNNION ANGLES). THE ROUTINE CALLS THE INCORP1 AND INCORP2 ROUTINES
R2992   WHICH COMPUTE THE DEVIATIONS AND CORRECT THE STATE VECTOR.

R2993   CALLING SEQUENCE
R2994   THIS ROUTINE IS PART OF'P20 RENDEZVOUS NAVIGATION FOR THE LM COMPUTER O NLY. THE ROUTINE IS ENTERED FROM
R2996   R22LEM  ONLY AND RETURNS DIRECTLY TO R22LEM  FOLLOWING SUCCESSFUL INCORPORATION OF MEASURED DATA. IF THE
R2998   COMPUTED STATE VECTOR DEVIATIONS EXCEED THE MAXIMUM PERMITTED. THE ROUTINE RETURNS TO R22LEM  TO DISPLAY
R3000   THE DEVIATIONS. IF THE ASTRONAUT ACCEPTS THE DATA R22LEM  RETURNS TO    LSR22.3 TO INCORPORATE THE
R3002   DEVIATIONS INTO THE STATE VECTOR. IF THE ASTRONAUT REJECTS THE DEVIATIONS, NO MORE MEASUREMENTS ARE
R3004   PROCESSED FOR THIS MARK,I.E.,R22LEM  GETS THE NEXT MARK.

R3005
R3006   SUBROUTINES CALLED
R3007    WLINIT      LGCUPDTE     INTEGRV     INCORP1     ARCTAN
R3008    GETULC      RARARANG     INCORP2     NBSM        INTSTALL
R3009
R3010   OUTPUT
R3011    CORRECTED LM OR CSM STATE VECTOR (PERMANENT)
R3012    NUMBER OF MARKS INCORPORATED IN MARKCTR
R3013    MAGNITUDE OF POSITION DEVIATION (FOR DISPLAY) IN R22DISP METERS B-29
R3014    MAGNITUDE OF VELOCITY DEVIATION (FOR DISPLAY) IN R22DISP +2 M/CSEC B-7
R3015    UPDATED W-MATRIX
R3016

R3017   ERASABLE INITIALIZATION REQUIRED
R3018    LM AND CSM STATE VECTORS
R3019    W-MATRIX
R3020    MARK TIME IN MKTIME
R3021    RADAR RANGE IN RM METERS B-29
R3022          RANGE RATE IN RDOTM METERS/CSES B-7
R3023          SHAFT ANGLE IN RRSHAFT REVS.B0
R3024          TRUNNION ANGLE IN RRTRUN REVS. B0
R3025    GIMBAL ANGLES  INNER IN AIG
R3026                   MIDDLE IN AMG
R3027                   OUTER IN AOG
R3028    REFSMMAT
R3029    RENDWFLG
R3030    NCANGFLG
R3031    VEHUPFLG

R3032   DEBRIS
R3033    PUSHLIST--ALL
R3034    MX, MY, MZ  (VECTORS)
```

```
R3035    ULC,RXZ,SINTHETA,LGRET,RDRET,BVECTOR,W.IND,X78T


 3036                          13,2207                          BANK     13
 3037   REF    1               26,2000                          SETLOC  P20S3
 3038                          26,2424                          BANK

 3039   REF   30  LAST   579   E7,1456                          EBANK=  LOSCOUNT
 3040   REF    1                                                COUNT*  $$/LSR22
 3041                          26,2424    77624 1   LSR22.3     CALL
 3042   REF    7  LAST   522   26,2425    51770 0                       GRP2PC
 3043                          26,2426    43014 0               BON     SET
 3044   REF    8  LAST   583   26,2427    04307 1                       SURFFLAG          ARE WE ON LUNAR SURFACE
 3045   REF    1               26,2430    55206 0                       LSR22.4           YES
 3046   REF    1               26,2431    02466 1                       DMENFLG
 3047                          26,2432    45014 0               BOFF    CALL
 3048   REF    6  LAST   516   26,2433    00747 0                       VEHUPFLG
 3049   REF    1               26,2434    54466 1                       DOLEM
 3050   REF   11  LAST   517   26,2435    27447 0                       INTSTALL
 3051                          26,2436    45014 0               CLEAR   CALL              LM PRECISION INTEGRATION
 3052   REF   10  LAST   517   26,2437    01674 0                       VINTFLAG
 3053   REF    4  LAST   516   26,2440    26702 0                       SETIFLGS
 3054                          26,2441    77624 1               CALL
 3055   REF    1               26,2442    53642 1                       INTGRCAL
 3056                          26,2443    77624 1               CALL
 3057   REF    8  LAST   595   26,2444    51770 0                       GRP2PC
 3058                          26,2445    77624 1               CALL
 3059   REF   12  LAST   595   26,2446    27447 0                       INTSTALL
 3060                          26,2447    43014 0               CLEAR   BOFF
 3061   REF    7  LAST   516   26,2450    01676 1                       DIMOFLAG
 3062   REF    5  LAST   516   26,2451    02756 1                       RENDWFLG
 3063   REF    1               26,2452    54456 1                       NOTWCSM
 3064                          26,2453    43014 0               SET     SET               CSM WITH W-MATRIX INTEGRATION
 3065   REF    8  LAST   595   26,2454    01476 0                       DIMOFLAG
 3066   REF    5  LAST   516   26,2455    01475 0                       D6OR9FLG
 3067                          26,2456    43014 0   NOTWCSM     SET     CLEAR
 3068   REF   11  LAST   595   26,2457    01474 1                       VINTFLAG
 3069   REF    3  LAST   509   26,2460    01673 1                       INTYPFLG
 3070                          26,2461    45014 0               SET     CALL
 3071   REF    1               26,2462    01472 1                       STATEFLG
 3072   REF    2  LAST   595   26,2463    53642 1                       INTGRCAL
 3073                          26,2464    77650 1               GOTO
 3074   REF    1               26,2465    54516 1                       MARKTEST
 3075                          26,2466    77624 1   DOLEM       CALL
 3076   REF   13  LAST   595   26,2467    27447 0                       INTSTALL
 3077                          26,2470    45014 0               SET     CALL
 3078   REF   12  LAST   595   26,2471    01474 1                       VINTFLAG
 3079   REF    5  LAST   595   26,2472    26702 0                       SETIFLGS
 3080                          26,2473    77624 1               CALL
 3081   REF    3  LAST   595   26,2474    53642 1                       INTGRCAL
 3082                              26,2475   77624 1            CALL
 3083   REF    9  LAST  595        26,2476   51770 0                    GRP2PC
 3084                              26,2477   77624 1            CALL
 3085   REF   14  LAST  595        26,2500   27447 0                    INTSTALL
 3086                              26,2501   43014 0            CLEAR   BOFF
 3087   REF    9  LAST  595        26,2502   01676 1                    DIMOFLAG
 3088   REF    6  LAST  595        26,2503   02756 1                    RENDWFLG
 3089   REF    1                   26,2504   54510 1                    NOTWLEM
 3090                              26,2505   43014 0            SET     SET                 LM WITH W-MATRIX INTEGRATION
 3091   REF   10  LAST  596        26,2506   01476 0                    DIMOFLAG
 3092   REF    6  LAST  595        26,2507   01475 0                    D6OR9FLG
 3093                              26,2510   43014 0  NOTWLEM   CLEAR   CLEAR
 3094   REF    4  LAST  595        26,2511   01673 1                    INTYPFLG
 3095   REF   13  LAST  595        26,2512   01674 0                    VINTFLAG
 3096                              26,2513   45014 0            SET     CALL
 3097   REF    2  LAST  595        26,2514   01472 1                    STATEFLG
 3098   REF    4  LAST  595        26,2515   53642 1                    INTGRCAL
 3099                              26,2516   45014 0  MARKTEST  BON     CALL                HAS W-MATRIX BEEN INVALIDATED
 3100   REF    7  LAST  596        26,2517   02716 0                    RENDWFLG            HAS W-MATRIX BEEN INVALIDATED
 3101   REF    1                   26,2520   54522 0                    RANGEBQ
 3102   REF    1                   26,2521   55250 0                    WLINIT              YES-REINITIALIZE
 3103                              26,2522   77414 0  RANGEBQ   BON     EXIT                DON'T CALL R65 IF ON SURFACE
 3104   REF    9  LAST  595        26,2523   04307 1                    SURFFLAG
 3105   REF    1                   26,2524   54532 1                    RANGEBQ1
 3106   REF  124  LAST  593        25,2525  3 4746 0            CA      ZERO
 3107   REF    6  LAST  535        26,2526  55'745 1            TS      R65CNTR
 3108   REF  161  LAST  589        26,2527  0 4607 1            TC      BANKCALL
 3109   REF    3  LAST  523        26,2530   46123 0            CADR    R65LEM
 3110   REF   57  LAST  592        26,2531  0 6060 1            TC      INTPRET
 3111                              26,2532   43174 1  RANGEBQ1  AXT,2   BON                  CLEAR X2
 3112                              26,2533   00000 1                    0
 3113   REF    2  LAST   38        26,2534   04304 1                    LMOONFLG            IS MOON SPHERE OF INFLUENCE
 3114   REF    1                   26,2535   54540 1                    SETX2               YES. STORE ZERO IN SCALSHFT REGISTER
 3115                              26,2536   77714 0            INCR,2
 3116                              26,2537   00002 0                    2
 3117                              26,2540   45134 0  SETX2     SXA,2   CALL
 3118   REF    2  LAST  152        26,2541   03720 1                    SCALSHFT            0-MOON. 2-EARTH
 3119   REF   10  LAST  596        26,2542   51770 0                    GRP2PC
 3120                              26,2543   66170 1            AXT,1   SXA,1               STORE RANGE CODE (1) FOR R3 IN NOUN 49
 3121                              26,2544   00001 0                    1
 3122   REF    3  LAST  327        26,2545   01353 0                    WHCHREAD
 3123                              26,2546   54335 0            SLOAD   SR                  GET SINGLE PRECISION RVARMIN (B-12)
 3124   REF    1                   26,2547   01773 0                    RVARMIN             SHIFT TO TRIPLE PRECISION    (B-40)
 3125                              26,2550   20635 0                    28D
 3126                              26,2551   77634 0            RTB
 3127   REF    1                   26,2552   21643 0                    TPMODE              AND SAVE  IN 20D
 3128                              26,2553   00025 0            STORE   20D
 3129                              26,2554   77624 1            CALL                        BEGIN COMPUTING THE 8-VECTORS,DELTAQ
 3130   REF    1                   26,2555   55332 0                    GETULC              B-VECTORS FOR RANGE
 3131                              26,2556   57414 1            BON     VCOMP               BO, COMP. IF LM BEING CORRECTED
 3132   REF   7  LAST  595   26,2557   00707 1                    VEHUPFLG
 3133                        26,2560   54561 1                    +1
 3134   REF   3  LAST  151   26,2561   27525 0           STOVL    BVECTOR
 3135   REF   3  LAST  511   26,2562   06505 1                    ZEROVECS
 3136   REF   4  LAST  597   26,2563   03533 1           STORE    BVECTOR +6       B1
 3137   REF   5  LAST  597   26,2564   17541 1           STODL    BVECTOR +12D     B2
 3138                        26,2565   00045 0                    36D
 3139                        26,2566   44257 1           SRR*     BDSU
 3140                        26,2567   56174 0                    2,2              SHIFT FROM EARTH/MOON SPHERE TO B-29
 3141   REF   4  LAST  590   26,2570   03757 1                    RM               RM - (MAGNITUDE RCSM-RLM)
 3142                        26,2571   77657 0           SLR*
 3143                        26,2572   56574 1                    2,2              SHIFT TO EARTH/MOON SPHERE
 3144   REF   2  LAST  151   26,2573   17547 1           STODL    DELTAQ           EARTH B-29. MOON B-27
 3145                        26,2574   00045 0                    36D              RLC  B-29/B-27
 3146                        26,2575   63501 0           NORM     DSQ              NORMALIZE AND SQUARE
 3147   REF   3  LAST  399   26,2576   00047 1                    X1
 3148                        26,2577   53605 1           DMP      SR*
 3149   REF   1              26,2600   01767 0                    RANGEVAR         MULTIPLY BY RANGEVAR(B12) THEN
 3150                        26,2601   20577 0                    0 -2,1           UNNORMALIZE
 3151                        26,2602   53657 0           SR*      SR*
 3152                        26,2603   20601 1                    0,1
 3153                        26,2604   57176 0                    0,2
 3154                        26,2605   47057 0           SR*      RTB
 3155                        26,2606   57176 0                    0,2
 3156   REF   2  LAST  596   26,2607   21643 0                    TPMODE
 3157   REF   2  LAST  131   26,2610   02707 0           STORE    VARIANCE         B-40
 3158                        26,2611   76276 0           DCOMP    TAD
 3159                        26,2612   00025 0                    20D                B-40
 3160                        26,2613   72240 1           BMN      TLOAD
 3161   REF   1              26,2614   54617 0                    QOK
 3162                        26,2615   00025 0                    20D                B-40
 3163   REF   3  LAST  597   26,2616   02707 0           STORE    VARIANCE
 3164                        26,2617   77624 1  QOK      CALL
 3165   REF   1              26,2620   55400 0                    LGCUPDTE

 3166                        26,2621   45131 0           SSP      CALL
 3167   REF   4  LAST  596   26,2622   01354 1                    WHCHREAD
 3168                        26,2623   00002 0           DEC      2                STORE R-RATE CODE (2) FOR R3 IN NOUN 49
 3169   REF  11  LAST  596   26,2624   51770 0                    GRP2PC
 3170                        26,2625   77624 1           CALL                      B-VECTOR,DELTAQ FOR RANGE RATE
 3171   REF   2  LAST  596   26,2626   55332 0                    GETULC
 3172                        26,2627   53725 1           PDDL     SR*              GET RLC SCALED B-29/B-27
 3173                        26,2630   00045 0                    36D              AND SHIFT TO B-23
 3174                        26,2631   57202 0                    0 -4,2
 3175                        26,2632   24045 0           STOVL    36D              THEN STORE BACK IN 36D
 3176                        26,2633   57414 1           BON      VCOMP            B1, COMP. IF LM BEING CORRECTED
 3177   REF   8  LAST  597   26,2634   00707 1                    VEHUPFLG
 3178                        26,2635   54636 0                    +1
 3179                        26,2636   77761 1           VXSC
 3180                        26,2637   00045 0                    36D              B1 = RLC  (B-24/B-22)
 3181   REF    6  LAST  597    26,2640    27533 1              STOVL  BVECTOR +6
 3182   REF    1               26,2641    01653 0                     NUVLEM
 3183                          26,2642    53257 1              VSR*   VAD
 3184                          26,2643    57170 0                     6,2              SHIFT FOR EARTH/MOON SPHERE
 3185   REF    2  LAST  516    26,2644    01667 1                     VCVLEM           EARTH B-7. MOON B-5
 3186                          26,2645    53715 1              PDVL   VSR*             VL TO PD6
 3187   REF    1               26,2646    01601 1                     NUVCSM
 3188                          26,2647    57170 0                     6,2              SHIFT FOR EARTH/MOON SPHERE
 3189                          26,2650    52255 1              VAD    VSU
 3190   REF    1               26,2651    01615 1                     VCVCSM
 3191                          26,2652    50315 0              PDVL   DOT              VC - VL = VLC TO PD6
 3192                          26,2653    00001 0                     0
 3193                          26,2654    00007 0                     6
 3194                          26,2655    53606 1              PUSH   SRR*             RDOT B-8/B-6 TO PD12
 3195                          26,2656    56174 0                     2,2              SHIFT FROM EARTH/MOON SPHERE TO B-8
 3196                          26,2657    57316 1              DSQ    DMPR             RDOT**2 B-16 X RATEVAR B12
 3197   REF    1               26,2660    01771 1                     RATEVAR
 3198   REF    4  LAST  597    26,2661    02707 0              STORE  VARIANCE
 3199                          26,2662    54335 0              SLOAD  SR
 3200   REF    1               26,2663    01774 1                     VVARMIN          GET SINGLE PRECISION VVARMIN (B+12)
 3201                          26,2664    20621 0                     16D              SHIFT TO DP (B -4)
 3202                          26,2665    00031 0              STORE  24D              AND SAVE IN 24D
 3203                          26,2666    50025 0              DSU    BMN              IS MIN. VARIANCE > COMPUTED VARIANCE
 3204   REF    5  LAST  598    26,2667    02707 0                     VARIANCE
 3205   REF    1               26,2670    54674 0                     VOK              BRANCH - NO
 3206                          26,2671    77745 1              DLOAD                   YES - USE MINIMUM VARIANCE
 3207                          26,2672    00031 0                     24D
 3208   REF    6  LAST  598    26,2673    02707 0              STORE  VARIANCE
 3209                          26,2674    60545 0   VOK        DLOAD  SR2              RDOT(PD12) FROM B-8/B-6
 3210                          26,2675    53725 1              PDDL   SLR*             TO B-10/B-8
 3211   REF    4  LAST  589    26,2676    03751 1                     RDOTM            SHIFT TO EARTH/MOON SPHERE
 3212                          26,2677    56577 1                     0 -1,2           B-7 TO B-10/B-8
 3213                          26,2700    77625 0              DSU
 3214                          26,2701    77675 0              DMPR
 3215                          26,2702    00045 0                     36D
 3216   REF    3  LAST  597    26,2703    27547 1              STOVL  DELTAQ             B-33
 3217                          26,2704    00001 0                     0                NOW GET B0
 3218                          26,2705    47235 0              VXV    VXV              (ULC X VLC) X ULC
 3219                          26,2706    57414 1              BON    VCOMP            B0, COMP. IF LM BEING CORRECTED
 3220   REF    9  LAST  597    26,2707    00707 1                     VEHUPFLG
 3221                          26,2710    54711 1                     +1
 3222                          26,2711    77657 0              VSR*
 3223                          26,2712    57200 1                     0 -2,2           SCALED B-5
 3224   REF    7  LAST  598    26,2713    27525 0              STOVL  BVECTOR
 3225   REF    4  LAST  597    26,2714    06505 1                     ZEROVECS
 3226                          26,2715    00025 0              STORE  20D              ZERO OUT 20 TO 25 IN PUSHLIST
 3227   REF    8  LAST  598    26,2716    27541 1              STOVL  BVECTOR +12D
 3228   REF    9  LAST  598    26,2717    03525 0                     BVECTOR
 3229                          26,2720    60246 1              ABVAL  NORM             LOAD B0, GET MAGNITUDE AND NORMALIZE
 3230                          26,2721    00025 0                     20D              SHIFT COUNT IN 20D
 3231                              26,2722    51575 1               VLOAD   ABVAL
 3232    REF  10  LAST  598        26,2723    03533 1                       BVECTOR +6D       LOAD B1, GET MAGNITUDE AND NORMALIZE
 3233                              26,2724    71301 0               NORM    DLOAD
 3234                              26,2725    00027 1                       22D               SHIFT COUNT IN 22D
 3235                              26,2726    00027 1                       22D               FIND WHICH SHIFT IS SMALLER
 3236                              26,2727    50025 0               DSU     BMN               BRANCH- B0 HAS SMALLER SHIFT COUNT
 3237                              26,2730    00025 0                       20D
 3238    REF   1                   26,2731    54735 1                       VOK1
 3239                              26,2732    52150 1               LXA,1   GOTO
 3240                              26,2733    00026 0                       22D               LOAD X2 WITH THE SMALLER SHIFT COUNT
 3241    REF   1                   26,2734    54737 0                       VOK2
 3242                              26,2735    77750 0   VCK1        LXA,1
 3243                              26,2736    00024 1                       20D
 3244                              26,2737    53775 1   VCK2        VLOAD   VSL*              THEN ADJUST B0,B1,DELTAQ AND VARIANCE
 3245    REF  11  LAST  599        26,2740    03525 0                       BVECTOR           WITH THIS SHIFT COUNT
 3246                              26,2741    20201 0                       0,1
 3247    REF  12  LAST  599        26,2742    27525 0               STOVL   BVECTOR
 3248    REF  13  LAST  599        26,2743    03533 1                       BVECTOR +6
 3249                              26,2744    77657 0               VSL*
 3250                              26,2745    20201 0                       0,1
 3251    REF  14  LAST  599        26,2746    17533 1               STODL   BVECTOR +6
 3252    REF   4  LAST  598        26,2747    03547 1                       DELTAQ
 3253                              26,2750    77657 0               SL*
 3254                              26,2751    20201 0                       0,1
 3255    REF   5  LAST  599        26,2752    03547 1               STORE   DELTAQ
 3256                              26,2753    53745 1               DLOAD   SL*               GET RLC AND ADJUST FOR SCALE SHIFT
 3257                              26,2754    00045 0                       36D
 3258                              26,2755    20200 1                       0 -1,1
 3259                              26,2756    41316 0               DSQ     DMP               MULTIPLY RLC**2 BY VARIANCE
 3260    REF   7  LAST  598        26,2757    02707 0                       VARIANCE
 3261                              26,2760    47012 1               SL4     RTB               SHIFT TO CONFORM TO BVECTORS AND DELTAQ
 3262    REF   3  LAST  597        26,2761    21643 0                       TPMODE
 3263    REF   8  LAST  599        26,2762    36707 1               STCALL  VARIANCE          AND STORE TP VARIANCE
 3264    REF   2  LAST  597        26,2763    55400 0                       LGCUPDTE

 3265                              26,2764    77624 1               CALL
 3266    REF  12  LAST  597        26,2765    51770 0                       GRP2PC
 3267                              26,2766    77414 0               BON     EXIT              ARE ANGLES TO BE DONE
 3268    REF  10  LAST  596        26,2767    04307 1                       SURFFLAG
 3269    REF   1                   26,2770    55204 1                       RENDEND           NO
 3270    REF   8  LAST  590        E7,1457                          EBANK=  AIG
 3271    REF   1                   26,2771  3 3331 0   MXMYMZ      CAF     AIGBANK
 3272    REF  14  LAST  471        26,2772 54 006 0                 TS      BBANK
 3273    REF   9  LAST  599        26,2773  3 1457 0                CA      AIG               YES, COMPUTE  MX, MY, MZ
 3274    REF  14  LAST  590        26,2774 54 765 1                 TS      CDUSPOT
 3275    REF   5  LAST  590        26,2775  3 1460 1                CA      AMG
 3276    REF  15  LAST  599        26,2776 54 767 0                 TS      CDUSPOT +2
 3277    REF   9  LAST  590        26,2777  3 1461 0                CA      AOG
 3278    REF  16  LAST  599        26,3000 54 771 1                 TS      CDUSPOT +4        GIMBL ANGLES NOW IN CDUSPOT FOR TRG*NBSM
 3279    REF  58  LAST  596        26,3001  0 6060 1                TC      INTPRET
 3280                                 26,3002    45175 0            VLOAD   CALL
 3281   REF   5   LAST   351          26,3003    06503 1                    UNITX
 3282   REF   4   LAST   267          26,3004    47656 1                    TRG*NBSM
 3283                                 26,3005    76505 0            VXM     VSL1
 3284   REF  12   LAST   583          26,3006    01732 0                    REFSMMAT
 3285   REF   2   LAST   151          26,3007    27677 1            STOVL   MX
 3286   REF   3   LAST   312          26,3010    06501 0                    UNITY
 3287                                 26,3011    77624 1            CALL
 3288   REF   3   LAST   566          26,3012    47665 1                    *NBSM*
 3289                                 26,3013    76505 0            VXM     VSL1
 3290   REF  13   LAST   600          26,3014    01732 0                    REFSMMAT
 3291   REF   2   LAST   151          26,3015    27705 0            STOVL   MY
 3292   REF   5   LAST   352          26,3016    06477 0                    UNITZ
 3293                                 26,3017    77624 1            CALL
 3294   REF   4   LAST   600          26,3020    47665 1                    *NBSM*
 3295                                 26,3021    76505 0            VXM     VSL1
 3296   REF  14   LAST   600          26,3022    01732 0                    REFSMMAT
 3297   REF   2   LAST   151          26,3023    37713 0  SHAFTBQ   STCALL  MZ
 3298   REF   1                       26,3024    55360 1                    RADARANG
 3299                                 26,3025    77331 0            SSP     VLOAD           STORE SHAFT CODE (3) FOR R3 IN NOUN 49
 3300   REF   5   LAST   597          26,3026    01354 1                    WHCHREAD
 3301                                 26,3027    00003 1            DEC     3
 3302   REF   2   LAST   152          26,3030    03724 0                    ULC
 3303                                 26,3031    72441 0            DOT     SL1
 3304   REF   3   LAST   600          26,3032    03677 1                    MX
 3305   REF   6   LAST   493          26,3033    24023 0            STOVL   SINTH           18D
 3306   REF   3   LAST   600          26,3034    03724 0                    ULC
 3307                                 26,3035    72441 0            DOT     SL1
 3308   REF   3   LAST   600          26,3036    03713 1                    MZ
 3309   REF   6   LAST   493          26,3037    34021 0            STCALL  COSTH           16D
 3310   REF   3   LAST   493          26,3040    26545 1                    ARCTAN
 3311                                 26,3041    41221 0            BDSU    DMP
 3312   REF   3   LAST   590          26,3042    03736 0                    RRSHAFT
 3313   REF   1                       26,3043    15440 0                    2PI/8
 3314                                 26,3044    41472 0            SL3R    PUSH
 3315                                 26,3045    52545 1            DLOAD   SL3
 3316   REF   3   LAST   214          26,3046    01701 0                    X789
 3317                                 26,3047    44257 1            SRR*    BDSU            SHIFT FROM -5/-3 TO B0
 3318                                 26,3050    56176 1                    0,2
 3319                                 26,3051    53605 1            DMP     SRR*
 3320   REF   2   LAST   152          26,3052    03722 0                    RXZ
 3321                                 26,3053    21601 0                    0,1             SHIFT TO EARTH/MOON SPHERE
 3322   REF   6   LAST   599          26,3054    27547 1            STOVL   DELTAQ          EARTH B-29. MOON B-27
 3323   REF   4   LAST   600          26,3055    03724 0                    ULC
 3324                                 26,3056    76435 1            VXV     VSL1
 3325   REF   3   LAST   600          26,3057    03705 0                    MY
 3326                                 26,3060    77656 1            UNIT
 3327                                 26,3061    57414 1            BOFF    VCOMP           BC, COMP. IF CSM BEING CORRECTED
 3328   REF  10   LAST   598          26,3062    00747 0                    VEHUPFLG
 3329                                 26,3063    55064 0                    +1
 3330    REF  15  LAST  599    26,3064    27525 0                STOVL  BVECTOR
 3331    REF   5  LAST  598    26,3065    06505 1                       ZEROVECS
 3332    REF  16  LAST  601    26,3066    03533 1                STORE  BVECTOR +6
 3333    REF  17  LAST  601    26,3067    17541 1                STODL  BVECTOR +12D
 3334    RFF   3  LAST  600    26,3070    03722 0                       RXZ
 3335                          26,3071    53657 0                SR*    SRR*            SHIFT FROM EARTH/MOON SPHERE TO B-25
 3336                          26,3072    20577 0                       0 -2,1
 3337                          26,3073    56176 1                       0,2
 3338    REF  18  LAST  601    26,3074    03541 1                STORE  BVECTOR +120
 3339                          26,3075    77735 0                SLOAD
 3340    REF   1               26,3076    02011 0                       SHAFTVAR
 3341                          26,3077    41215 1                DAD    DMP
 3342    REF   1               26,3100    15435 1                       IMUVAR          RAD**2 B12
 3343    REF   4  LAST  601    26,3101    03722 0                       RXZ
 3344                          26,3102    41257 1                SRR*   DMP
 3345                          26,3103    21601 0                       0,1             SHIFT TO EARTH/MOON SPHERE
 3346    REF   5  LAST  601    26,3104    03722 0                       RXZ
 3347                          26,3105    53657 0                SR*    SR*
 3348                          26,3106    20577 0                       0 -2,1
 3349                          26,3107    57176 0                       0,2
 3350                          26,3110    47057 0                SR*    RTB
 3351                          26,3111    57176 0                       0,2
 3352    REF   4  LAST  599    26,3112    21643 0                       TPMODE          STORF VARIANCE TRIPLE PRFCISION
 3353    REF   9  LAST  599    26,3113    36707 1                STCALL VARIANCE        B-40
 3354    REF   3  LAST  599    26,3114    55400 0                       LGCUPDTE

 3355                          26,3115    77624 1                CALL
 3356    REF  13  LAST  599    26,3116    51770 0                       GRP2PC
 3357                          26,3117    77624 1    TRUNBQ      CALL
 3358    REF   2  LAST  600    26,3120    55360 1                       RADARANG
 3359                          26,3121    77331 0                SSP    VLOAD           STORE TRUNNION CODE (4) FOR R3 IN N49
 3360    REF   6  LAST  600    26,3122    01354 1                       WHCHREAD
 3361                          26,3123    00004 0                DEC    4
 3362    REF   5  LAST  600    26,3124    03724 0                       ULC
 3363                          26,3125    76435 1                VXV    VSL1
 3364    REF   4  LAST  600    26,3126    03705 0                       MY
 3365                          26,3127    76435 1                VXV    VSL1            (ULC X MY) X ULC
 3366    REF   6  LAST  601    26,3130    03724 0                       ULC
 3367                          26,3131    57414 1                BOFF   VCOMP           BO, COMP. IF CSM BEING CORRECTED
 3368    REF  11  LAST  600    26,3132    00747 0                       VEHUPFLG
 3369                          26,3133    55134 1                       +1
 3370    REF  19  LAST  601    26,3134    27525 0                STOVL  BVECTOR
 3371    REF   6  LAST  601    26,3135    06505 1                       ZEROVECS
 3372    REF  20  LAST  601    26,3136    03533 1                STORE  BVECTOR +6
 3373    REF  21  LAST  601    26,3137    17541 1                STODL  BVECTOR +12D
 3374    REF   6  LAST  601    26,3140    03722 0                       RXZ
 3375                          26,3141    53657 0                SR*    SRR*            SHIFT FROM FARTH/MOON SPHERE TO B-25
 3376                          26,3142    20577 0                       0 -2,1
 3377                          26,3143    56176 1                       0,2
 3378    REF  22  LAST  601    26,3144    03543 0                STORE  BVECTOR +14D
 3379                          26,3145   77735 0               SLOAD
 3380   REF   1                26,3146   02012 0                       TRUNVAR
 3381                          26,3147   41215 1               DAD     DMP
 3382   REF   2  LAST   601    26,3150   15435 1                       IMUVAR
 3383   REF   7  LAST   601    26,3151   03722 0                       RXZ
 3384                          26,3152   41257 1               SRR*    DMP
 3385                          26,3153   21601 0                       0,1                SHIFT TO EARTH/MOON SPHERE
 3386   REF   3  LAST   602    26,3154   03722 0                       RXZ
 3387                          26,3155   53657 0               SR*     SR*
 3388                          26,3156   20577 0                       0 -2,1
 3389                          26,3157   57176 0                       0,2
 3390                          26,3160   47057 0               SR*     RTB
 3391                          26,3161   57176 0                       0,2
 3392   REF   5  LAST   601    26,3162   21643 0                       TPMODE             STORE VARIANCE TRIPLE PRECISION
 3393   REF  10  LAST   601    26,3163   16707 0               STODL   VARIANCE
 3394   REF   2  LAST   152    26,3164   03732 1                       SINTHETA
 3395                          26,3165   44336 1               ASIN    BDSU               SIN  THETA IN PD6
 3396   REF   3  LAST   589    26,3166   03734 1                       RRTRUN
 3397                          26,3167   56405 0               DMP     SL3R
 3398   REF   2  LAST   600    26,3170   15440 0                       2PI/8
 3399                          26,3171   52525 1               PDDL    SL3
 3400   REF   4  LAST   600    26,3172   01703 1                       X789 +2
 3401                          26,3173   44257 1               SRR*    BDSU               SHIFT FROM -5/-3 TO B0
 3402                          26,3174   56176 1                       0,2
 3403                          26,3175   53605 1               DMP     SRR*
 3404   REF   9  LAST   602    26,3176   03722 0                       RXZ
 3405                          26,3177   21601 0                       0,1
 3406   REF   7  LAST   600    26,3200   37547 0               STCALL  DELTAQ             EARTH B-29. MOON B-27
 3407   REF   4  LAST   601    26,3201   55400 0                       LGCUPDTE
 3408                          26,3202   77624 1               CALL
 3409   REF  14  LAST   601    26,3203   51770 0                       GRP2PC
 3410                          26,3204   77650 1   RENDEND     GOTO
 3411   REF   1                26,3205   50644 1                       R22LEM93
R3412   FUNCTIONAL DESCRIPTION

R3413   LSR22.4 IS THE ENTRY TO PERFORM LUNAR SURFACE NAVIGATION FOR THE LM
R3414   COMPUTER ONLY. THIS ROUTINE COMPUTES THE B-VECTORS AND DELTA Q FOR RANGE
R3415   AND RANGE RATE MEASURED BY THE RENDEZVOUS RADAR

R3416   SUBROUTINES CALLED
R3417    INSTALL   LGCUPDTE   INCORP1   RP-TO-R
R3418    INTEGRV   GETULC     INCORP2

R3419   OUTPUT
R3420    CORRECTED CSM STATE VECTOR (PERMANENT)
R3421    NUMBER OF MARKS INCORPORATED IN MARKCTR
R3422    MAGNITUDE OF POSITION DEVIATION (FOR DISPLAY) IN R22DISP METERS B-29
R3423    MAGNITUDE OF VELOCITY DEVIATION (FOR DISPLAY) IN R22DISP +2 M/CSEC B-7
R3424    UPDATED W-MATRIX
```

```
R3425    ERASABLE INITIALIZATION REQUIRED
R3426     LM AND CSM STATE VECTORS
R3427     W-MATRIX
R3428     MARK TIME IN MKTIME
R3429     RADAR RANGE IN RM METERS B-29
R3430           RANGE RATE IN RDOTM METERS/CSEC B-7
R3431     VEHUPFLG


 3432                              26,3206   77624 1  LSR22.4  CALL
 3433    REF  15  LAST  596        26,3207   27447 0                   INTSTALL
 3434                              26,3210   43C14 0           SET     CLEAR
 3435    REF   3  LAST  596        26,3211   01472 1                   STATEFLG
 3436    REF  14  LAST  596        26,3212   01674 0                   VINTFLAG        CALL TO GET LM POS + VEL IN REF COORD.
 3437                              26,3213   77624 1           CALL
 3438    REF   5  LAST  596        26,3214   53642 1                   INTGRCAL
 3439                              26,3215   77624 1           CALL
 3440    REF  15  LAST  602        26,3216   51770 0                   GRP2PC
 3441                              26,3217   45014 0           CLEAR   CALL
 3442    REF   2  LAST  595        26,3220   02666 0                   DMENFLG         SET MATRIX SIZE TO 6X6 FOR INCORP
 3443    REF  16  LAST  603        26,3221   27447 0                   INTSTALL
 3444                              26,3222   46145 0           DLOAD   BHIZ            IS THIS FIRST TIME THROUGH
 3445    REF   3  LAST  522        26,3223   03463 0                   MARKCTR
 3446    REF   1                   26,3224   55237 1                   INITWMX6        YES. INITIALIZE 6X6 W-MATRIX
 3447                              26,3225   43014 0           CLEAR   SET
 3448    REF   7  LAST  596        26,3226   01675 1                   D6OR9FLG
 3449    REF  11  LAST  596        26,3227   01476 0                   DIMOFLAG
 3450                              26,3230   43014 0           SET     CLEAR
 3451    REF  15  LAST  603        26,3231   01474 1                   VINTFLAG
 3452    REF   5  LAST  596        26,3232   01673 1                   INTYPFLG
 3453                              26,3233   77624 1           CALL
 3454    REF   6  LAST  603        26,3234   53642 1                   INTGRCAL
 3455                              26,3235   77650 1            GOTO
 3456    REF   2  LAST  596        26,3236   54522 0                   RANGEBQ

 3457                              26,3237   77624 1  INITWMX6 CALL
 3458    REF   2  LAST  596        26,3240   55250 0                   WLINIT          INITIALIZE W-MATRIX
 3459                              26,3241   45C14 0           SET     CALL
 3460    REF  16  LAST  603        26,3242   01474 1                   VINTFLAG
 3461    REF   6  LAST  595        26,3243   26702 0                   SETIFLGS
 3462                              26,3244   77624 1           CALL
 3463    REF   7  LAST  603        26,3245   53642 1                   INTGRCAL
 3464                              26,3246   77650 1           GOTO
 3465    REF   3  LAST  603        26,3247   54522 0                   RANGEBQ

R3466    THIS ROUTINE CLEARS RFINAL (DP) AND CALLS INTEGRV

 34665   REF   4  LAST  595        25,2000                     SETLOC  P20S1
 34666                             25,3642                     BANK
 3467                          25,3642   71220 1  INTGRCAL STQ     OLOAO
 3468   REF   1                25,3643   03675 0                   IGRET
 3469   REF   9  LAST  589     25,3644   03755 0                   MKTIME
 3470   REF  18  LAST  590     25,3645   34041 0           STCALL  TOEC1
 3471   REF   8  LAST  516     25,3646   27172 0                   INTEGRV
 3472                          25,3647   77650 1           GOTO
 3473   REF   2  LAST  604     25,3650   03675 0                   IGRET

R3474   THIS ROUTINE INITIALIZES THE W-MATRIX BY ZEROING ALL W THEN SETTING
R3475   DIAGONAL ELEMENTS TO INITIAL STORED VALUES.

 34755  REF   2  LAST  595     26,2000                     SETLOC  P20S3
 34756                         26,3250                     BANK

 3476   REF   4  LAST  132     E5,1400                     EBANK=  W
 3477                          26,3250   77776 1  WLINIT   EXIT
 3478   REF   1                26,3251  3 3330 1           CAF     WBANK
 3479   REF  15  LAST  599     26,3252  54 006 0           TS      BBANK
 3480   REF   1                26,3253  3 3436 0           CAF     WSIZE
 3481   REF   1                26,3254  55'256 0           TS      W.IND
 3482   REF 125  LAST  596     26,3255  3 4746 0           CAF     ZERO
 3483   REF   2  LAST  604     26,3256  51'256 1           INDEX   W.IND
 3484   REF   5  LAST  604     26,3257  55'400 0           TS      W
 3485   REF   3  LAST  604     26,3260  11'256 0           CCS     W.IND
 3486                          26,3261  0 3254 1           TC      -5
 3487   REF   2  LAST  599     26,3262  3 3331 0           CAF     AIGBANK              RESTORE EBANK 7
 3488   REF  16  LAST  604     26,3263  54 006 0           TS      BBANK
 3489   REF  59  LAST  599     26,3264  0 6060 1           TC      INTPRET
 3490                          26,3265   67214 1           BON     SLOAD                IF ON LUNAR SURFACE,INITIALIZE WITH
 3491   REF  11  LAST  599     26,3266   04307 1                   SURFFLAG             WSURFPOS AND WSURFVEL INSTEAD OF
 3492   REF   1                26,3267   55273 1                   WLSRFPOS             WRENDPOS AND WRENDVEL
 3493   REF   2  LAST  122     26,3270   02001 1                   WRENDPOS
 3494                          26,3271   77650 1           GOTO
 3495   REF   1                26,3272   55275 1                   WPOSTORE
 3496                          26,3273   77735 0  WLSRFPOS SLOAD
 3497   REF   1                26,3274   02007 1                   WSURFPOS
 3498                          26,3275   77661 0  WPOSTORE SR                           SHIFT TO B-19 SCALE
 3499                          26,3276   20606 0                   5
 3500   REF   6  LAST  604     26,3277   02401 0           STORE   W
 3501   REF   7  LAST  604     26,3300   02411 1           STORE   W +8D
 3502   REF   8  LAST  604     26,3301   02421 1           STORE   W +16D
 3503                          26,3302   67214 1           BON     SLOAD
 3504   REF  12  LAST  604     26,3303   04307 1                   SURFFLAG
 3505   REF   1                26,3304   55310 0                   WLSRFVEL
 3506   REF   1                26,3305   02002 1                   WRENDVEL
 3507                          26,3306   77650 1           GOTO
 3508   REF   1                26,3307   55312 1                   WVELSTOR
 3509                          26,3310   77735 0  WLSRFVEL SLOAD
 3510   REF   1                26,3311   02010 1                   WSURFVEL
 3511   REF   9  LAST  604     26,3312   02511 0  WVELSTOR STORE   W +72D
 3512   REF  10  LAST  604   26,3313   02521 0             STORE  W +80D
 3513   REF  11  LAST  605   26,3314   02531 1             STORE  W +88D
 3514                        26,3315   77735 0             SLOAD
 3515   REF   1              26,3316   02003 0                    WSHAFT
 3516   REF  12  LAST  605   26,3317   02621 0             STORE  W +144D
 3517                        26,3320   77735 0             SLOAD
 3518   REF   1              26,3321   02004 1                    WTRUN
 3519   REF  13  LAST  605   26,3322   02631 1             STORE  W +152D
 3520                        26,3323   66214 0             SET    SSP             SET RENDWFLG - W-MATRIX VALID
 3521   REF   8  LAST  596   26,3324   02476 0                    RENDWFLG
 3522   REF   4  LAST  603   26,3325   03463 0                    MARKCTR         SET MARK COUNTER EQUAL ZERO
 3523                        26,3326   00000 1                    0
 3524                        26,3327   77616 0             RVQ

 3525   REF  14  LAST  605   E5,1400                       EBANK= W
 3526   REF   3  LAST  603   26,3330   54065 0  WBANK      BBCON  WLINIT
 3527   REF  10  LAST  599   E7,1457                       EBANK= AIG
 3528   REF   2  LAST  522   26,3331   54067 1  AIGBANK    BBCON  LSR22.3

R3529   GETULC

R3530   THIS SUBROUTINE COMPUTES THE RELATIVE POSITION VECTOR BETWEEN THE CSM
R3531   AND THE LM, LEAVING THE UNIT VECTOR IN THE PUSHLIST AND MPAC AND THE
R3532   MAGNITUDE IN 36D.

 3533                        26,3332   77201 1  GETULC     SETPD  VLOAD
 3534                        26,3333   00001 0                    0
 3535   REF   1              26,3334   01645 1                    DELTALEM
 3536                        26,3335   77754 1             LXA,2
 3537   REF   3  LAST  596   26,3336   03720 1                    SCALSHFT        LOAD X2 WITH SCALE SHIFT
 3538                        26,3337   53257 1             VSR*   VAD
 3539                        26,3340   57165 1                    9D,2            SHIFT FOR EARTH/MOON SPHERE
 3540   REF   2  LAST  516   26,3341   01661 1                    RCVLEM
 3541                        26,3342   53715 1             PDVL   VSR*
 3542   REF   1              26,3343   01573 1                    DELTACSM
 3543                        26,3344   57165 1                    9D,2            SHIFT FOR EARTH/MOON SPHERE
 3544                        26,3345   52255 1             VAD    VSU
 3545   REF   1              26,3346   01607 1                    RCVCSM
 3546                        26,3347   41434 1             RTB    PUSH            USE NORMUNIT TO PRESERVE ACCURACY
 3547   REF   1              26,3350   21722 0                    NORMUNX1
 3548   REF   7  LAST  601   26,3351   17724 0             STODL  ULC
 3549                        26,3352   00045 0                    36D
 3550                        26,3353   77657 0             SL*                    ADJUST MAGNITUDE FROM NORMUNIT
 3551                        26,3354   20201 0                    0,1
 3552                        26,3355   24045 0             STOVL  36D             ULC IN PD0 AND MPAC,RLC IN 36D
 3553   REF   8  LAST  605   26,3356   03724 0                    ULC
 3554                        26,3357   77616 0             RVQ
R3555   RADARANG

R3556   THIS SUBROUTINE COMPUTES SINTHETA = -ULC DOT MY
```

```
R3557    RXZ = (SQRT (1-SINTHETA**2))RLC
R3558    OUTPUT
R3559     ULC  IN ULC, PD0
R3560     RLC   IN PD36D
R3561     SIN THETA IN SINTHETA AND PD6
R3562     RXZ NORM IN RXZ (N  IN X1)
 3563                              26,3360   45020 1  RADARANG STQ     CALL
 3564    REF    2  LAST   151      26,3361   03675 0                   RDRET
 3565    REF    3  LAST   597      26,3362   55332 0                   GETULC
 3566                              26,3363   50276 1           VCOMP   DOT
 3567    REF    5  LAST   601      26,3364   03705 0                   MY
 3568                              26,3365   41572 1           SL1R    PUSH              SIN THETA TO PD6
 3569    REF    3  LAST   602      26,3366   03732 1           STORE   SINTHETA
 3570                              26,3367   44316 0           DSQ     BDSU
 3571    REF    4  LAST   515      26,3370   06475 1                   DP1/4TH           1 - (SIN THETA)**2
 3572                              26,3371   41366 1           SQRT    DMP
 3573                              26,3372   00045 0                   36D
 3574                              26,3373   60352 0           SL1     NORM
 3575    REF    4  LAST   597      26,3374   00047 1                   X1                SET SHIFT COUNTER IN X1
 3576    REF   10  LAST   602      26,3375   03722 0           STORE   RXZ
 3577                              26,3376   77650 1           GOTO                      EXIT
 3578    REF    3  LAST   606      26,3377   03675 0                   RDRET
 3579                              26,3400   45020 1  LGCUPDTE STQ     CALL
 3580    REF    4  LAST   522      26,3401   03675 0                   LGRET
 3581    REF    1                  26,3402   46514 0                   INCORP1
 3582                              26,3403   51575 1           VLOAD   ABVAL
 3583    REF    3  LAST   131      26,3404   02673 1                   DELTAX +6
 3584                              26,3405   53754 1           LXA,2   SRP*
 3585    REF    4  LAST   605      26,3406   03720 1                   SCALSHFT          0-MOON. 2-EARTH
 3586                              26,3407   56174 0                   2,2               SET VEL DISPLAY TO B-7
 3587    REF    3  LAST   327      26,3410   24317 1           STOVL   R22DISP +2
 3588    REF    4  LAST   606      26,3411   02665 0                   DELTAX
 3589                              26,3412   53646 0           ABVAL   SRR*
 3590                              26,3413   56174 0                   2,2               SET POS DISPLAY TO B-29
 3591    REF    4  LAST   606      26,3414   00315 0           STORE   R22DISP
 3592                              26,3415   54335 0           SLOAD   SR
 3593    REF    1                  26,3416   02005 0                   RMAX
 3594                              26,3417   20613 1                   10D
 3595                              26,3420   50025 0           DSU     BMN
 3596    REF    5  LAST   606      26,3421   00315 0                   R22DISP
 3597    REF    1                  26,3422   50650 1                   R22LEM96          GO DISPLAY
 3598                              26,3423   45335 0           SLOAD   DSU
 3599    REF    1                  26,3424   02006 0                   VMAX
 3600    REF    6  LAST   606      26,3425   00317 1                   R22DISP +2        VMAX MINUS VEL. DEVIATION
 3601                              26,3426   77640 0           BMN
 3602    REF    2  LAST   606      26,3427   50650 1                   R22LEM96          GO DISPLAY
 3603                              26,3430   77624 1  ASTOK    CALL
 3604    REF    1                  26,3431   46726 0                   INCORP2
 3605                              26,3432   77650 1           GOTO
 3606    REF    5  LAST   606      26,3433   03675 0                   LGRET
 3607                        26,3434   00103 0  IMUVAR    2DEC    E-6 B12          RAD**2
 3607                        26,3435   03370 0
 3608                        26,3436   00241 0  WSIZE     DEC     161
 3609                        26,3437   31103 1  2PI/8     2DEC    3.141592653 B-2
 3609                        26,3440   36652 0
 3610  REF  31  LAST  595    E7,1456                      EBANK= LOSCOUNT
```

```
R3611    PROGRAM NAME LRS24.1   RR SEARCH ROUTINE
R3612    MOD NO  0          BY  P VOLANTE  SDC           DATE  1-15-67


R3613    FUNCTIONAL DESCRIPTION

R3614    DRIVES THE RENDEZVOUS RADAR IN A HEXAGONAL SEARCH PATTERN ABOUT THE LOS TO THE CSM (COMPUTED FROM THE CSM AND LM
R3616    STATE VECTORS) CHECKING FOR THE DATA GOOD DISCRETE AND MONITORING THE ANGLE BETWEEN THE RADAR BORESIGHT AND THE
R3618    LM +Z AXIS. IF THIS ANGLE EXCEEDS 30 DEGREES THE PREFERRED TRACKING ATTITUDE ROUTINE IS CALLED TO PERFORM AN
R3620    ATTITUDE MANEUVER.


R3621    CALLING SEQUENCE - BANKCALL FOR LRS24.1


R3622    SUBROUTINES CALLED

R3623          LEMCONIC        R61LEM
R3624          CSMCONIC        RRDESSM
R3625          JOBDELAY        FLAGDOWN
R3626          WAITLIST        FLAGUP
R3627          RRNB            BANKCALL


R3628    EXIT   - TO ENDOFJOB WHEN THE SEARCH FLAG (SRCHOPT) IS NOT SET


R3629    OUTPUT

R3630        DATAGOOD (SP)-FOR DISPLAY IN R1- 00000 INDICATES NO LOCKON
R3631                                         11111 INDICATES LOCKON ACHIEVED
R3632        OMEGAD   (SP)-FOR DISPLAY IN R2- ANGLE BETWEEN RR BORESIGHT VECTOR AND THE SPACECRAFT +Z AXIS

R3634    ERASABLE INITIALIZATION REQUIRED
R3635       SEARCH FLAG MUST BE SET
R3636       LM AND CSM STATE VECTORS AND REFSMMAT MATRIX
R3637    DEBRIS

R3638       RLMSRCH       UXVECT
R3639       VXRLM         UYVECT
R3640       LOSDESRD      NSRCHPNT
R3641       DATAGOOD      OMEGAD
R3642       MPAC          PUSHLIST


 3643    REF   1                                               COUNT* $$/LRS24
 3644    REF 126  LAST  604    26,3441  3 4746 0  LRS24.1  CAF     ZERO
 3645    REF   2  LAST  150    26,3442  55'736 0           TS      NSRCHPNT          SET SEARCH PATTERN POINT COUNTER TO ZERO
 3646    REF  54  LAST  580    26,3443  3 4727 1  CHKSRCH  CAF     BIT14             ISSUE AUTO TRACK ENABLE TO RADAR
 3647                          26,3444  0 0006 1           EXTEND
```

```
3648   REF 39  LAST  580    26,3445  05 012 1            WOR     CHAN12
3649   REF  1               26,3446  3 4727 1            CAF     SRCHOBIT    CHECK IF SEARCH STILL REQUESTED
3650   REF 10  LAST  568    26,3447  7 0076 1            MASK    FLAGWRD2    (SRCHOPT FLAG SET)
3651                        26,3450  0 0006 1            EXTEND
3652   REF 95  LAST  568    26,3451  1 5146 0            BZF     ENDOFJOB    NO-TERMINATE JOB


3653   REF  1               26,3452  3 3713 1            CAF     6SECONDS    SCHEDULE TASK TO DRIVE RADAR TO NEXT PT.
3654                        26,3453  0 0004 0            INHINT
3655   REF 23  LAST  579    26,3454  0 5205 0            TC      WAITLIST    IN 6 SECONDS
3656   REF 32  LAST  607    E7,1456                      EBANK=  LOSCOUNT
3657   REF  3  LAST  531    26,3455   03642 1            2CADR   CALLDGCH
3657                        26,3456   54067 1
3658                        26,3457  0 0003 1            RELINT
3659   REF 97  LAST  588    26,3460  4 0110 0            CS      RADMODES    IS REMODE IN PROGRESS
3660   REF  7  LAST  562    26,3461  7 4727 0            MASK    REMODBIT
3661                        26,3462  0 0006 1            EXTEND
3662   REF 96  LAST  609    26,3463  1 5146 0            BZF     ENDOFJOB    YES- WAIT SIX SECONDS
3663   REF 60  LAST  604    26,3464  0 6060 1            TC      INTPRET

3664                        26,3465   43234 0            RTB     DAD          COMPUTE LOS AT PRESENT TIME + 1.5 SEC.
3665   REF 13  LAST  534    26,3466   21603 1                    LOADTIME
3666   REF  1               26,3467   15715 0                    1.5SECS
3667   REF 19  LAST  604    26,3470   34041 0   LRS24.11 STCALL  TDEC1
3668   REF  4  LAST  583    26,3471   27136 0                    LEMCONIC    EXTRAPOLATE LM STATE VECTOR
3669                        26,3472   77775 1            VLOAD
3670   REF  7  LAST  583    26,3473   00001 0                    RATT
3671   REF  4  LAST  155    26,3474   27676 0            STOVL   RLMSRCH     SAVE LEM POSITION
3672   REF  3  LAST  583    26,3475   00007 0                    VATT
3673   REF  1               26,3476   17740 1            STODL   SAVLEMV     SAVE LEM VELOCITY
3674   REF  6  LAST  583    26,3477   00015 0                    TAT
3675   REF 20  LAST  609    26,3500   34041 0            STCALL  TDEC1       EXTRAPOLATE CSM STATE VECTOR
3676   REF  3  LAST  583    26,3501   27124 0                    CSMCONIC    EXTRAPOLATE CSM STATE VECTOR
3677                        26,3502   52375 1            VLOAD   VSU         LOS VECTOR = R(CSM)-R(LM)
3678   REF  8  LAST  609    26,3503   00001 0                    RATT
3679   REF  5  LAST  609    26,3504   03676 0                    RLMSRCH
3680                        26,3505   77656 1            UNIT
3681   REF  2  LAST  150    26,3506   27712 0            STOVL   LOSDESRD    STORE DESIRED LOS
3682   REF  4  LAST  609    26,3507   00007 0                    VATT        COMPUTE UNIT(V(CM) CROSS R(CM))
3683                        26,3510   47256 0            UNIT    VXV
3684   REF  9  LAST  609    26,3511   00001 0                    RATT
3685                        26,3512   77656 1            UNIT
3686   REF  2  LAST  150    26,3513   03704 1            STORE   VXRCM
3687                        26,3514   52375 1            VLOAD   VSU
3688   REF  5  LAST  609    26,3515   00007 0                    VATT
3689   REF  2  LAST  609    26,3516   03740 1                    SAVLEMV
3690                        26,3517   76521 0            MXV     VSL1        CONVERT FROM REFERENCE TO STABLE MEMBER
3691   REF 15  LAST  600    26,3520   01732 0                    REFSMMAT
3692   REF  3  LAST  609    26,3521   03740 1            STORE   SAVLEMV     VLC = V(CSM) - V(LM)
3693                        26,3522   53135 0            SLOAD   BZE         CHECK IF N=0
```

```
 3694   REF    3  LAST  608    26,3523   03737 1                     NSRCHPNT
 3695   REF    1               26,3524   55635 1                     DESGLOS         YES-DESIGNATE ALONG LOS
 3696                          26,3525   53025 0            DSU      BZE             IS N=1
 3697   REF    1               26,3526   15711 1                     ONEOCT          YES-CALCULATE X AND Y AXES OF
 3698   REF    1               26,3527   55622 1                     CALCXY          SEARCH PATTERN COORDINATE SYSTEM
 3699                          26,3530   77775 1            VLOAD                    NO-ROTATE X-Y AXES TO NEXT SEARCH POINT
 3700   REF    2  LAST  150    26,3531   03720 1                     UXVECT
 3701   REF    1               26,3532   24015 0            STOVL    UXVECTPR        SAVE ORIGINAL X AND Y VECTORS
 3702   REF    2  LAST  150    26,3533   03726 1                     UYVECT          UXPRIME = ORIGINAL UX
 3703   REF    1               26,3534   00023 0            STORE    UYVECTPR        UYPRIME = ORIGINAL UY
 3704                          26,3535   77761 1            VXSC
 3705   REF    1               26,3536   15705 1                     SIN60DEG        UX =(COS 60)UXPR +(SIN 60)UYPR
 3706   REF    3  LAST  610    26,3537   27720 1            STOVL    UXVECT
 3707   REF    2  LAST  610    26,3540   00015 0                     UXVECTPR
 3708                          26,3541   53361 0            VXSC     VAD
 3709   REF    1               26,3542   06503 1                     COS60DEG
 3710   REF    4  LAST  610    26,3543   03720 1                     UXVECT
 3711                          26,3544   77656 1            UNIT
 3712   REF    5  LAST  610    26,3545   27720 1            STOVL    UXVECT
 3713   REF    3  LAST  610    26,3546   00015 0                     UXVECTPR        UY=(-SIN60)UXPR +(COS 60)UYPR
 3714                          26,3547   77761 1            VXSC
 3715   REF    2  LAST  610    26,3550   15705 1                     SIN60DEG
 3716   REF    3  LAST  610    26,3551   27726 1            STOVL    UYVECT
 3717   REF    2  LAST  610    26,3552   00023 0                     UYVECTPR
 3718                          26,3553   52361 1            VXSC     VSU
 3719   REF    2  LAST  610    26,3554   06503 1                     COS60DEG
 3720   REF    4  LAST  610    26,3555   03726 1                     UYVECT
 3721                          26,3556   77656 1            UNIT
 3722   REF    5  LAST  610    26,3557   03726 1            STORE    UYVECT
 3723                          26,3560   53361 0  OFFCALC   VXSC     VAD             OFFSET VECTOR = K(UY)
 3724   REF    1               26,3561   15707 0                     OFFSTFAC        LOS VECTOR + OFFSET VECTOR DEFINES
 3725   REF    3  LAST  609    26,3562   03712 0                     LOSDESRD        DESIRED POINT IN SEARCH PATTERN
 3726                          26,3563   64256 1            UNIT     MXV
 3727   REF   16  LAST  609    26,3564   01732 0                     REFSMMAT        CONVERT TO STABLE MEMBER COORDINATES
 3728                          26,3565   77772 0            VSL1
 3729   REF   12  LAST  590    26,3566   25101 0  CONTDESG  STOVL    RRTARGET
 3730   REF    4  LAST  609    26,3567   03740 1                     SAVLEMV
 3731   REF    5  LAST  583    26,3570   01757 0            STORE    LOSVEL
 3732                          26,3571   77776 1            EXIT
 3733                          26,3572  0 0004 0            INHINT
 3734   REF    8  LAST  583    26,3573  0 6050 1            TC       KILLTASK        KILL ANY PRESENTLY WAITLISTED TASK
 3735   REF    4  LAST  583    26,3574   52573 1            CADR     DESLOOP +2      WHICH WOULD DESIGNATE TO THE LAST
A3736                                                                                POINT IN THE PATTERN
 3737   REF    2  LAST  531    26,3575  4 4726 1  CONTDES2  CS       CDESBIT
 3738   REF   98  LAST  609    26,3576  7 0110 0            MASK     RADMODES        SET BIT 15 OF RADMODES TO INDICATE
 3739   REF    3  LAST  610    26,3577  6 4726 0            AD       CDESBIT         A CONTINUOUS DESIGNATE WANTED.
 3740   REF   99  LAST  610    26,3600  54 110 0            TS       RADMODES
 3741   REF   61  LAST  609    26,3601  0 6060 1            TC       INTPRET

 3742                          26,3602   77624 1            CALL
 3743   REF   3  LAST  526   26,3603   52364 1                     RRDESSM        DESIGNATE RADAR TO RRTARGET VECTOR

 3744                        26,3604   77776 1           EXIT
 3745   REF   1              26,3605  0 3674 1           TC        LIMALARM       LOS NOT IN MODE 2 COVERAGE (P22)
 3746   REF   2  LAST  611   26,3606  0 3674 1           TC        LIMALARM       VEHICLE MANEUVER REQUIRED (P20)


A3747                                                                             COMPUTE OMEGA,ANGLE  BETWEEN RR LOS AND
A3748                                                                             SPACECRAFT +Z AXIS
 3749                        26,3607  0 0006 1  OMEGCALC EXTEND
 3750   REF  13  LAST  588   26,3610  3 0036 1           DCA       CDUT
 3751   REF  10  LAST  589   26,3611  53'753 0           DXCH      TANGNB
 3752   REF  62  LAST  610   26,3612  0 6060 1           TC        INTPRET
 3753                        26,3613   77624 1           CALL
 3754   REF   3  LAST  590   26,3614   46041 0                     RRNB
 3755                        26,3615   65545 0           DLOAD     ACOS           OMEGA IS ARCCOSINE OF Z-COMPONENT OF
 3756                        26,3616   00045 0                     36D            VECTOR COMPUTED BY RRNB (LEFT AT 32D)
 3757   REF   3  LAST  150   26,3617   03735 0           STORE     OMEGDISP       STORE FOR DISPLAY IN R2
 3758                        26,3620   77776 1           EXIT
 3759   REF  57  LAST  609   26,3621  0 5146 1           TC        ENDOFJOB
```

```
P3760    CALCULATE X AND Y VECTORS FOR SEARCH PATTERN COORDINATE SYSTEM

 3761                          26,3622    47375 0  CALCXY    VLOAD   VXV
 3762    REF   3  LAST  609    26,3623    03704 1                    VXRCM
 3763    REF   4  LAST  610    26,3624    03712 0                    LOSDESRD
 3764                          26,3625    77656 1            UNIT
 3765    REF   6  LAST  610    26,3626    27720 1            STOVL   UXVECT          UX = (VLM X RLM)X LOS
 3766    REF   5  LAST  612    26,3627    03712 0                    LOSDESRD
 3767                          26,3630    53435 0            VXV     UNIT
 3768    REF   7  LAST  612    26,3631    03720 1                    UXVECT
 3769    REF   6  LAST  610    26,3632    03726 1            STORE   UYVECT          UY = LOS X UX
 3770                          26,3633    77650 1            GOTO
 3771    REF   1               26,3634    55560 1                    OFFCALC

 3772                          26,3635    64375 1  DESGLOS   VLOAD   MXV             WHEN N= 0,DESIGNATE ALONG LOS
 3773    REF   6  LAST  612    26,3636    03712 0                    LOSDESRD
 3774    REF  17  LAST  610    26,3637    01732 0                    REFSMMAT        CONVERT LOS FROM REFERENCE TO SM COORDS
 3775                          26,3640    52172 1            VSL1    GOTO
 3776    REF   1               26,3641    55566 1                    CONTDESG

 3777    REF  26  LAST  514    26,3642   30 074 1  CALLDGCH  CAE     FLAGWRD0        IS RENDEZVOUS FLAG SET
 3778    REF  10  LAST  555    26,3643   7 4736 0            MASK    RNDVZBIT
 3779                          26,3644   0 0006 1            EXTEND
 3780    REF  27  LAST  570    26,3645   1 5263 1            BZF     TASKOVER        NO-EXIT R24
 3781    REF   2  LAST  565    26,3646   3 7734 0            CAF     PRIO25          YES -SCHEDULE JOB TO DRIVE RADAR TO NEXT
 3782    REF  23  LAST  562    26,3647   0 5076 0            TC      FINDVAC         POINT IN SEARCH PATTERN
 3783    REF   6  LAST  609    E7,1675                       EBANK=  RLMSRCH
 3784    REF   1               26,3650    03653 1            2CADR   DATGDCHK
 3784    REF   1               26,3651    54067 1
 3785    REF  28  LAST  612    26,3652   0 5263 0            TC      TASKOVER

 3786    REF  29  LAST  577    26,3653   3 4741 1  DATGDCHK  CAF     BIT4
 3787                          26,3654   0 0006 1            EXTEND                  CHECK IF DATA GOOD DISCRETE PRESENT
 3788    REF  19  LAST  588    26,3655   02 C33 0            RAND    CHAN33
 3789                          26,3656   0 0006 1            EXTEND
 3790    REF   1               26,3657   1 3666 0            BZF     STORE1S         YES- GO TO STORE 11111 FOR DISPLAY IN R1
 3791    REF  13  LAST  570    26,3660   4 6263 1            CS      SIX
 3792    REF   4  LAST  610    26,3661   6 1736 1            AD      NSRCHPNT        IS N GREATER THAN 6
 3793                          26,3662   0 0006 1            EXTEND
 3794    REF   2  LAST  531    26,3663   1 3441 1            BZF     LRS24.1         YES - RESET N = 0 AND START AROUND AGAIN
 3795    REF   5  LAST  612    26,3664   25'736 1            INCR    NSRCHPNT        NO-SET N = N+1 AN GO TO
 3796    REF   1               26,3665   1 3443 0            TCF     CHKSRCH         NEXT POINT IN PATTERN

 3797    REF   1               26,3666   3 3703 0  STORE1S   CAF     ALL1S           STORE 11111 FOR DISPLAY IN R1
 3798    REF   5  LAST  530    26,3667   55'733 0            TS      DATAGOOD
 3799                           26,3670  0 0004 0            INHINT
 3800   REF   9  LAST  610      26,3671  0 6050 1            TC      KILLTASK          DELETE DESIGNATE TASK FROM
 3801   REF   5  LAST  610      26,3672   52573 1            CADR    DESLOOP +2        WAITLIST USING KILLTASK
 3802   REF  98  LAST  611      26,3673  0 5146 1            TC      ENDOFJOB

 3803   REF  24  LAST  580      26,3674  0 5571 1  LIMALARM  TC      ALARM             ISSUE ALARM 527-LOS NOT IN MODE2
 3804                           26,3675   00527 1            OCT     527               COVERAGE IN P22 OR VEHICLE MANEUVER
 3805                           26,3676  0 0004 0            INHINT                    REQUIRED IN P20
 3806   REF  10  LAST  613      26,3677  0 6050 1            TC      KILLTASK          KILL WAITLIST CALL FOR NEXT
 3807   REF   4  LAST  609      26,3700   55642 1            CADR    CALLDGCH          POINT IN SEARCH PATTERN
 38075  REF   3  LAST  526      26,3701  0 6032 0            TC      CLRADMD1          CLEAR BITS 10 & 15 IN RADMODES
 3808   REF  99  LAST  613      26,3702  0 5146 1            TC      ENDOFJOB


 3809                           26,3703   25547 0  ALL1S     DEC     11111
 3810                           26,3704   33555 1  SIN60DEG  2DEC    .86603
 3810                           26,3705   01106 1
 3811   REF   7  LAST  374      23,2502            COS60DEG  =       DPHALF            (2DEC    .50)
 3812                              0014            UXVECTPR  EQUALS  12D               PREVIOUS
 3813                              0022            UYVECTPR  EQUALS  18D
 3814                              0014            RLMUNIT   EQUALS  12D
 3815                           26,3706   01642 0  OFFSTFAC  2DEC    0.05678           TANGENT OF 3.25 DEGREES
 3815                           26,3707   11045 0
 3816                           26,3710   00001 0  ONEOCT    OCT     00001             ****  NOTE-THESE TWO CONSTANTS MUST ****
 3817                           26,3711   00000 1  3SECONDS  2DEC    300               ****  BE IN THIS ORDER BECAUSE      ****
 3817                           26,3712   00454 1
A3818                                                                                  ****  ONEOCT NEEDS A LOWER ORDER    ****
A3819                                                                                  ****  WORD OF ZEROES                ****
 3820                           26,3713   01130 1  6SECONDS  DEC     600
 3821                           26,3714   00000 1  1.5SECS   2DEC    150
 3821                           26,3715   00226 1
 3822   REF   3  LAST  502      23,2504            ZERO/SP   EQUALS  HI6ZEROS
 3823                              4607                      BLOCK   02
 3824   REF   5  LAST  461         6000                      SETLOC  FFTAG5
 3825                              6043                      BANK
 3826   REF   1                                              COUNT*  $$/P20
 3827                              6043  0 0006 1  GOTOV56   EXTEND                    P20 TERMINATES BY GOTOV56 INSTEAD OF
 3828   REF   1                    6044  3 6047 1            DCA     VB56CADR          GOTOPOOH
 3829   REF   4  LAST  472         6045  1 5167 0            TCF     SUPDXCHZ
 3830   REF   3  LAST  501      E7,1471                      EBANK=  WHOCARES
 3831   REF   2  LAST  275         6046   03020 0  VB56CADR  2CADR   TRMTRACK
 3831                              6047   66107 1
```

```
P3832   W-MATRIX MONITOR

 3833                          31,2007                             BANK    31
 3834   REF   1                31,2000                             SETLOC  V867
 3835                          31,2007                             BANK
 3836   REF   1                                                    COUNT*  $$/EXTVB

 3837   REF   4  LAST  330     E4,1571                             EBANK=  WWPOS

 3838   REF  63  LAST  611     31,2007  0 6060 1   V67CALL   TC      INTPRET
 3839                          31,2010   77624 1             CALL
 3840   REF   1                31,2011   62120 0                     V67WW
 3841                          31,2012   77776 1             EXIT
 3842                          31,2013  0 0006 1             EXTEND                    SAVE THE PRESENT N99 VALUES FOR
 3843   REF   5  LAST  614     31,2014  3 1572 0             DCA     WWPOS             COMPARISON AFTER THE DISPLAY
 3844   REF   2  LAST  330     31,2015  53'600 1             DXCH    WWBIAS +2
 3845                          31,2016  0 0006 1             EXTEND
 3846   REF   3  LAST  330     31,2017  3 1574 0             DCA     WWVEL
 3847   REF   3  LAST  614     31,2020  53'602 0             DXCH    WWBIAS +4
 3848                          31,2021  0 0006 1             EXTEND
 3849   REF   4  LAST  614     31,2022  3 1576 1             DCA     WWBIAS
 3850   REF   5  LAST  614     31,2023  53'604 0             DXCH    WWBIAS +6
 3851   REF   1                31,2024  3 2143 0   V06N99DS  CAF     V06N99
 3852   REF 162  LAST  596     31,2025  0 4607 1             TC      BANKCALL
 3853   REF   7  LAST  303     31,2026   20323 1             CADR    GOXDSPF
 3854   REF  32  LAST  503     31,2027  1 5474 1             TCF     ENDEXT
 3855   REF   1                31,2030  1 2032 0             TCF     V6N99PRO
 3856   REF   1                31,2031  1 2024 1             TCF     V06N99DS
 3857                          31,2032  22 007 0   V6N99PRO  ZL
 3858   REF  11  LAST  523     31,2033  3 4747 1             CA      FIVE
 3859   REF 169  LAST  578     31,2034  54 002 1   N99LOOP   TS      Q
 3860   REF 170  LAST  614     31,2035  50 002 0             INDEX   Q
 3861   REF   6  LAST  614     31,2036  4 1571 1             CS      WWPOS
 3862   REF 171  LAST  614     31,2037  50 002 0             INDEX   Q
 3863   REF   7  LAST  614     31,2040  6 1577 0             AD      WWPOS +6
 3864   REF  89  LAST  588     31,2041  26 001 1             ADS     L
 3865   REF 172  LAST  614     31,2042  10 002 1             CCS     Q                 THE SUM OF ALL DIFFERENCES MUST BE ZERO.
 3866   REF   1                31,2043  1 2034 0             TCF     N99LOOP
 3867   REF 198  LAST  590     31,2044  22 000 1             LXCH    A
 3868                          31,2045  0 0006 1             EXTEND
 3869   REF   1                31,2046  1 2051 0             BZF     V06N9933
 3870   REF  36  LAST  574     31,2047  0 5506 1             TC      UPFLAG
 3871   REF   1                31,2050   00160 0             ADRES   V67FLAG

 3872   REF  64  LAST  614     31,2051  0 6060 1   V06N9933  TC      INTPRET
 3873                          31,2052   77414 0             BON     EXIT
 3874   REF   2  LAST  614     31,2053   03707 1                     V67FLAG
 3875                          31,2054   62056 0                     +2
 3876   REF  33  LAST  614     31,2055  1 5474 1             TCF     ENDEXT
 3877                          31,2056   77745 1             DLOAD
 3878   REF   8  LAST  614   31,2057   02172 1                    WWPOS
 3879                        31,2060   72412 0           SL4      SL1
 3880                        31,2061   14001 0           STODL    0D
 3881   REF   4  LAST  614   31,2062   02174 1                    WWVEL
 3882                        31,2063   14003 1           STODL    2D
 3883   REF   6  LAST  614   31,2064   02176 0                    WWBIAS
 3884                        31,2065   77661 0           SL                          SHIFT FROM NOUN SCALING (B-5) TO
 3885                        31,2066   20213 0                    10D                INTERNAL SCALING (B+5)
 3886                        31,2067   00005 1           STORE    4D
 3887                        31,2070   72014 1           BON      LXA,1
 3888   REF  13  LAST  604   31,2071   04307 1                    SURFFLAG
 3889   REF   1              31,2072   62102 0                    V67SURF
 3890                        31,2073   00000 1                    0D
 3891                        31,2074   72130 0           SXA,1    LXA,1
 3892   REF   3  LAST  604   31,2075   02000 0                    WRENDPOS
 3893                        31,2076   00002 0                    2D
 3894                        31,2077   52130 1           SXA,1    GOTO
 3895   REF   2  LAST  604   31,2100   02001 1                    WRENDVEL
 3896   REF   1              31,2101   62110 0                    V67CLRF
 3897                        31,2102   66150 0  V67SURF  LXA,1    SXA,1
 3898                        31,2103   00000 1                    0D
 3899   REF   2  LAST  604   31,2104   02006 0                    WSURFPOS
 3900                        31,2105   66150 0           LXA,1    SXA,1
 3901                        31,2106   00002 0                    2D
 3902   REF   2  LAST  604   31,2107   02007 1                    WSURFVEL
 3903                        31,2110   66150 0  V67CLRF  LXA,1    SXA,1
 3904                        31,2111   00004 0                    4D
 3905   REF   2  LAST  605   31,2112   02003 0                    WTRUN
 3906                        31,2113   77730 0           SXA,1
 3907   REF   2  LAST  605   31,2114   02002 1                    WSHAFT
 3908                        31,2115   77414 0           CLEAR    EXIT
 3909   REF   9  LAST  605   31,2116   02676 1                    RENDWFLG
 3910   REF  34  LAST  614   31,2117  1 5474 1           TCF      ENDEXT
 3911                        31,2120   40020 1  V67WW    STQ      BOV
 3912   REF   6  LAST  392   31,2121   00051 0                    S2
 3913                        31,2122   62123 0                    +1
 3914                        31,2123   45014 0           CLEAR    CALL
 3915   REF   3  LAST  614   31,2124   03667 0                    V67FLAG
 3916   REF  17  LAST  603   31,2125   27447 0                    INTSTALL
 3917                        31,2126   71331 0           SSP      DLOAD
 3918   REF   6  LAST  397   31,2127   00051 0                    S1
 3919                        31,2130   00006 1           DEC      6
 3920   REF   7  LAST  601   31,2131   06505 1                    ZEROVECS
 3921   REF   9  LAST  615   31,2132   02172 1           STORE    WWPOS
 3922   REF   5  LAST  615   31,2133   02174 1           STORE    WWVEL
 3923   REF   7  LAST  615   31,2134   02176 0           STORE    WWBIAS
 3924                        31,2135   77770 1           AXT,1
 3925                        31,2136   00066 1           DEC      54
 3926                        31,2137   47573 0  NXPOSVEL VLOAD*   VSQ
 3927   REF  15  LAST  605   31,2140   02467 0                    W +54D,1
 3928                          31,2141    77650 1              GOTO
 3929   REF   1                31,2142    60002 0                      ADDPOS
 3930                          31,2143    01543 1   V06N99     VN      0699

 3931   REF   1                30,2000                         SETLOC VB67A
 3932                          30,2002                         BANK
 3933   REF   1                                                COUNT* $$/EXTVB

 3934                          30,2002    77615 0   ADDPOS     DAD
 3935   REF  10   LAST   615   30,2003    02172 1                      WWPOS
 3936   REF  11   LAST   616   30,2004    02172 1              STORE   WWPOS
 3937                          30,2005    47573 0              VLOAD*  VSQ
 3938   REF  16   LAST   615   30,2006    02555 0                      W +108D,1
 3939                          30,2007    77615 0              DAD
 3940   REF   6   LAST   615   30,2010    02174 1                      WWVEL
 3941   REF   7   LAST   616   30,2011    02174 1              STORE   WWVEL
 3942                          30,2012    47573 0              VLOAD*  VSQ
 3943   REF  17   LAST   616   30,2013    02643 1                      W +162D,1
 3944                          30,2014    77615 0              DAD
 3945   REF   8   LAST   615   30,2015    02176 0                      WWBIAS
 3946   REF   9   LAST   616   30,2016    02176 0              STORE   WWBIAS
 3947                          30,2017    75500 0              TIX,1   SQRT
 3948   REF   1                30,2020    62137 0                      NXPOSVEL
 3949                          30,2021    77661 0              SR                            SHIFT FROM INTERNAL SCALING (B+5) TO
 3950                          30,2022    20613 1                      10D                   NOUN SCALING (B-5)
 3951   REF  10   LAST   616   30,2023    16176 0              STODL   WWBIAS
 3952   REF   8   LAST   616   30,2024    02174 1                      WWVEL
 3953                          30,2025    77766 0              SQRT
 3954   REF   9   LAST   616   30,2026    16174 1              STODL   WWVEL
 3955   REF  12   LAST   616   30,2027    02172 1                      WWPOS
 3956                          30,2030    77766 0              SQRT
 3957   REF  13   LAST   616   30,2031    02172 1              STORE   WWPOS
 3958                          30,2032    52000 0              BOV     GOTO
 3959                          30,2033    60035 1                      +2
 3960   REF   1                30,2034    60042 1                      V67XXX
 3961                          30,2035    77745 1              DLOAD
 3962   REF   4   LAST   390   30,2036    06513 0                      DPPOSMAX
 3963   REF  14   LAST   616   30,2037    02172 1              STORE   WWPOS
 3964   REF  10   LAST   616   30,2040    02174 1              STORE   WWVEL
 3965   REF  11   LAST   616   30,2041    02176 0              STORE   WWBIAS
 3966                          30,2042    45345 1   V67XXX     DLOAD   DSU
 3967   REF  15   LAST   616   30,2043    02172 1                      WWPOS
 3968   REF   1                30,2044    20060 0                      FT99999
 3969                          30,2045    71240 1              BMN     DLOAD
 3970                          30,2046    60051 0                      +3
 3971   REF   2   LAST   616   30,2047    20060 0                      FT99999
 3972   REF  16   LAST   616   30,2050    02172 1              STORE   WWPOS
 3973                          30,2051    66150 0              LXA,1   SXA,1
 3974   REF   7   LAST   615   30,2052    00051 0                      S2
 3975   REF   2   LAST   310   30,2053    00052 0                      QPRET
 3976                              30,2054    77776 1              EXIT
 3977   REF  41  LAST  581         30,2055   0 4626 1              TC        POSTJUMP
 3978   REF   2  LAST  310         30,2056    27460 0              CADR      INTWAKE

 3979                              30,2057    01670 1   FT99999    2DEC      30479 B-19
 3979                              30,2060    17000 1
```

```
P3980
 3981                          25,3651                                BANK    25
 3982   REF    3  LAST  571    25,2000                                SETLOC  RADARUPT
 3983                          25,3651                                BANK
 3984   REF    3  LAST  571 TO  579:    266    269*                   COUNT*  $$/RRUPT

 3985   REF   33  LAST  609    E7,1456                                EBANK=  LOSCOUNT

 3986   REF   28  LAST  575    25,3651  4 4740 1  RADLITES  CS      BIT5
 3987   REF   25  LAST  573    25,3652  6 0061 0            AD      ITEMP1
 3988   REF  199  LAST  614    25,3653  10 000 0            CCS     A
 3989   REF   71  LAST  579    25,3654  4 4744 0            CS      ONE        +
 3990   REF    1               25,3655  1 3705 1            TCF     VLIGHT     0

 3991   REF    1               25,3656  1 4561 0            TCF     RRTRKF     ←

 3992   REF    5  LAST  271    25,3657  54 065 0  HLIGHT    TS      ITEMP5           ZERO ITEMP5 FOR H INDEX

 3993   REF    1               25,3660  3 4740 0            CA      HLITE
 3994   REF   50  LAST  614    25,3661  54 001 1            TS      L

 3995   REF    1               25,3662  3 4740 0            CA      LRALTBIT
 3996   REF  100  LAST  610    25,3663  7 0110 0  BOTHLITS  MASK    RADMODES
 3997   REF  200  LAST  618    25,3664  10 000 0            CCS     A
 3998   REF    1               25,3665  1 3677 0            TCF     ONLITES

 3999   REF   16  LAST  576    25,3666  3 0107 1            CA      FLGWRD11
 4000   REF    6  LAST  618    25,3667  50 065 1            INDEX   ITEMP5
 4001   REF    1               25,3670  7 4744 0            MASK    HFLSHBIT
 4002   REF  201  LAST  618    25,3671  10 000 0            CCS     A
 4003   REF    2  LAST  618    25,3672  1 4561 0            TCF     RRTRKF ←

 4004                          25,3673  0 0006 1  LITIT     EXTEND
 4005   REF    3  LAST  190    25,3674  22 066 1            QXCH    ITEMP6
 4006   REF    2  LAST  540    25,3675  0 4573 1            TC      TRKFLON +1

 4007   REF    4  LAST  618    25,3676  0 0066 1            TC      ITEMP6

 4008   REF    7  LAST  618    25,3677  50 065 1  ONLITES   INDEX   ITEMP5
 4009   REF    2  LAST  618    25,3700  4 4744 0            CS      HFLSHBIT
 4010   REF   17  LAST  618    25,3701  7 0107 0            MASK    FLGWRD11
 4011   REF   18  LAST  618    25,3702  54 107 0            TS      FLGWRD11

 4012   REF   51  LAST  618    25,3703  3 0001 0            CA      L
 4013   REF    1               25,3704  1 3673 1            TCF     LITIT
 4014   REF    8  LAST  618    25,3705  54 065 0  VLIGHT    TS      ITEMP5
 4015   REF    1               25,3706  3 4742 1            CA      VLITE
 4016   REF   52  LAST  618    25,3707  54 001 1            TS      L
 4017   REF   28  LAST  575    25,3710  3 4735 1            CA      BIT8
 4018   REF    1               25,3711  1 3663 0            TCF     BOTHLITS
```

RESET
HFLSH BIT
OR
VFLSHBIT

```
 4019    REF   29   LAST   618        4740            HLITE     EQUALS BIT5
 4020    REF   31   LAST   588        4742            VLITE     EQUALS BIT3



*** END OF LEMP20S .168 ***
```

```
P0023   PROGRAM DESCRIPTION  P30     DATE 3-6-67

R0024   MOD.1  BY  RAMA AIYAWAR
R0025   FUNCTIONAL DESCRIPTION
R0026      ACCEPT ASTRONAUT INPUTS OF TIG,DELV(LV)
R0027      CALL IMU STATUS CHECK ROUTINE (R02)
R0028      DISPLAY TIME TO GO, APOGEE, PERIGEE, DELV(MAG), MGA AT IGN
R0029      REQUEST BURN PROGRAM

R0030   CALLING SEQUENCE VIA JOB FROM V37

R0031   EXIT VIA V37 CALL OR TO GOTOPOOH (V34E)

R0032   SUBROUTINE CALLS-FLAGUP, PHASCHNG, BANKCALL, ENDOFJOB, GOFLASH, GOFLASHR
R0033                    GOPERF3R, INTPRET, BLANKET, GOTOPOOH, R02BOTH, S30.1,
R0034                    TTG/N35, MIDGIM, DISPMGA

R0035   ERASABLE INITIALIZATION- STATE VECTOR

R0036   OUTPUT-RINIT, VINIT, +MGA, VTIG, RTIG, DELVSIN, DELVSAB, DELVSLV, HAPO,
R0037           HPER, TTOGO

R0038   DEBRIS- A,L, MPAC, PUSHLIST

 00381                       32,2570                         BANK    32
 00382  REF   1              35,2000                         SETLOC P30S
 00383                       35,2000                         BANK
 00384  REF   2  LAST  326   E4,1643                         EBANK= +MGA
 0039   REF   1                                              COUNT* $$/P30
 0040   REF  37  LAST  614   35,2000  0 5506 1  P30          TC     UPFLAG            SET UPDATE FLAG
 0041   REF   3  LAST  510   35,2001   00027 1               ADRES  UPDATFLG
 00411  REF  38  LAST  620   35,2002  0 5506 1               TC     UPFLAG            SET TRACK FLAG
 00412  REF   3  LAST  518   35,2003   00031 0               ADRES  TRACKFLG

 0042   REF   1              35,2004  3 2032 1  P30N33       CAF    V06N33            T OF IGN
 0043   REF   1              35,2005  0 3622 1               TC     VNPOOH            RETURNS ON PROCEED, POOH ON TERMINATE

 0051   REF   1              35,2006  3 3637 0               CAF    V06N81            DISPLAY DELTA V (LV)
 0052   REF   2  LAST  620   35,2007  0 3622 1               TC     VNPOOH                REDISPLAY ON RECYCLE

 0057   REF  56  LAST  588   35,2010  0 5520 0               TC     DOWNFLAG          RESET UPDATE FLAG
 0058   REF   4  LAST  620   35,2011   00027 1               ADRES  UPDATFLG
 0059   REF  65  LAST  614   35,2012  0 6060 1               TC     INTPRET
 0060                        35,2013   77624 1               CALL
 0061   REF   1              35,2014   70000 0                      S30.1
 0067   *                    35,2015   43014 0               SET    SET
 00675  REF   5  LAST  620   35,2016   00470 1                      UPDATFLG
 00676 *REF   1              35,2017   01067 1                      XDELVFLG
 00677 *                     35,2020   77776 1               EXIT
 0068   REF   1              35,2021  3 2033 0  PARAM30      CAF    V06N42            DISPLAY APOGEE,PERIGEE ,DELTA V
 0069    REF    3  LAST  620    35,2022   0 3622 1              TC       VNPOOH

 0070    REF   66  LAST  620    35,2023   0 6060 1              TC       INTPRET
 0071   *                       35,2024    77614 1              SET
 0072   *REF    1               35,2025    01071 0                       FINALFLG
 0074                           35,2026    77624 1  REVN1645 CALL
 0075    REF    1               35,2027    73516 1                       VN1645
 0076                           35,2030    77650 1              GOTO                   COMES HERE ON RECYCLE RESPONSE
 0077    REF    1               35,2031    72026 0                       REVN1645

 0100                           35,2032    01441 1  V06N33      VN       0633
 0102                           35,2033    01452 0  V06N42      VN       0642
```

```
P0105   PROGRAM DESCRIPTION S30.1       DATE 9NOV66

R0106   MOD NO 1          LOG SECTION  P30,P37
R0107   MOD  BY  RAMA AIYAWAR **
R0108   FUNCTIONAL DESCRIPTION
R0109            BASED ON STORED TARGET PARAMETERS(R OF IGNITION(RTIG),V OF
R0110            IGNITION(VTIG),TIME OF IGNITION (TIG)),COMPUTE PERIGEE ALTITUDE
R0111            APOGEE ALTITUDE AND DELTAV REQUIRED(DELVSIN).
R0112   CALLING SEQUENCE
R0113       L    CALL
R0114       L+1         S30.1
R0115   NORMAL EXIT MODE
R0116       AT L+2 OR CALLING SEQUENCE (GOTO L+2)
R0117   SUBROUTINES CALLED
R0118            LEMPREC
R0119            PERIAPO
R0120   ALARM OR ABORT EXIT MODES
R0121                   NONE
R0122   ERASABLE INITIALIZATION REQUIRED
R0123            TIG       TIME OF IGNITION                    DP      B28CS
R0124            DELVSLV   SPECIFIED DELTA-V IN LOCAL VERT.
R0125                      COORDS. OF ACTIVE VEHICLE AT
R0126                   TIME OF IGNITION      VECTOR  B+7  METERS/CS
R0127   OUTPUT
R0128            RTIG   POSITION AT TIG       VECTOR  B+29 METERS
R0129            VTIG   VELOCITY AT TIG       VECTOR  B+29 METERS/CS
R0130            PDL 4D APOGEE ALTITUDE       DP      B+29 M ,  B+27 METERS.
R01301           HAPO   APOGEE ALTITUDE       DP      B+29 METERS
R0131            PDL 8D PERIGEE ALTITUDE      DP      B+29 M ,  B+27 METERS.
R01311           HPER   PERIGEE ALTITUDE      DP      B+29 METERS
R0132            DELVSIN   SPECIFIED DELTA-V IN INERTIAL
R0133                      COORD. OF ACTIVE VEHICLE AT
R0134                   TIME OF IGNITION      VECTOR  B+7  METERS/CS
R0135            DELVSAB MAG. OF DELVSIN      VECTOR  B+7  METERS/CS
R0136   DEBRIS QTEMP    TEMP. ERASABLE
R0137          QPRET,MPAC
R0138          PUSHLIST

 0139   REF   1               34,2000                 SETLOC P30S1
 0140                         34,2000                 BANK

 0141   REF   1                                       COUNT* $$/S30S

 0142                         34,2000   71220 1  S30.1  STQ    DLOAD
 0143   REF   1               34,2001   03632 0                QTEMP
 0144   REF  10  LAST  508    34,2002   03442 0                TIG              TIME IGNITION SCALED AT 2(+28)CS
 0145   REF  21  LAST  609    34,2003   34041 0         STCALL TDEC1
 0146   REF   3  LAST  219    34,2004   27115 1                LEMPREC          ENCKE ROUTINE FOR LEM

 0147                         34,2005   67175 0         VLOAD  SXA,2
 01471  REF  10  LAST  609   34,2006  00001 0             RATT
 0148   REF   1              34,2007  02777 1             RTX2
 0150   REF   2  LAST  148   34,2010  03642 1   STORE     RTIG         RADIUS VECTOR AT IGNITION TIME
 0153                        34,2011  57456 1   UNIT      VCOMP
 0154   REF   3  LAST  149   34,2012  27656 1   STDVL     DELVSIN      ZRF/LV IN DELVSIN SCALED AT 2
 0155   REF   6  LAST  609   34,2013  00007 0             VATT         VELOCITY VECTOR AT TIG, SCALED 2(7) M/CS
 0156   REF   2  LAST  148   34,2014  03650 1   STORE     VTIG
 0158                        34,2015  53435 0   VXV       UNIT
 0159   REF   3  LAST  623   34,2016  03642 1             RTIG
 0160                        34,2017  66001 0   SETPD     SXA,1
 0161                        34,2020  00001 0             0
 01611  REF   2  LAST  129   34,2021  02776 0             RTX1
 0162                        34,2022  47206 0   PUSH      VXV          YRF/LV PDL 0  SCALED AT 2
 0163   REF   4  LAST  623   34,2023  03656 1             DELVSIN
 0164                        34,2024  63372 1   VSL1      PDVL
 0165                        34,2025  63315 0   PDVL      PDVL         YRF/LV PDL 6   SCALED AT 2
 0166   REF   5  LAST  623   34,2026  03656 1             DELVSIN      ZRF/LV PDL 12D SCALED AT 2
 0167   REF   4  LAST  210   34,2027  03434 1             DELVSLV
 0168                        34,2030  76505 0   VXM       VSL1
 0169                        34,2031  00001 0             0
 0170   REF   6  LAST  623   34,2032  03656 1   STORE     DELVSIN      DELTAV IN INERT. COOR. SCALED TO B+7M/CS
 0172                        34,2033  77646 0   ABVAL
 0173   REF   2  LAST  148   34,2034  27664 0   STDVL     DELVSAB      DELTA V MAG.
 0174   REF   4  LAST  623   34,2035  03642 1             RTIG         (FOR PERIAPO)
 0175                        34,2036  53315 0   PDVL      VAD          VREQUIRED = VTIG + DELVSIN (FOR PERIAPO)
 0176   REF   3  LAST  623   34,2037  03650 1             VTIG
 0177   REF   7  LAST  623   34,2040  03656 1             DELVSIN
 01771                       34,2041  77624 1   CALL
 0178   REF   1              34,2042  46337 1             PERIAPO1
 01781                       34,2043  77624 1   CALL
 01782  REF   1              34,2044  46447 1             SHIFTR1      RESCALE IF NEEDED
 017822                      34,2045  77624 1   CALL                   LIMIT DISPLAY TO 9999.9 N. MI.
 017824 REF   1              34,2046  45640 1             MAXCHK
 01783  REF   2  LAST  326   34,2047  16312 0   STODL     HPER         PERIGEE ALT 2(29) METERS, FOR DISPLAY
 01784                       34,2050  00005 1             4D
 01785                       34,2051  77624 1   CALL
 01786  REF   2  LAST  623   34,2052  46447 1             SHIFTR1      RESCALE IF NEEDED
 01787                       34,2053  77624 1   CALL                   LIMIT DISPLAY TO 9999.9 N. MI.
 01788  REF   2  LAST  623   34,2054  45640 1             MAXCHK
 0179   REF   4  LAST  326   34,2055  36310 0   STCALL    HAPO         APOGEE  ALT 2(29) METERS, FOR DISPLAY
 0180   REF   2  LAST  622   34,2056  03632 0             QTEMP
```

```
P0010   COELLIPTIC SEQUENCE INITIATION (CSI) PROGRAMS (P32 AND P72)

R0011   MOD NO -1         LOG SECTION - P32-P35, P72-P75
R0012   MOD BY WHITE.P   DATE   1JUNE67

R0013   PURPOSE

R0014           (1) TO CALCULATE PARAMETERS ASSOCIATED WITH THE FOLLOWING
R0015               CONCENTRIC FLIGHT PLAN MANEUVERS - THE CO-ELLIPTIC SEQUENCE
R0016               INITIATION (CSI) MANEUVER AND THE CONSTANT DELTA ALTITUDE
R0017               (CDH) MANEUVER.

R0018           (2) TO CALCULATE THESE PARAMETERS BASED UPON MANEUVER DATA
R0019               APPROVED AND KEYED INTO THE DSKY BY THE ASTRONAUT.

R0020           (3) TO DISPLAY TO THE ASTRONAUT AND THE GROUND DEPENDENT VARIABLES
R0021               ASSOCIATED WITH THE CONCENTRIC FLIGHT PLAN MANEUVERS FOR
R0022               APPROVAL BY THE ASTRONAUT/GROUND.

R0023           (4) TO STORE THE CSI TARGET PARAMETERS FOR USE BY THE DESIRED
R0024               THRUSTING PROGRAM.

R0025   ASSUMPTIONS

R0026           (1) AT A SELECTED TPI TIME THE LINE OF SIGHT BETWEEN THE ACTIVE
R0027               AND PASSIVE VEHICLES IS SELECTED TO BE A PRESCRIBED ANGLE (E)
R0028               FROM THE HORIZONTAL PLANE DEFINED BY THE ACTIVE VEHICLE
R00285              POSITION.

R0029           (2) THE TIME BETWEEN CSI IGNITION AND CDH IGNITION MUST BE
R0030               COMPUTED TO BE GREATER THAN 10 MINUTES FOR SUCCESSFUL
R0031               COMPLETION OF THE PROGRAM.

R0032           (3) THE TIME BETWEEN CDH IGNITION AND TPI IGNITION MUST BE
R0033               COMPUTED TO BE GREATER THAN 10 MINUTES FOR SUCCESSFUL
R0034               COMPLETION OF THE PROGRAM.

R0035           (4) CDH DELTA V IS SELECTED TO MINIMIZE THE VARIATION OF THE
R0036               ALTITUDE DIFFERENCE BETWEEN THE ORBITS.

R0037           (5) CSI BURN IS DEFINED SUCH THAT THE IMPULSIVE DELTA V IS IN THE
R0038               HORIZONTAL PLANE DEFINED BY THE ACTIVE VEHICLE POSITION AT CSI
R00385              IGNITION.

R0039           (6) THE PERICENTER ALTITUDE OF THE ORBIT FOLLOWING CSI AND CDH
R0040               MUST BE GREATER THAN 35,000 FT (LUNAR ORBIT) OR 85 NM (EARTH
R0041               ORBIT) FOR SUCCESSFUL COMPLETION OF THIS PROGRAM.

R0042           (7) THE CSI AND CDH MANEUVERS ARE ORIGINALLY ASSUMED TO BE
R0043               PARALLEL TO THE PLANE OF THE CSM ORBIT.  HOWEVER CREW
```

```
R0044                  MODIFICATION OF DELTA V (LV) COMPONENTS MAY RESULT IN AN
R0045                  OUT-OF-PLANE CSI MANEUVER.

R0046              (8) STATE VECTOR UPDATES BY P27 ARE DISALLOWED DURING AUTOMATIC
R0047                  STATE VECTOR UPDATING INITIATED BY P20 (SEE ASSUMPTION 10).

R0048              (9) COMPUTED VARIABLES MAY BE STORED FOR LATER VERIFICATION BY
R0049                  THE GROUND.  THESE STORAGE CAPABILITIES ARE NORMALLY LIMITED
R0050                  ONLY TO THE PARAMETERS FOR ONE THRUSTING MANEUVER AT A TIME
R0051                  EXCEPT FOR CONCENTRIC FLIGHT PLAN MANEUVER SEQUENCES.

R0052             (10) THE RENDEZVOUS RADAR MAY OR MAY NOT BE USED TO UPDATE THE LM
R0053                  OR CSM STATE VECTORS FOR THIS PROGRAM.  IF RADAR USE IS
R0054                  DESIRED THE RADAR WAS TURNED ON AND LOCKED ON THE CSM BY
R0055                  PREVIOUS SELECTION OF P20.  RADAR SIGHTING MARKS WILL BE MADE
R0056                  AUTOMATICALLY APPROXIMATELY ONCE A MINUTE WHEN ENABLED BY THE
R0057                  TRACK AND UPDATE FLAGS (SEE P20).  THE RENDEZVOUS TRACKING
R0058                  MARK COUNTER IS ZEROED BY THE SELECTION OF P20 AND AFTER EACH
R0059                  THRUSTING MANEUVER.

R0060             (11) THE ISS NEED NOT BE ON TO COMPLETE THIS PROGRAM.

R0061             (12) THE OPERATION OF THE PROGRAM UTILIZES THE FOLLOWING FLAGS -

R0062                      ACTIVE VEHICLE FLAG - DESIGNATES THE VEHICLE WHICH IS
R0063                      DOING RENDEZVOUS THRUSTING MANEUVERS TO THE PROGRAM WHICH
R0064                      CALCULATES THE MANEUVER PARAMETERS.  SET AT THE START OF
R0065                      EACH RENDEZVOUS PRE-THRUSTING PROGRAM.

R0066                      FINAL FLAG - SELECTS FINAL PROGRAM DISPLAYS AFTER CREW HAS
R0067                      COMPLETED THE FINAL MANEUVER COMPUTATION AND DISPLAY
R0068                      CYCLE.

R0069                      EXTERNAL DELTA V STEERING FLAG - DESIGNATES THE TYPE OF
R0070                      STEERING REQUIRED FOR EXECUTION OF THIS MANEUVER BY THE
R0071                      THRUSTING PROGRAM SELECTED AFTER COMPLETION OF THIS
R0072                      PROGRAM.

R0073             (13) IT IS NORMALLY REQUIRED THAT THE ISS BE ON FOR 1 HOUR PRIOR TO
R0074                  A THRUSTING MANEUVER.

R0075             (14) THIS PROGRAM IS SELECTED BY THE ASTRONAUT BY DSKY ENTRY -

R0076                      P32 IF THIS VEHICLE IS ACTIVE VEHICLE.

R0077                      P72 IF THIS VEHICLE IS PASSIVE VEHICLE.

R0110        INPUT

R0111              (1) TCSI      TIME OF THE CSI MANEUVER
```

```
R0112         (2) NN        NUMBER OF APSIDAL CROSSINGS THRU WHICH THE ACTIVE
R0113                       VEHICLE ORBIT CAN BE ADVANCED TO OBTAIN THE CDH
R0114                       MANEUVER POINT
R0115         (3) ELEV      DESIRED LOS ANGLE AT TPI
R0116         (4) TTPI      TIME OF THE TPI MANEUVER
R0130   OUTPUT

R0131         (1) TRKMKCNT NUMBER OF MARKS
R0132         (2) TTOGO     TIME TO GO
R0133         (3) +MGA      MIDDLE GIMBAL ANGLE
R0134         (4) DIFFALT   DELTA ALTITUDE AT CDH
R0135         (5) T1TOT2    DELTA TIME FROM CSI TO CDH
R0136         (6) T2TOT3    DELTA TIME FROM CDH TO TPI
R0137         (7) DELVLVC   DELTA VELOCITY AT CSI - LOCAL VERTICAL COORDINATES
R0138         (8) DELVLVC   DELTA VELOCITY AT CDH - LOCAL VERTICAL COORDINATES

R0139   DOWNLINK

R01391        (1) TCSI      TIME OF THE CSI MANEUVER
R01392        (2) TCDH      TIME OF THE CDH MANEUVER
R01393        (3) TTPI      TIME OF THE TPI MANEUVER
R01394        (4) TIG       TIME OF THE CSI MANEUVER
R01395        (5) DELVEET1 DELTA VELOCITY AT CSI - REFERENCE COORDINATES
R01396        (6) DELVEET2 DELTA VELOCITY AT CDH - REFERENCE COORDINATES
R01397        (7) DIFFALT   DELTA ALTITUDE AT CDH
R01398        (8) NN        NUMBER OF APSIDAL CROSSINGS THRU WHICH THE ACTIVE
R01399                      VEHICLE ORBIT CAN BE ADVANCED TO OBTAIN THE CDH
R0140                       MANEUVER POINT
R01401        (9) ELEV      DESIRED LOS ANGLE AT TPI

R01402  COMMUNICATION TO THRUSTING PROGRAMS

R01403        (1) TIG       TIME OF THE CSI MANEUVER
R01404        (2) RTIG      POSITION OF ACTIVE VEHICLE AT CSI - BEFORE ROTATION
R01405                      INTO PLANE OF PASSIVE VEHICLE
R01406        (3) VTIG      VELOCITY OF ACTIVE VEHICLE AT CSI - BEFORE ROTATION
R01407                      INTO PLANE OF PASSIVE VEHICLE
R01408        (4) DELVSIN   DELTA VELOCITY AT CSI - REFERENCE COORDINATES
R01409        (5) DELVSAB   MAGNITUDE OF DELTA VELOCITY AT CSI
R0141         (6) XDELVFLG SET TO INDICATE EXTERNAL DELTA V VG COMPUTATION

R0150   SUBROUTINES USED

R0151         AVFLAGA
R0152         AVFLAGP
R01525        P20FLGON
R0153         VARALARM
R0154         BANKCALL
R0155         GOFLASH
R0156         GOTOPOOH
```

```
R01562         VNPOOH
R01564         GOFLASHR
R0157          BLANKET
R0158          ENDOFJOB
R0159          SELECTMU
R0160          ADVANCE
R0161          INTINT
R0162          PASSIVE
R0163          CSI/A
R0164          S32/33.1
R0165          DISDVLVC
R0166          VN1645

 0400                           35,2034                        BANK    35
 0401   REF    1                35,2000                        SETLOC  CSI/CDH
 0402                           35,2034                        BANK
 0403   REF    1                E7,1470                        EBANK=  SUBEXIT
 0404   REF    1                                               COUNT*  $$/P3272
 0500   REF    1                35,2034   0 2354 1  P32        TC      AVFLAGA
 0502   REF    1                35,2035   0 2037 1             TC      P32STRT
 0503   REF    1                35,2036   0 2361 1  P72        TC      AVFLAGP
 050305                         35,2037   0 0006 1  P32STRT    EXTEND
 050306 REF    1                35,2040   3 2425 0             DCA     P30ZERO
 050307 REF    3   LAST   327   35,2041  53'621 1              DXCH    CENTANG
 05031  REF    1                35,2042   0 2060 0             TC      P32/P72A
 05032                          35,2043    77734 1  ALMXITA    SXA,2
 05033  REF    2   LAST   147   35,2044    03613 0                     CSIALRM
 05034                          35,2045    77740 1  ALMXIT     LXC,1
 05035  REF    3   LAST   627   35,2046    03613 0                     CSIALRM
 05038                          35,2047    77533 1             SLOAD*  EXIT
 05039  REF    1                35,2050    32430 1                     ALARM/TB -1,1
 0504   REF  263   LAST   593   35,2051   3 0154 1             CA      MPAC
 05041  REF    3   LAST   400   35,2052   0 5740 1             TC      VARALARM
 05042  REF    1                35,2053   3 4777 1             CAF     V05N09
 05043  REF  163   LAST   614   35,2054   0 4607 1             TC      BANKCALL
 05044  REF    8   LAST   508   35,2055    20471 1             CADR    GOFLASH
 05045  REF    6   LAST   508   35,2056   0 6001 0             TC      GOTOPOOH
 05046                          35,2057   0 2053 0             TC      -4
 0505   REF    1                35,2060   0 2366 0  P32/P72A   TC      P20FLGON
 05051  REF    2   LAST   627   35,2061   3 2424 1             CAF     P30ZERO
 0506   REF    3   LAST   327   35,2062  55'467 1              TS      NN +1
 05061  REF    4   LAST   317   35,2063  55'633 1              TS      TCSI
 05062  REF    5   LAST   627   35,2064  55'634 0              TS      TCSI +1
 0507   REF    1                35,2065   3 2415 0  VN0611     CAF     V06N11            TCSI
 0508   REF    4   LAST   621   35,2066   0 3622 1             TC      VNPOOH
 050801 REF   67   LAST   621   35,2067   0 6060 1             TC      INTPRET
 050802                         35,2070    57545 1             DLOAD   DCOMP
 050803 REF    6   LAST   627   35,2071    03634 0                     TCSI
 050804                         35,2072    71240 1             BMN     DLOAD
 050805 REF    1                35,2073    72120 1                     VN0655
```

```
050806 REF   3  LAST  517   35,2074   01643 1                    TETLEM
050807 REF  22  LAST  622   35,2075   34041 0             STCALL TDEC1
050808 REF   1              35,2076   46401 0                    PRECSET
050809                      35,2077   53775 1             VLOAD  VSR*
05081  REF   1              35,2100   03536 1                    RACT3
050811                      35,2101   57176 0                    0,2
050812 REF   2  LAST  509   35,2102   26655 0             STOVL  RVEC
050813 REF   2  LAST  147   35,2103   03544 1                    VACT3
050814                      35,2104   43057 1             VSR*   SET
050815                      35,2105   57176 0                    0,2
050816 REF   2  LAST  509   35,2106   03466 0                    RVSW
050817 REF   3  LAST  509   35,2107   16744 1             STODL  VVEC
050818 REF   5  LAST  616   35,2110   06513 0                    DPPOSMAX
050819 REF   2  LAST  130   35,2111   36756 0             STCALL RDESIRED
05082  REF   1              35,2112   25557 1                    TIMERAD
050821                      35,2113   77615 0             DAD
050822 REF   1              35,2114   03574 1                    TDEC2
050823 REF   7  LAST  627   35,2115   03634 0             STORE  TCSI
050824                      35,2116   77776 1             EXIT
050825 REF   1              35,2117 0 2065  0             TC     VN0611
050826                      35,2120   77776 1  VN0655     EXIT
0509   REF   1              35,2121 3 3634  0             CAF    V06N55          NN, ELEV(RGLOS)
0510   REF 164  LAST  627   35,2122 0 4607  1             TC     BANKCALL
0511   REF   9  LAST  627   35,2123   20471 1             CADR   GOFLASH
0512   REF   7  LAST  627   35,2124 0 6001  0             TC     GOTOPOOH
0513                        35,2125 0 2127  1             TC     +2
0514                        35,2126 0 2121  1             TC     -5
0518   REF   1              35,2127 3 3633  1             CAF    V06N37          TTPI
0519   REF   5  LAST  627   35,2130 0 3622  1             TC     VNPOOH
0520   REF  68  LAST  627   35,2131 0 6060  1             TC     INTPRET
0521                        35,2132   77745 1             DLOAD
0522   REF   8  LAST  628   35,2133   03634 0                    TCSI
0523   REF  11  LAST  622   35,2134   37442 1             STCALL TIG
0524   REF   1              35,2135   20000 0                    SELECTMU
0525                        35,2136   77624 1  P32/P72B   CALL
0526   REF   1              35,2137   71016 0                    ADVANCE
0527                        35,2140   77201 1             SETPD  VLOAD
0528                        35,2141   00001 0                    0D
0529   REF   3  LAST  150   35,2142   03506 1                    VPASS1
0530                        35,2143   65315 0             PDVL   PDDL
0531   REF   2  LAST  147   35,2144   03500 1                    RPASS1
0532   REF   9  LAST  628   35,2145   03634 0                    TCSI
0533                        35,2146   65325 0             PDDL   PDDL
0534   REF   4  LAST  318   35,2147   03636 1                    TTPI
0535   REF   1              35,2150   33642 1                    TWOPI
0536                        35,2151   45006 0             PUSH   CALL
0537   REF   1              35,2152   73404 0                    INTINT
0538                        35,2153   77624 1             CALL
0539   REF   1              35,2154   46433 1                    PASSIVE
0540                        35,2155   77624 1             CALL
```

```
0541    REF    1                35,2156    70113 0                    CSI/A
0542                            35,2157    43014 0   P32/P72C BON       SET
0543    REF    2  LAST   621    35,2160    01311 0                    FINALFLG
0544    REF    1                35,2161    72163 0                    P32/P72D
0545    REF    6  LAST   620    35,2162    00470 1                    UPDATFLG
0546                            35,2163    77745 1   P32/P72D DLOAD
0547    REF    3  LAST   328    35,2164    02244 1                    T1TOT2
0548    REF    4  LAST   629    35,2165    02244 1   P32/P72E STORE   T1TOT2
0549                            35,2166    51025 1            DSU     BPL
0550    REF    1                35,2167    32427 1                    60MIN
0551    REF    1                35,2170    72165 0                    P32/P72E
0552                            35,2171    77745 1            DLOAD
0553    REF    2  LAST   328    35,2172    02246 0                    T2TOT3
0554    REF    3  LAST   629    35,2173    02246 0   P32/P72F STORE   T2TOT3
0555                            35,2174    51025 1            DSU     BPL
0556    REF    2  LAST   629    35,2175    32427 1                    60MIN
0557    REF    1                35,2176    72173 1                    P32/P72F
0558                            35,2177    77776 1            EXIT
0559    REF    1                35,2200    3 2417 1           CAF     V06N75
0560    REF    6  LAST   628    35,2201    0 3622 1           TC      VNPOOH
0561    REF   69  LAST   628    35,2202    0 6060 1           TC      INTPRET
0562                            35,2203    45175 0            VLOAD   CALL
0563    REF    3  LAST   210    35,2204    02260 1                    DELVEET1
0566    REF    1                35,2205    71100 0                    S32/33.1
0567    REF    4  LAST   629    35,2206    26260 1            STOVL   DELVEET1
05671   REF    2  LAST   121    35,2207    02302 1                    RACT2
05672   REF    2  LAST   121    35,2210    26274 1            STOVL   RACT1
0568    REF    3  LAST   210    35,2211    02266 1                    DELVEET2
0569                            35,2212    45170 0            AXT,1   CALL
05691                           35,2213    01522 0            VN      0682
0572    REF    1                35,2214    72375 0                    DISDVLVC
0573                            35,2215    77745 1            DLOAD
05731   REF    5  LAST   628    35,2216    03636 1                    TTPI
05732   REF    1                35,2217    37640 1            STCALL  TTPIO
0574    REF    2  LAST   621    35,2220    73516 1                    VN1645
0575                            35,2221    77650 1            GOTO
0576    REF    1                35,2222    72136 0                    P32/P72B
```

```
P1010    CONSTANT DELTA HEIGHT (CDH) PROGRAMS (P33 AND P73)

R1011    MOD NO -1         LOG SECTION - P32-P35, P72-P75
R1012    MOD BY WHITE.P  DATE  1JUNE67
R1013    PURPOSE

R1014            (1) TO CALCULATE PARAMETERS ASSOCIATED WITH THE CONSTANT DELTA
R1015                ALTITUDE MANEUVER (CDH).

R1016            (2) TO CALCULATE THESE PARAMETERS BASED UPON MANEUVER DATA
R1017                APPROVED AND KEYED INTO THE DSKY BY THE ASTRONAUT.

R1018            (3) TO DISPLAY TO THE ASTRONAUT AND THE GROUND DEPENDENT VARIABLES
R1019                ASSOCIATED WITH THE CDH MANEUVER FOR APPROVAL BY THE
R1020                ASTRONAUT/GROUND.

R1021            (4) TO STORE THE CDH TARGET PARAMETERS FOR USE BY THE DESIRED
R1022                THRUSTING PROGRAM.

R1023    ASSUMPTIONS

R1024            (1) THIS PROGRAM IS BASED UPON PREVIOUS COMPLETION OF THE
R1025                CO-ELLIPTIC SEQUENCE INITIATION (CSI) PROGRAM (P32/P72).
R1026                THERFORE -

R1027                (A) AT A SELECTED TPI TIME (NOW IN STORAGE) THE LINE OF SIGHT
R1028                    BETWEEN THE ACTIVE AND PASSIVE VEHICLES WAS SELECTED TO BE
R1029                    A PRESCRIBED ANGLE (E) (NOW IN STORAGE) FROM THE
R1030                    HORIZONTAL PLANE DEFINED BY THE ACTIVE VEHICLE POSITION.

R1031                (B) THE TIME BETWEEN CSI IGNITION AND CDH IGNITION WAS
R1032                    COMPUTED TO BE GREATER THAN 10 MINUTES.

R1033                (C) THE TIME BETWEEN CDH IGNITION AND TPI IGNITION WAS
R1034                    COMPUTED TO BE GREATER THAN 10 MINUTES.

R1035                (D) THE VARIATION OF THE ALTITUDE DIFFERENCE BETWEEN THE
R1036                    ORBITS WAS MINMIZED.

R1037                (E) CSI BURN WAS DEFINED SUCH THAT THE IMPULSIVE DELTA V WAS
R1038                    IN THE HORIZONTAL PLANE DEFINED BY ACTIVE VEHICLE

R10385                   POSITION AT CSI IGNITION.

R1039                (F) THE PERICENTER ALTITUDES OF THE ORBITS FOLLOWING CSI AND
R1040                    CDH WERE COMPUTED TO BE GREATER THAN 35,000 FT FOR LUNAR
R1041                    ORBIT OR 85 NM FOR EARTH ORBIT.

R1042                (G) THE CSI AND CDH MANEUVERS WERE ASSUMED TO BE PARALLEL TO
R1043                    THE PLANE OF THE PASSIVE VEHICLE ORBIT.  HOWEVER, CREW
```

```
R1044                    MODIFICATION OF DELTA V (LV) COMPONENTS MAY HAVE RESULTED
R1045                    IN AN OUT-OF-PLANE MANEUVER.

R1046             (2) STATE VECTOR UPDATES BY P27 ARE DISALLOWED DURING AUTOMATIC
R1047                 STATE VECTOR UPDATING INITIATED BY P20 (SEE ASSUMPTION 4).

R1048             (3) COMPUTED VARIABLES MAY BE STORED FOR LATER VERIFICATION BY
R1049                 THE GROUND.  THESE STORAGE CAPABILITES ARE NORMALLY LIMITED
R1050                 ONLY TO THE PARAMETERS FOR ONE THRUSTING MANEUVER AT A TIME
R1051                 EXCEPT FOR CONCENTRIC FLIGHT PLAN MANEUVER SEQUENCES.

R1052             (4) THE RENDEZVOUS RADAR MAY OR MAY NOT BE USED TO UPDATE THE LM
R1053                 OR CSM STATE VECTORS FOR THIS PROGRAM.  IF RADAR USE IS
R1054                 DESIRED THE RADAR WAS TURNED ON AND LOCKED ON THE CSM BY
R1055                 PREVIOUS SELECTION OF P20.  RADAR SIGHTING MARKS WILL BE MADE
R1056                 AUTOMATICALLY APPROXIMATELY ONCE A MINUTE WHEN ENABLED BY THE
R1057                 TRACK AND UPDATE FLAGS (SEE P20).  THE RENDEZVOUS TRACKING
R1058                 MARK COUNTER IS ZEROED BY THE SELECTION OF P20 AND AFTER EACH
R1059                 THRUSTING MANEUVER.

R1060             (5) THE ISS NEED NOT BE ON TO COMPLETE THIS PROGRAM.

R1061             (6) THE OPERATION OF THE PROGRAM UTILIZES THE FOLLOWING FLAGS -

R1062                    ACTIVE VEGICLE FLAG - DESIGNATES THE VEHICLE WHICH IS
R1063                    DOING RENDEZVOUS THRUSTING MANEUVERS TO THE PROGRAM WHICH
R1064                    CALCULATES THE MANEUVER PARAMETERS.  SET AT THE START OF
R1065                    EACH RENDEZVOUS PRE-THRUSTING PROGRAM.

R1066                    FINAL FLAG - SELECTS FINAL PROGRAM DISPLAYS AFTER CREW HAS
R1067                    COMPLETED THE FINAL MANEUVER COMPUTATION AND DISPLAY
R1068                    CYCLE.

R1069                    EXTERNAL DELTA V STEERING FLAG - DESIGNATES THE TYPE OF
R1070                    STEERING REQUIRED FOR EXECUTION OF THIS MANEUVER BY THE
R1071                    THRUSTING PROGRAM SELECTED AFTER COMPLETION OF THIS
R1072                    PROGRAM.

R1073             (7) IT IS NORMALLY REQUIRED THAT THE ISS BE ON FOR 1 HOUR PRIOR TO
R1074                 A THRUSTING MANEUVER.

R1075             (8) THIS PROGRAM IS SELECTED BY THE ASTRONAUT BY DSKY ENTRY -

R1076                    P33 IF THIS VEHICLE IS ACTIVE VEHICLE.

R1077                    P73 IF THIS VEHICLE IS PASSIVE VEHICLE.

R1110       INPUT

R1111             (1) TTPIO    TIME OF THE TPI MANEUVER - SAVED FROM P32/P72
```

```
R1112          (2) ELEV      DESIRED LOS ANGLE AT TPI - SAVED FROM P32/P72
R1113          (3) TCDH      TIME OF THE CDH MANEUVER

R1130   OUTPUT

R1131          (1) TRKMKCNT NUMBER OF MARKS
R1132          (2) TTOGO     TIME TO GO
R1133          (3) +MGA      MIDDLE GIMBAL ANGLE
R1134          (4) DIFFALT   DELTA ALTITUDE AT CDH
R1135          (5) T2TOT3    DELTA TIME FROM CDH TO COMPUTED TPI
R1136          (6) NOMTPI    DELTA TIME FROM NOMINAL TPI TO COMPUTED TPI
R1137          (7) DELVLVC   DELTA VELOCITY AT CDH - LOCAL VERTICAL COORDINATES

R1139   DOWNLINK

R11391         (1) TCDH      TIME OF THE CDH MANEUVER
R11392         (2) TTPI      TIME OF THE TPI MANEUVER
R11393         (3) TIG       TIME OF THE CDH MANEUVER
R11394         (4) DELVEET2 DELTA VELOCITY AT CDH - REFERENCE COORDINATES
R11395         (5) DIFFALT   DELTA ALTITUDE AT CDH
R11396         (6) ELEV      DESIRED LOS ANGLE AT TPI
R11402  COMMUNICATION TO THRUSTING PROGRAMS

R11403         (1) TIG       TIME OF THE CDH MANEUVER
R11404         (2) RTIG      POSITION OF ACTIVE VEHICLE AT CDH - BEFORE ROTATION
R11405                       INTO PLANE OF PASSIVE VEHICLE
R11406         (3) VTIG      VELOCITY OF ACTIVE VEHICLE AT CDH - BEFORE ROTATION
R11407                       INTO PLANE OF PASSIVE VEHICLE
R11408         (4) DELVSIN   DELTA VELOCITY AT CDH - REFERENCE COORDINATES
R11409         (5) DELVSAB   MAGNITUDE OF DELTA VELOCITY AT CDH
R1141          (6) XDELVFLG SET TO INDICATE EXTERNAL DELTA V VG COMPUTATION

R1150   SUBROUTINES USED

R1151          AVFLAGA
R1152          AVFLAGP
R11525         P20FLGON
R1153          VNPOOH
R1154          SELECTMU
R1155          ADVANCE
R1156          CDHMVR
R1157          INTINT3P
R1158          ACTIVE
R1159          PASSIVE
R1160          S33/34.1
R1161          ALARM
R1162          BANKCALL
R1163          GOFLASH
R1164          GOTOPOOH
R1166          S32/33.1
```

```
 1499  REF   1                                               COUNT* $$/P3373
 1500  REF   2  LAST  627    35,2223  0 2354 1  P33        TC     AVFLAGA
 1502  REF   1               35,2224  0 2226 0             TC     P33/P73A
 1503  REF   2  LAST  627    35,2225  0 2361 1  P73        TC     AVFLAGP
 1505  REF   2  LAST  627    35,2226  0 2366 0  P33/P73A   TC     P20FLGON
 15051 REF   1               35,2227  3 2416 0             CAF    V06N13              TCDH
 1506  REF   7  LAST  629    35,2230  0 3622 1             TC     VNPOOH
 1507  REF  70  LAST  629    35,2231  0 6060 1             TC     INTPRET
 1508                        35,2232    77745 1            DLOAD
 15081 REF   2  LAST  629    35,2233    03640 0                   TTPIO
 15082 REF   6  LAST  629    35,2234    17636 1            STODL  TTPI
 1509  REF   4  LAST  317    35,2235    01775 0                   TCDH
 1510  REF  12  LAST  628    35,2236    37442 1            STCALL TIG
 1511  REF   2  LAST  628    35,2237    20000 0                   SELECTMU
 1512                        35,2240    77624 1 P33/P73B   CALL
 1513  REF   2  LAST  628    35,2241    71016 0                   ADVANCE
 1514                        35,2242    77624 1            CALL
 1515  REF   1               35,2243    71133 0                   CDHMVR
 1516                        35,2244    77201 1            SETPD  VLOAD
 1517                        35,2245    00001 0                   0D
 1518  REF   3  LAST  628    35,2246    03544 1                   VACT3
 1519                        35,2247    45115 0            PDVL   CALL
 1520  REF   3  LAST  629    35,2250    02302 1                   RACT2
 1521  REF   1               35,2251    71071 1                   INTINT3P
 1522                        35,2252    77624 1            CALL
 1523  REF   1               35,2253    46423 0                   ACTIVE
 1524                        35,2254    77201 1            SETPD  VLOAD
 1525                        35,2255    00001 0                   0D
 1526  REF   2  LAST  147    35,2256    03530 1                   VPASS2
 1527                        35,2257    45115 0            PDVL   CALL
 1528  REF   2  LAST  147    35,2260    03522 1                   RPASS2
 1529  REF   2  LAST  633    35,2261    71071 1                   INTINT3P
 1530                        35,2262    77624 1            CALL
 1531  REF   2  LAST  628    35,2263    46433 1                   PASSIVE
 1532                        35,2264    43145 0            DLOAD  SET
 1533  REF   3  LAST  627    35,2265    32425 0                   P30ZERO
 1534  REF   1               35,2266    03460 0                   ITSWICH
 1535  REF   1               35,2267    36310 0            STCALL NOMTPI
 1536  REF   1               35,2270    72702 1                   S33/34.1
 1537                        35,2271    77454 1            BZE    EXIT
 1538  REF   1               35,2272    72307 0                   P33/P73C
 1539  REF  25  LAST  613    35,2273  0 5571 1             TC     ALARM
 1540                        35,2274    00611 1            OCT    611
 1541  REF   2  LAST  627    35,2275  3 4777 1             CAF    V05N09
 1542  REF 165  LAST  628    35,2276  0 4607 1             TC     BANKCALL
 1543  REF  10  LAST  628    35,2277    20471 1            CADR   GOFLASH
 1544  REF   8  LAST  628    35,2300  0 6001 0             TC     GOTOPOOH
 1545                        35,2301  0 2303 0             TC     +2
 1546    REF   2  LAST   633    35,2302  0 2226 0                TC      P33/P73A
 1547    REF  71  LAST   633    35,2303  0 6060 1                TC      INTPRET
 1548                           35,2304   77745 1                DLOAD
 1549    REF   4  LAST   633    35,2305   32425 0                        P30ZERO
 1550    REF   2  LAST   633    35,2306   02310 1                STORE   NOMTPI
 1551                           35,2307   43014 0  P33/P73C BON     SET
 1552    REF   3  LAST   629    35,2310   01311 0                        FINALFLG
 1553    REF   1                35,2311   72313 0                        P33/P73D
 1554    REF   7  LAST   629    35,2312   00470 1                        UPDATFLG
 1557                           35,2313   43345 1  P33/P73D DLOAD   DAD
 1558    REF   3  LAST   634    35,2314   02310 1                        NOMTPI
 1559    REF   7  LAST   633    35,2315   03636 1                        TTPI
 1560    REF   8  LAST   634    35,2316   03636 1                STORE   TTPI
 1561                           35,2317   77625 0                DSU
 1562    REF   5  LAST   633    35,2320   01775 0                        TCDH
 1563                           35,2321   51025 1  P33/P73E DSU     BPL
 1564    REF   3  LAST   629    35,2322   32427 1                        60MIN
 1565    REF   1                35,2323   72321 1                        P33/P73E
 1566                           35,2324   77615 0                DAD
 1567    REF   4  LAST   634    35,2325   32427 1                        60MIN
 1568    REF   5  LAST   629    35,2326   16244 1                STODL   T1TOT2
 1569    REF   9  LAST   634    35,2327   03636 1                        TTPI
 1570                           35,2330   41425 1                DSU     PUSH
 1571    REF   3  LAST   633    35,2331   03640 0                        TTPI0
 1572                           35,2332   45246 0  P33/P73F ABS     DSU
 1573    REF   5  LAST   634    35,2333   32427 1                        60MIN
 1574                           35,2334   43244 1                BPL     DAD
 1575    REF   1                35,2335   72332 0                        P33/P73F
 15751   REF   6  LAST   634    35,2336   32427 1                        60MIN
 15753                          35,2337   45565 0                SIGN    STADR
 15755   REF   4  LAST   629    35,2340   75531 1                STORE   T2TOT3
 1576                           35,2341   77776 1                EXIT
 1577    REF   2  LAST   629    35,2342  3 2417 1                CAF     V06N75
 1578    REF   8  LAST   633    35,2343  0 3622 1                TC      VNPOOH
 1579    REF  72  LAST   634    35,2344  0 6060 1                TC      INTPRET
 1580                           35,2345   45175 0                VLOAD   CALL
 1581    REF   4  LAST   629    35,2346   02266 1                        DELVEET2
 1584    REF   2  LAST   629    35,2347   71100 0                        S32/33.1
 1585    REF   5  LAST   634    35,2350   36266 0                STCALL  DELVEET2
 1589    REF   3  LAST   629    35,2351   73516 1                        VN1645
 1590                           35,2352   77650 1                GOTO
 1591    REF   1                35,2353   72240 1                        P33/P73B
```

```
P3800    ..... AVFLAGA/P .....

R3850    SUBROUTINES USED

R3851              UPFLAG
R3852              DOWNFLAG

 3900                          35,2354  0 0006 1  AVFLAGA  EXTEND                  AVFLAG = LEM
 3901    REF   2  LAST   627   35,2355  23'470 0           QXCH    SUBEXIT
 3902    REF  39  LAST   620   35,2356  0 5506 1           TC      UPFLAG
 3903    REF   1               35,2357   00050 1           ADRES   AVFLAG
 3904    REF   3  LAST   635   35,2360  0 1470 0           TC      SUBEXIT
 3905                          35,2361  0 0006 1  AVFLAGP  EXTEND                  AVFLAG = CSM
 3906    REF   4  LAST   635   35,2362  23'470 0           QXCH    SUBEXIT
 3907    REF  57  LAST   620   35,2363  0 5520 0           TC      DOWNFLAG
 3908    REF   2  LAST   635   35,2364   00050 1           ADRES   AVFLAG
 3909    REF   5  LAST   635   35,2365  0 1470 0           TC      SUBEXIT
 39091                         35,2366  0 0006 1  P20FLGON EXTEND
 39092   REF   6  LAST   635   35,2367  23'470 0           QXCH    SUBEXIT
 39093   REF  40  LAST   635   35,2370  0 5506 1           TC      UPFLAG
 3910    REF   8  LAST   634   35,2371   00027 1           ADRES   UPDATFLG        SET UPDATFLG
 39101   REF  41  LAST   635   35,2372  0 5506 1           TC      UPFLAG
 39102   REF   4  LAST   620   35,2373   00031 0           ADRES   TRACKFLG        SET TRACKFLG
 3911    REF   7  LAST   635   35,2374  0 1470 0           TC      SUBEXIT
```

```
P4600    ..... DISDVLVC  .....

R4650    SUBROUTINES USED

R4651          S32/33.X
R4652           VNPOOH

 4700    REF  12  LAST  329    35,2375    03434 1  DISDVLVC STORE  DELVLVC
 4701                          35,2376    45020 1           STQ    CALL
 4702    REF   2  LAST  146    35,2377    03463 0                  NORMEX
 47021   REF   1               35,2400    71120 1                  S32/33.X
 47022                         35,2401    64375 1           VLOAD  MXV
 47023   REF  13  LAST  636    35,2402    03434 1                  DELVLVC
 47024                         35,2403    00001 0                  0D
 470241                        35,2404    66172 0           VSL1   SXA,1
 470243  REF   1               35,2405    03615 0                  VERBNOUN
 47025   REF  14  LAST  636    35,2406    03434 1           STORE  DELVLVC
 47026                         35,2407    77776 1           EXIT
 4703    REF   2  LAST  636    35,2410  3 1615 1            CA     VERBNOUN
 4704    REF   9  LAST  634    35,2411  0 3622 1            TC     VNPOOH
 4705    REF  73  LAST  634    35,2412  0 6060 1            TC     INTPRET
 4706                          35,2413    77650 1           GOTO
 4707    REF   3  LAST  636    35,2414    03463 0                  NORMEX
```

```
P4800    ..... CONSTANTS .....

 4901                             35,2415    01413 0  VO6N11    VN       0611
 4902                             35,2416    01415 0  VO6N13    VN       0613
 4903                             35,2417    01513 1  VO6N75    VN       0675
 4914                             35,2420    77776 1  SN359+    2DEC     -.000086601
 4914                             35,2421    62460 1
 4915                             35,2422    17777 0  CS359+    2DEC     +.499999992
 4915                             35,2423    37776 0
 4916                             35,2424    00000 1  P30ZERO   2DEC     0
 4916                             35,2425    00000 1
 4917                             35,2426    00025 0  60MIN     2DEC     360000
 4917                             35,2427    37100 1
 4919                             35,2430    00600 1  ALARM/TB  OCT      00600            NO 1
 4920                             35,2431    00601 0            OCT      00601               2
 4921                             35,2432    00602 0            OCT      00602               3
 4922                             35,2433    00603 1            OCT      00603               4
 4923                             35,2434    00604 0            OCT      00604               5
 4924                             35,2435    00605 1            OCT      00605               6
 4925                             35,2436    00606 1            OCT      00606               7
```

```
P5000    ..... CSI/A      .....

R5150    SUBROUTINES USED

R5152           VECSHIFT
R5153           TIMETHET
R5154           PERIAPO
R5155           SHIFTR1
R5156           INTINT2C
R5157           CDHMVR
R5158           PERIAPO1
R5159           INTINT
R5160           ACTIVE

 5400                           34,2057                          BANK    34
 5401    REF    1               34,2000                          SETLOC CSI/CDH1
 5402                           34,2057                          BANK
 5403    REF    8  LAST  635    E7,1470                          EBANK= SUBEXIT
 5404    REF    1                                                COUNT* $$/CSI
 5413                           34,2057  00000 1  LOOPMX    2DEC    16
 5413                           34,2060  00020 0
 5414                           34,2061  00003 1  INITST    2DEC    .03048 B-7            INITIAL DELDV = 10 FPS
 5414                           34,2062  34661 1
 5415                           34,2063  00606 1  DVMAX1    2DEC    3.0480 B-7            MAXIMUM DV1 = 1000 FPS
 5415                           34,2064  04467 0
 5416                           34,2065  00601 0  DVMAX2    2DEC    3.014472 B-7                         989 FPS
 5416                           34,2066  33216 1
 5417                           34,2067  10000 0  1DPB2     2DEC    1.0B-2
 5417                           34,2070  00000 1
 5418                           34,2071  00000 1  1DPB28    2DEC    1
 5418                           34,2072  00001 0
 5419                           34,2073  00004 0  PMINE     2DEC    157420 B-29      85 NM    - MUST BE 8 WORDS BEFORE PMINM
 5419                           34,2074  31566 0
 5420                           34,2075  00000 1  EPSILN1   2DEC    .0003048 B-7           .1 FPS
 5420                           34,2076  01177 1
 5421                           34,2077  00002 0  NICKELDP  2DEC    .021336 B-7      7 FPS (CHANGED FROM .05 FPS)
 5421                           34,2100  27311 1
 5422                           34,2101  77754 1  F1FPSDP   2DEC    -.152400 B-7           50  FPS
 5422                           34,2102  57611 0
 5423                           34,2103  00000 1  PMINM     2DEC    10668 B-29       35000 FT - MUST BE 8 WORDS AFTER PMINE
 5423                           34,2104  12326 0
 5424                           34,2105  00116 1  DELMAX1   2DEC    .6096000 B-7           200 FPS
 5424                           34,2106  00730 0
 5425                           34,2107  00000 1  ONETHTH   2DEC    .0001 B-3
 5425                           34,2110  06433 0
 5426                           34,2111  00003 1  TMIN      2DEC    60000            10 MIN
 5426                           34,2112  25140 0
 5500                           34,2113  43014 0  CSI/A     CLEAR   SET              INITIALIZE INDICATORS
 5501    REF    1               34,2114  03260 0                    S32.1F1          DVT1 HAS EXCEEDED MAX INDICATOR
 5502    REF    1               34,2115  03061 0                    S32.1F2          FIRST PASS FOR NEWTON ITERATION INDICATR
```

```
5503                       34,2116   43014 0            CLEAR   SET
5504   REF  1              34,2117   03262 1                    S32.1F3A      00=1ST 2 PASSES 2ND CYCLE 01=FIRST CYCLE
5505   REF  1              34,2120   03063 1                    S32.1F3B      10=2ND CYCLE 11=50FPS STAGE 2ND CYCLE
5506                       34,2121   77745 1            DLOAD
5507   REF  5  LAST  634   34,2122   32425 0                    P30ZERO
5508   REF  1              34,2123   03606 1            STORE   LOOPCT
5509   REF  4  LAST  627   34,2124   03614 1            STORE   CSIALRM
5510                       34,2125   77201 1  CSI/B     SETPD   VLOAD
5511                       34,2126   00001 0                    0D
5512   REF  3  LAST  629   34,2127   02274 1                    RACT1
5513                       34,2130   41446 1            ABVAL   PUSH          RA1                                B29 PL02D
5514                       34,2131   70501 1            NORM    SR1
5515   REF  2  LAST  502   34,2132   00050 1                    X2                                        B29-N2+ B1 PL04D
5516                       34,2133   51515 1            PDVL    ABVAL
5517   REF  1              34,2134   03552 0                    RPASS3
5518                       34,2135   55301 0            NORM    BDDV          RA1/RP3                             B1 PL02D
5519   REF  5  LAST  606   34,2136   00047 1                    X1
5520                       34,2137   53664 0            XSU,2   SR*                                               B2
5521   REF  6  LAST  639   34,2140   00046 0                    X1
5522                       34,2141   57175 0                    1,2
5523                       34,2142   41215 1            DAD     DMP           (1+(RA1/RP3))RA1            B29+B2=B31 PL00D
5524   REF  1              34,2143   30070 0                    1DPB2
5525                       34,2144   65301 0            NORM    PDDL                                                 PL02D
5526   REF  7  LAST  639   34,2145   00047 1                    X1
5527   REF  1              34,2146   02312 0                    RTMU
5528                       34,2147   56342 1            SR1     DDV                                      B38-B31= B7 PL00D
5529                       34,2150   75457 0            SL*     SQRT                                              B7
5530                       34,2151   20172 1                    0 -7,1
5531                       34,2152   53515 0            PDVL    UNIT                                                 PL02D
5532   REF  4  LAST  639   34,2153   02274 1                    RACT1
5533                       34,2154   47315 0            PDVL    VXV
5534   REF  3  LAST  123   34,2155   02252 0                    UP1
5535                       34,2156   77656 1            UNIT                  UNIT(URP1 X UVP1 X URA1) = UH1
5536                       34,2157   72441 0            DOT     SL1           VA1 . UH1                           B7
5537   REF  2  LAST  150   34,2160   03472 0                    VACT1
5538                       34,2161   45421 1            BDSU    STADR                                                PL00D
5539   REF  3  LAST  147   34,2162   60203 0            STODL   DELVCSI
5540   REF  1              34,2163   30062 0                    INITST        10 FPS
5541   REF  2  LAST  147   34,2164   03612 1            STORE   DELDV
5542                       34,2165   43345 1  CSI/B1    DLOAD   DAD           IF LOOPCT = 16
5543   REF  2  LAST  639   34,2166   03606 1                    LOOPCT
5544   REF  1              34,2167   30072 1                    1DPB28
5545   REF  3  LAST  639   34,2170   03606 1            STORE   LOOPCT
5546                       34,2171   77025 0            DSU     AXT,2
5547   REF  1              34,2172   30060 1                    LOOPMX
5548                       34,2173   00006 1                    6
5549                       34,2174   77644 1            BPL
5550   REF  1              34,2175   70776 0                    SCNDSOL
5551                       34,2176   77601 0  CSI/B2    SETPD
5552                       34,2177   00001 0                    0D
```

```
 5553                          34,2200   51545 1              DLOAD   ABS
 5554    REF    4  LAST  639   34,2201   03574 1                      DELVCSI
 5555                          34,2202   50025 0              DSU     BMN
 5556    REF    1              34,2203   30064 0                      DVMAX1
 5557    REF    1              34,2204   70224 1                      CSI/B23
 5558                          34,2205   43174 1              AXT,2   BON
 5559                          34,2206   00007 0                      7
 5560    REF    2  LAST  638   34,2207   03300 1                      S32.1F1
 5561    REF    2  LAST  639   34,2210   70776 0                      SCNDSOL
 5562                          34,2211   43014 0              BOFF    BON
 5563    REF    2  LAST  639   34,2212   03342 1                      S32.1F3A
 5564    REF    1              34,2213   70216 0                      CSI/B22          FLAG 3 NEQ 3
 5565    REF    2  LAST  639   34,2214   03303 1                      S32.1F3B
 5566    REF    3  LAST  640   34,2215   70776 0                      SCNDSOL
 5567                          34,2216   71214 0   CSI/B22    SET     DLOAD
 5568    REF    3  LAST  640   34,2217   03060 1                      S32.1F1
 5569    REF    1              34,2220   30066 1                      DVMAX2
 5570                          34,2221   77765 0              SIGN
 5571    REF    5  LAST  640   34,2222   03574 1                      DELVCSI
 5572    REF    6  LAST  640   34,2223   03574 1              STORE   DELVCSI
 5573                          34,2224   41575 0   CSI/B23    VLOAD   PUSH
 5574    REF    5  LAST  639   34,2225   02274 1                      RACT1
 5575                          34,2226   63256 0              UNIT    PDVL
 5576    REF    4  LAST  639   34,2227   02252 0                      UP1
 5577                          34,2230   53435 0              VXV     UNIT             UNIT(URP1 X UVP1 X URA1) = UH1
 5578                          34,2231   76561 1              VXSC    VSL1
 5579    REF    7  LAST  640   34,2232   03574 1                      DELVCSI
 5580    REF    5  LAST  629   34,2233   02260 1              STORE   DELVEFT1
 5581                          34,2234   40055 0              VAD     BOV
 5582    REF    3  LAST  639   34,2235   03472 0                      VACT1
 5583    REF    1              34,2236   70237 0                      CSI/B23D
 5584    REF    2  LAST  148   34,2237   37566 0   CSI/B23D STCALL  VACT4
 5585    REF    1              34,2240   46437 0                      VECSHIFT
 5586    REF    4  LAST  628   34,2241   26744 1              STOVL   VVEC
 5587                          34,2242   77614 1              SET
 5588    REF    3  LAST  628   34,2243   03466 0                      RVSW
 5589    REF    3  LAST  628   34,2244   26655 0              STOVL   RVEC
 5590    REF    1              34,2245   32421 1                      SN359+
 5591    REF    3  LAST  509   34,2246   36730 0              STCALL  SNTH             ALSO CSTH
 5592    REF    2  LAST  509   34,2247   24732 1                      TIMETHET
 5593                          34,2250   72142 0              SR1     LXA,1
 5594    REF    3  LAST  623   34,2251   02776 0                      RTX1
 5595    REF    1              34,2252   37604 1              STCALL  HAFPA1
 5596    REF    1              34,2253   46347 0                      PERIAPO
 5597                          34,2254   77624 1              CALL
 5598    REF    3  LAST  623   34,2255   46447 1                      SHIFTR1
 5599    REF    1              34,2256   17602 0              STODL   POSTCSI
 5600    REF    4  LAST  627   34,2257   03621 1                      CENTANG
 560001                        34,2260   52054 1              BZE     GOTO
 560002                        34,2261   70263 1                      +2
 560003 REF    1                34,2262   70372 0                   CIRCL
 560004                         34,2263   77745 1            DLOAD
 560005 REF    2  LAST  130     34,2264   02752 0                   ECC
 5601                           34,2265   50025 0            DSU    BMN
 5602   REF    1                34,2266   30110 1                   ONETHTH
 5603   REF    2  LAST  641     34,2267   70372 0                   CIRCL
 5604                           34,2270   45145 0            DLOAD  CALL
 5605   REF    1                34,2271   00041 1                   R1
 5606   REF    4  LAST  640     34,2272   46447 1                   SHIFTR1
 5607                           34,2273   60201 1            SETPD  NORM
 5608                           34,2274   00003 1                   2D
 5609   REF    8  LAST  639     34,2275   00047 1                   X1
 5610                           34,2276   50315 0            PDVL   DOT                                                      PL04D
 5611   REF    6  LAST  640     34,2277   02274 1                   RACT1
 5612   REF    3  LAST  640     34,2300   03566 1                   VACT4
 5613                           34,2301   56246 1            ABS    DDV
 5614                           34,2302   00003 1                   02D               (/RDOTV/)/R1            B36-B29= B7
 5615                           34,2303   45257 0            SL*    DSU
 5616                           34,2304   20201 0                   0,1
 5617   REF    1                34,2305   30100 0                   NICKELDP
 5618                           34,2306   71240 1            BMN    DLOAD
 5619   REF    3  LAST  641     34,2307   70372 0                   CIRCL
 5620   REF    2  LAST  130     34,2310   02740 0                   P
 5621                           34,2311   45312 0            SL2    DSU
 5622   REF    2  LAST  639     34,2312   30070 0                   1DPB2
 5623                           34,2313   14017 1            STODL  14D
 5624   REF    3  LAST  121     34,2314   02310 1                   RTSR1/MU
 5625                           34,2315   56342 1            SR1    DDV               (1/ROOTMU)/R1       B-16-B29 = B-45 PL02D
 5626                           34,2316   41325 0            PDDL   DMP
 5627   REF    3  LAST  641     34,2317   02740 0                   P
 5628   REF    2  LAST  641     34,2320   00041 1                   R1
 5629                           34,2321   77624 1            CALL
 5630   REF    5  LAST  641     34,2322   46447 1                   SHIFTR1
 5631                           34,2323   72412 0            SL4    SL1
 5632                           34,2324   41366 1            SQRT   DMP               ((P/MU)**.5)/R1     B14+B-45 = B-31 PL02D
 5633                           34,2325   52414 1            BOFF   SL3
 5634   REF    2  LAST   38     34,2326   04343 1                   CMOONFLG
 5635   REF    1                34,2327   70330 0                   CSI/B3
 5636                           34,2330   50315 0  CSI/B3    PDVL   DOT
 5637   REF    7  LAST  641     34,2331   02274 1                   RACT1
 5638   REF    4  LAST  641     34,2332   03566 1                   VACT4
 5639   REF    2  LAST  148     34,2333   03617 1            STORE  RDOTV
 5640                           34,2334   77646 0            ABS
 5641                           34,2335   41301 0            NORM   DMP               ((P/MU)**.5)RDOTV/R1                PL02D
 5642   REF    3  LAST  639     34,2336   00050 1                   X2
 5643                           34,2337   53660 1            XSU,1  SL*                                 B-31+B36-B3= B2
 5644   REF    4  LAST  641     34,2340   00047 1                   X2
 5645                           34,2341   20204 0                   3,1
 5646                           34,2342   14015 0            STODL  12D
 5647   REF    6  LAST  639     34,2343   32425 0                   P30ZERO
 5648                              34,2344   00021 1              STORE   16D
 5649                              34,2345   53575 0              VLOAD   UNIT
 5650                              34,2346   00015 0                      12D
 5651   REF   4  LAST  640         34,2347   26730 1              STOVL   SNTH              ALSO STORES CSTH AND 0
 5652   REF   8  LAST  641         34,2350   02274 1                      RACT1
 5653                              34,2351   75315 1              PDVL    SIGN
 5654   REF   5  LAST  641         34,2352   03566 1                      VACT4
 5655   REF   3  LAST  641         34,2353   03617 1                      RDOTV
 5656                              34,2354   45076 1              VCOMP   CALL
 5657   REF   2  LAST  640         34,2355   46437 0                      VECSHIFT
 5658   REF   5  LAST  640         34,2356   26744 1              STOVL   VVEC
 5659                              34,2357   77614 1              SET
 5660   REF   4  LAST  640         34,2360   03466 0                      RVSW
 5661   REF   4  LAST  640         34,2361   36655 1              STCALL  RVEC
 5662   REF   3  LAST  640         34,2362   24732 1                      TIMETHET
 5663                              34,2363   51125 0              PDDL    BPL
 5664   REF   4  LAST  642         34,2364   03617 1                      RDOTV
 5665   REF   1                    34,2365   70376 1                      NTP/2
 5666                              34,2366   45345 1              DLOAD   DSU
 5667   REF   2  LAST  640         34,2367   03604 0                      HAFPA1
 5668                              34,2370   52006 0              PUSH    GOTO
 5669   REF   2  LAST  642         34,2371   70376 1                      NTP/2
 5670                              34,2372   71201 1  CIRCL       SETPD   DLOAD
 5671                              34,2373   00001 0                      00D
 5672   REF   7  LAST  641         34,2374   32425 0                      P30ZERO
 5673                              34,2375   77606 1              PUSH
 5674                              34,2376   41345 0  NTP/2       DLOAD   DMP
 5675   REF   4  LAST  627         34,2377   03467 1                      NN
 5676   REF   3  LAST  642         34,2400   03604 0                      HAFPA1
 5677                              34,2401   45261 0              SL      DSU
 5678                              34,2402   20217 1                      14D
 5679                              34,2403   77615 0              DAD
 5680   REF  10  LAST  628         34,2404   03634 0                      TCSI
 5681   REF   6  LAST  634         34,2405   01775 0              STORE   TCDH
 5682                              34,2406   77021 1              BDSU    AXT,2
 5683   REF  10  LAST  634         34,2407   03636 1                      TTPI
 5684                              34,2410   00005 1                      5D
 5685                              34,2411   40240 0              BMN     SETPD
 5686   REF   4  LAST  640         34,2412   70776 0                      SCNDSOL
 5687                              34,2413   00001 0                      0D
 5688                              34,2414   63375 0              VLOAD   PDVL
 5689   REF   6  LAST  642         34,2415   03566 1                      VACT4
 5690   REF   9  LAST  642         34,2416   02274 1                      RACT1
 5691                              34,2417   77624 1              CALL
 5692   REF   1                    34,2420   71062 0                      INTINT2C
 5693   REF   4  LAST  633         34,2421   26302 1              STOVL   RACT2
 5694   REF   7  LAST  623         34,2422   00007 0                      VATT
 5695   REF   1                    34,2423   27514 1              STOVL   VACT2
 5696   REF   4  LAST  628         34,2424   03506 1                      VPASS1
 5697                              34,2425   63201 1              SETPD   PDVL
 5698                              34,2426    00001 0                 0D
 5699   REF   3  LAST  628         34,2427    03500 1                 RPASS1
 5700                              34,2430    77624 1        CALL
 5701   REF   2  LAST  642         34,2431    71062 0                 INTINT2C
 5702   REF   3  LAST  633         34,2432    27522 1        STOVL    RPASS2
 5703   REF   8  LAST  642         34,2433    00007 0                 VATT
 5704   REF   3  LAST  633         34,2434    37530 0        STCALL   VPASS2
 5705   REF   2  LAST  633         34,2435    71133 0                 CDHMVR
 5706                              34,2436    40375 1        VLOAD    SETPD
 5707   REF   5  LAST  642         34,2437    02302 1                 RACT2
 5708                              34,2440    00001 0                 0D
 5709                              34,2441    45115 0        PDVL     CALL
 5710   REF   4  LAST  633         34,2442    03544 1                 VACT3
 5711   REF   2  LAST  623         34,2443    46337 1                 PERIAPO1
 5712                              34,2444    77624 1        CALL
 5713   REF   6  LAST  641         34,2445    46447 1                 SHIFTR1
 5714   REF   2  LAST  147         34,2446    27604 0        STOVL    POSTCDH
 5715   REF   5  LAST  643         34,2447    03544 1                 VACT3
 5716                              34,2450    63201 1        SETPD    PDVL
 5717                              34,2451    00001 0                 0D
 5718   REF   6  LAST  643         34,2452    02302 1                 RACT2
 5719                              34,2453    65325 0        PDDL     PDDL
 5720   REF   7  LAST  642         34,2454    01775 0                 TCDH
 5721   REF  11  LAST  642         34,2455    03636 1                 TTPI
 5722                              34,2456    41525 0        PDDL     PUSH
 5723   REF   2  LAST  628         34,2457    33642 1                 TWOPI
 5724                              34,2460    77624 1        CALL
 5725   REF   2  LAST  628         34,2461    73404 0                 INTINT
 5726                              34,2462    77624 1        CALL
 5727   REF   2  LAST  633         34,2463    46423 0                 ACTIVE
 5728                              34,2464    77745 1        DLOAD
 5738   REF   4  LAST  327         34,2465    02250 1                 ELEV
 5739                              34,2466    73401 0        SETPD    SINE
 5740                              34,2467    00007 0                 6D
 5741                              34,2470    53515 0        PDVL     UNIT
 5742   REF   2  LAST  628         34,2471    03536 1                 RACT3
 5743                              34,2472    00001 0        STORE    00D             URA3 AT 00D
 5744                              34,2473    47315 0        PDVL     VXV             PL14D,PL08D
 5745   REF   5  LAST  640         34,2474    02252 0                 UP1
 5746                              34,2475    77656 1        UNIT
 5747                              34,2476    71525 0        PDDL     COSINE          UNIT(URA3XUVA3XURA3) = UH3        B1 PL14D
 5748   REF   5  LAST  643         34,2477    02250 1                 ELEV
 5749                              34,2500    45561 1        VXSC     STADR           (COSLOS)(UH3)                     82 PL08D
 5750                              34,2501    77754 1        STORE    18D                 PLUS
 5751                              34,2502    74345 0        DLOAD    VXSC            (SINLOS)(URA3) = U                B2 PL00D
 5752                              34,2503    76455 1        VAD      VSL1
 5753                              34,2504    00023 0                 18D                                               81
 5754                              34,2505    50206 0        PUSH     DOT                                                  PL06D
 5755   REF   3  LAST  643         34,2506    03536 1                 RACT3           (U . RA3) = TEMP1        B1 +829=B30
 5756                              34,2507    41552 0        SL1      PUSH                                             B29 PL08D
```

```
5757                         34,2510  72316 0          DSQ    TLOAD     TEMP1**2                            B58
5758  REF 264  LAST  627     34,2511  00155 0                 MPAC
5759                         34,2512  50315 0          PDVL   DOT                                               PL11D
5760  REF   4  LAST  643     34,2513  03536 1                 RACT3
5761  REF   5  LAST  644     34,2514  03536 1                 RACT3
5762                         34,2515  57551 1          TLOAD  DCOMP     RA3.RA3
5763  REF 265  LAST  644     34,2516  00155 0                 MPAC
5764                         34,2517  50315 0          PDVL   DOT       RP3.RP3                             B58 PL14D
5765  REF   2  LAST  639     34,2520  03552 0                 RPASS3
5766  REF   3  LAST  644     34,2521  03552 0                 RPASS3                                            PL11D
5767                         34,2522  76371 0          TAD    TAD       TEMP1**2+RA3.RA3+RP3.RP3=TEMP2          PL08D
5768                         34,2523  71244 0          BPL    DLOAD
5769  REF   1                34,2524  70542 0                 K1ORK2
5770  REF   4  LAST  639     34,2525  03606 1                 LOOPCT
5771                         34,2526  77025 0          DSU    AXT,2
5772  REF   2  LAST  639     34,2527  30072 1                 1DPB28
5773                         34,2530  00001 0                 1D
5774                         34,2531  77654 0          BZE
5775  REF   1                34,2532  72043 0                 ALMXITA
5776                         34,2533  70545 1          DLOAD  SR1
5777  REF   3  LAST  639     34,2534  03612 1                 DELDV
5778  REF   4  LAST  644     34,2535  03612 1          STORE  DELDV
5779                         34,2536  77621 1          BDSU
5780  REF   1                34,2537  03576 0                 DVPREV
5781  REF   8  LAST  640     34,2540  37574 0          STCALL DELVCSI
5782  REF   1                34,2541  70165 1                 CSI/B1
5783                         34,2542  41566 1  K1ORK2  SQRT   PUSH      TEMP3 = TEMP2**.5                   B29 PL10D
5784                         34,2543  45276 0          DCOMP  DSU
5785                         34,2544  00007 0                 06D       -TEMP1-TEMP3 =K2 AT 10D
5786                         34,2545  14013 0          STODL  10D                                               PL08D
5787                         34,2546  45425 0          DSU    STADR                                             PL06D
5788                         34,2547  77762 1          STORE  12D       -TEMP1+TEMP3 =K1 AT 12D
5789                         34,2550  77646 0          ABS
5790                         34,2551  14017 1          STODL  14D
5791                         34,2552  00013 0                 10D
5792                         34,2553  45246 0          ABS    DSU
5793                         34,2554  00017 1                 14D
5794                         34,2555  71240 1          BMN    DLOAD
5795  REF   1                34,2556  70561 1                 K2.
5796                         34,2557  00015 0                 12D
5797                         34,2560  00013 0          STORE  10D       K=K1
5798                         34,2561  77745 1  K2.     DLOAD
5799                         34,2562  00013 0                 10D
5800                         34,2563  76561 1          VXSC   VSL1
5801                         34,2564  53455 0          VAD    UNIT      V=RA3+KU  UNIT                      B1
5802  REF   6  LAST  644     34,2565  03536 1                 RACT3
5803                         34,2566  53515 0          PDVL   UNIT                                              PL06D
5804  REF   4  LAST  644     34,2567  03552 0                 RPASS3
5805                         34,2570  53515 0          PDVL   UNIT                                              PL12D
5806  REF   1                34,2571  03560 1                 VPASS3
```

```
5807                              34,2572   63235 0             VXV     PDVL            UVP3 X URP3                      PL18D
5808                              34,2573   00007 0                     06D
5809                              34,2574   00007 0                     06D
5810                              34,2575   50235 0             VXV     DOT
5811                              34,2576   00001 0                     00D
5812                              34,2577   77626 0             STADR                                                    PL12D
5813                              34,2600   53762 1             STOVL   12D             (URP3XV).(UVP3XURP3)=TEMP        PL06D
5814                              34,2601   72441 0             DOT     SL1                                              PL00D
5815                              34,2602   75326 1             ARCCOS  SIGN
5816                              34,2603   00015 0                     12D                                         B0
5817                              34,2604   41542 1             SR1     PUSH            GAMMA=SIGN(TEMP)ARCOS(UNITV.URP3)  PL02D
5818                              34,2605   71214 0             BON     DLOAD
5819    REF  2  LAST  638         34,2606   03301 0                     S32.1F2
5820    REF  1                    34,2607   70644 0                     FRSTPAS
5821                              34,2610   00001 0                     00D             NOT THE FIRST PASS OF A CYCLE
5822                              34,2611   65225 1             DSU     PDDL            GAMMA-GAMPREV                   B1 PL04D
5823    REF  2  LAST  148         34,2612   03610 0                     GAMPREV
5824    REF  9  LAST  644         34,2613   03574 1                     DELVCSI
5825                              34,2614   60225 1             DSU     NORM                                            B7
5826    REF  2  LAST  644         34,2615   03576 0                     DVPREV
5827    REF  9  LAST  641         34,2616   00047 1                     X1
5828                              34,2617   65265 0             BDDV    PDDL            (GAM-GAMPREV)/(DV-DVPREV)   B-6+N1 PL06D
5829                              34,2620   00003 1                     02D                   = SLOPE
5830    REF 10  LAST  645         34,2621   03574 1                     DELVCSI
5831    REF  3  LAST  645         34,2622   03576 0             STORE   DVPREV
5832                              34,2623   43014 0             BOFF    BOFF
5833    REF  3  LAST  640         34,2624   03342 1                     S32.1F3A
5834    REF  1                    34,2625   70656 0                     THRDCHK
5835    REF  3  LAST  640         34,2626   03343 0                     S32.1F3B
5836    REF  2  LAST  645         34,2627   70656 0                     THRDCHK
5837                              34,2630   41345 0             DLOAD   DMP
5838                              34,2631   00003 1                     02D
5839    REF  3  LAST  645         34,2632   03610 0                     GAMPREV
5840                              34,2633   71244 0             BPL     DLOAD
5841    REF  1                    34,2634   70663 0                     FIFTYFPS
5842    REF  2  LAST  639         34,2635   30062 0                     INITST
5843                              34,2636   77765 0             SIGN
5844    REF  5  LAST  644         34,2637   03612 1                     DELDV
5845    REF  6  LAST  645         34,2640   03612 1             STORE   DELDV
5846                              34,2641   43014 0             SET     CLEAR
5847    REF  4  LAST  645         34,2642   03062 0                     S32.1F3A
5848    REF  4  LAST  645         34,2643   03263 0                     S32.1F3B
5849                              34,2644   77745 1   FRSTPAS   DLOAD
5850                              34,2645   00001 0                     00D
5851    REF  4  LAST  645         34,2646   17610 0             STODL   GAMPREV
5852    REF 11  LAST  645         34,2647   03574 1                     DELVCSI
5853    REF  4  LAST  645         34,2650   03576 0             STORE   DVPREV
5854                              34,2651   43025 1             DSU     CLEAR
5855    REF  7  LAST  645         34,2652   03612 1                     DELDV
5856    REF  3  LAST  645         34,2653   03261 1                     S32.1F2
```

```
 5857   REF   12  LAST   645    34,2654    37574 0                STCALL DELVCSI
 5858   REF    2  LAST   644    34,2655    70165 1                       CSI/B1
 5859                           34,2656    43014 0  THRDCHK  BON    BON
 5860   REF    5  LAST   645    34,2657    03302 0                       S32.1F3A
 5861   REF    1                34,2660    70702 0                       NEWTN
 5862   REF    5  LAST   645    34,2661    03303 1                       S32.1F3B
 5863   REF    2  LAST   646    34,2662    70702 0                       NEWTN
 5864                           34,2663    75345 1  FIFTYFPS DLOAD  SIGN
 5865   REF    1                34,2664    30102 1                       FIFPSDP
 5866                           34,2665    00005 1                       04D
 5867                           34,2666    77765 0           SIGN
 5868   REF    5  LAST   645    34,2667    03610 0                       GAMPREV
 5869   REF    8  LAST   645    34,2670    03612 1           STORE  DELDV
 5870                           34,2671    43276 0           DCOMP  DAD
 5871   REF   13  LAST   646    34,2672    03574 1                       DELVCSI
 5872   REF   14  LAST   646    34,2673    17574 1           STODL  DELVCSI
 5873                           34,2674    00001 0                       00D
 5874                           34,2675    43014 0           SET    SET
 5875   REF    6  LAST   646    34,2676    03063 1                       S32.1F3B
 5876   REF    6  LAST   646    34,2677    03062 0                       S32.1F3A
 5877   REF    6  LAST   646    34,2700    37610 1           STCALL GAMPREV
 5878   REF    1                34,2701    70176 0                       CSI/B2
 5879                           34,2702    60345 0  NEWTN    DLOAD  NORM
 5880                           34,2703    00005 1                       04D
 5881   REF    5  LAST   641    34,2704    00050 1                       X2
 5882                           34,2705    54065 0           BDDV   XSU,1
 5883                           34,2706    00001 0                       00D
 5884   REF    6  LAST   646    34,2707    00047 1                       X2
 5885                           34,2710    77657 0           SR*
 5886                           34,2711    20601 1                       0,1
 5887   REF    9  LAST   646    34,2712    17612 1           STODL  DELDV
 5888                           34,2713    00001 0                       00D
 5889   REF    7  LAST   646    34,2714    03610 0           STORE  GAMPREV
 5890                           34,2715    51545 1           DLOAD  ABS
 5891   REF   10  LAST   646    34,2716    03612 1                       DELDV
 5892                           34,2717    45206 1           PUSH   DSU                                                   P108D
 5893   REF    1                34,2720    30076 0                       EPSILN1
 5894                           34,2721    71240 1           BMN    DLOAD
 5895   REF    1                34,2722    70737 0                       CSI/SOL
 5896                           34,2723    50025 0           DSU    BMN
 5897   REF    1                34,2724    30106 0                       DELMAX1
 5898   REF    1                34,2725    70732 0                       CSISTEP
 5899                           34,2726    75345 1           DLOAD  SIGN
 5900   REF    2  LAST   646    34,2727    30106 0                       DELMAX1
 5901   REF   11  LAST   646    34,2730    03612 1                       DELDV
 5902   REF   12  LAST   646    34,2731    03612 1           STORE  DELDV
 5903                           34,2732    45345 1  CSISTEP  DLOAD  DSU
 5904   REF   15  LAST   646    34,2733    03574 1                       DELVCSI
 5905   REF   13  LAST   646    34,2734    03612 1                       DELDV
 5906   REF   16  LAST   646    34,2735    37574 0           STCALL DELVCSI
 5907   REF   3  LAST  646    34,2736   70165 1                       CSI/B1
 5908                         34,2737   77145 1  CSI/SOL   DLOAD    AXT,2
 5909   REF   2  LAST  640    34,2740   03602 0                       POSTCSI
 5910                         34,2741   00002 0                       2
 5911                         34,2742   77750 0            LXA,1
 5912   REF   4  LAST  640    34,2743   02776 0                       RTX1
 5913                         34,2744   50023 0            DSU*     BMN
 5914   REF   1               34,2745   30072 1                       PMINE -2,1
 5915   REF   5  LAST  642    34,2746   70776 0                       SCNDSOL
 5916                         34,2747   71374 1            AXT,2    DLOAD
 5917                         34,2750   00003 1                       3
 5918   REF   3  LAST  643    34,2751   03604 0                       POSTCDH
 5919                         34,2752   50023 0            DSU*     BMN
 5920   REF   2  LAST  647    34,2753   30072 1                       PMINE -2,1
 5921   REF   6  LAST  647    34,2754   70776 0                       SCNDSOL
 5922                         34,2755   45345 1            DLOAD    DSU
 5923   REF   8  LAST  643    34,2756   01775 0                       TCDH
 5924   REF  11  LAST  642    34,2757   03634 0                       TCSI
 5925   REF   6  LAST  634    34,2760   02244 1            STORE    T1TOT2
 5926                         34,2761   45374 0            AXT,2    DSU
 5927                         34,2762   00004 0                       4
 5928   REF   1               34,2763   30112 0                       TMIN
 5929                         34,2764   77040 0            BMN      AXT,2
 5930   REF   7  LAST  647    34,2765   70776 0                       SCNDSOL
 5931                         34,2766   00005 1                       5
 5932                         34,2767   45345 1            DLOAD    DSU
 5933   REF  12  LAST  643    34,2770   03636 1                       TTPI
 5934   REF   9  LAST  647    34,2771   01775 0                       TCDH
 5935   REF   5  LAST  634    34,2772   02246 0            STORE    T2TOT3
 5936                         34,2773   51025 1            DSU      BPL
 5937   REF   2  LAST  647    34,2774   30112 0                       TMIN
 5938   REF   1               34,2775   72157 1                       P32/P72C
 5939                         34,2776   43014 0  SCNDSOL   BON      BOFF
 5940   REF   7  LAST  646    34,2777   03302 0                       S32.1F3A
 5941   REF   1               34,3000   72045 0                       ALMXIT
 5942   REF   7  LAST  646    34,3001   03343 0                       S32.1F3B
 5943   REF   2  LAST  647    34,3002   72045 0                       ALMXIT
 5944                         34,3003   71334 0            SXA,2    DLOAD
 5945   REF   5  LAST  639    34,3004   03613 0                       CSIALRM
 5946   REF   8  LAST  642    34,3005   32425 0                       P30ZERO
 5947                         34,3006   43014 0            CLEAR    SET
 5948   REF   4  LAST  640    34,3007   03260 0                       S32.1F1
 5949   REF   4  LAST  645    34,3010   03061 0                       S32.1F2
 5950                         34,3011   43014 0            CLEAR    CLEAR
 5951   REF   8  LAST  647    34,3012   03262 1                       S32.1F3A
 5952   REF   8  LAST  647    34,3013   03263 0                       S32.1F3B
 5953   REF   5  LAST  644    34,3014   37606 0            STCALL   LOOPCT
 5954   REF   1               34,3015   70125 0                       CSI/B
```

```
L          P32-P35, P72-P75                                                                            USER'S PAGE NO.  25       E7 S3

P6000      ..... ADVANCE    .....

R6050      SUBROUTINES USED

R6051              PRECSET
R6052              ROTATE

 6100                                34,3016    71220 1  ADVANCE   STQ     DLOAD
 6101      REF   9  LAST  638    34,3017    03470 1                    SUBEXIT
 6102      REF  13  LAST  633    34,3020    03442 0                    TIG
 6103      REF  23  LAST  628    34,3021    34041 0            STCALL  TDEC1
 6104      REF   2  LAST  628    34,3022    46401 0                    PRECSET
 6105                                34,3023    77214 0            SET     VLOAD
 61055     REF   2  LAST  620    34,3024    01067 1                    XDELVFLG
 6106      REF   2  LAST  644    34,3025    03560 1                    VPASS3
 6107      REF   4  LAST  643    34,3026    03530 1            STORE   VPASS2
 6108      REF   5  LAST  642    34,3027    27506 1            STOVL   VPASS1
 6109      REF   5  LAST  644    34,3030    03552 0                    RPASS3
 6110      REF   4  LAST  643    34,3031    03522 1            STORE   RPASS2
 6111      REF   4  LAST  643    34,3032    03500 1            STORE   RPASS1
 6112                                34,3033    47256 0            UNIT    VXV
 6113      REF   6  LAST  648    34,3034    03506 1                    VPASS1
 6114                                34,3035    77656 1            UNIT
 6115      REF   6  LAST  643    34,3036    26252 0            STOVL   UP1
 6116      REF   7  LAST  644    34,3037    03536 1                    RACT3
 6117      REF   5  LAST  623    34,3040    37642 0            STCALL  RTIG
 6118      REF   1                   34,3041    71052 0                    ROTATE
 6119      REF   7  LAST  643    34,3042    02302 1            STORE   RACT2
 6120      REF  10  LAST  642    34,3043    26274 1            STOVL   RACT1
 6121      REF   6  LAST  643    34,3044    03544 1                    VACT3
 6122      REF   4  LAST  623    34,3045    37650 0            STCALL  VTIG
 6123      REF   2  LAST  648    34,3046    71052 0                    ROTATE
 6124      REF   2  LAST  642    34,3047    03514 1            STORE   VACT2
 6125      REF   4  LAST  640    34,3050    37472 1            STCALL  VACT1
 6126      REF  10  LAST  648    34,3051    03470 1                    SUBEXIT
```

```
P6200    ..... ROTATE     .....

 6300                              34,3052    41406 0  ROTATE    PUSH     PUSH
 6301                              34,3053    74241 0            DOT      VXSC
 6302    REF   7  LAST   648       34,3054    02252 0                     UP1
 6303    REF   8  LAST   649       34,3055    02252 0                     UP1
 6304                              34,3056    51352 1            VSL2     BVSU
 6305                              34,3057    63256 0            UNIT     PDVL
 6306                              34,3060    74246 1            ABVAL    VXSC
 6307                              34,3061    43572 0            VSL1     RVQ
```

```
P7000    ..... INTINTNA  .....

 7100                              34,3062   65325 0  INTINT2C PDDL     PDDL
 7101   REF   12  LAST   647       34,3063   03634 0                    TCSI
 7102   REF   10  LAST   647       34,3064   01775 0                    TCDH
 7103                              34,3065   41525 0           PDDL     PUSH
 7104   REF    3  LAST   643       34,3066   33642 1                    TWOPI
 7105                              34,3067   77650 1           GOTO
 7106   REF    3  LAST   643       34,3070   73404 0                    INTINT
 7107                              34,3071   65325 0  INTINT3P PDDL     PDDL
 7108   REF   11  LAST   650       34,3072   01775 0                    TCDH
 7109   REF   13  LAST   647       34,3073   03636 1                    TTPI
 7110                              34,3074   41525 0           PDDL     PUSH
 7111   REF    9  LAST   647       34,3075   32425 0                    P30ZERO
 7112                              34,3076   77650 1           GOTO
 7113   REF    4  LAST   650       34,3077   73404 0                    INTINT
```

```
P7400     ..... S32/33.1  .....

R7450     SUBROUTINES USED

R7451           S32/33.X

 7500                               34,3100    76020 1  S32/33.1 STQ     AXT,1
 75001   REF   11   LAST   648      34,3101    03470 1                   SUBEXIT
 75002                              34,3102    01521 0           VN      0681
 75003                              34,3103    77624 1           CALL
 75004   REF    2   LAST   629      34,3104    72375 0                   DISDVLVC
 7501                               34,3105    77624 1           CALL
 7502    REF    2   LAST   636      34,3106    71120 1                   S32/33.X
 7503                               34,3107    61375 1           VLOAD   VXM
 7504    REF   15   LAST   636      34,3110    03434 1                   DELVLVC
 7505                               34,3111    00001 0                   0D
 75051                              34,3112    77772 0           VSL1
 7506    REF    8   LAST   623      34,3113    03656 1           STORE   DELVSIN
 7507                               34,3114    51406 1           PUSH    ABVAL
 7508    REF    3   LAST   623      34,3115    27664 0           STOVL   DELVSAB
 7509                               34,3116    77650 1           GOTO
 7510    REF   12   LAST   651      34,3117    03470 1                   SUBEXIT
```

```
P7800   ..... S32/33.X  .....

 7900                            34,3120   77201 1  S32/33.X SETPD   VLOAD
 7901                            34,3121   00007 0                   6D
 7902   REF    9  LAST   649     34,3122   02252 0                   UP1
 7903                            34,3123   63276 1           VCOMP   PDVL
 7904   REF   11  LAST   648     34,3124   02274 1                   RACT1
 7905                            34,3125   57456 1           UNIT    VCOMP
 7906                            34,3126   47206 0           PUSH    VXV
 7907   REF   10  LAST   652     34,3127   02252 0                   UP1
 7908                            34,3130   77772 0           VSL1
 7909                            34,3131   00001 0           STORE   0D
 7910                            34,3132   77616 0           RVQ
```

```
P8000      ..... CDHMVR     .....

R8050      SUBROUTINES USED

R8051             VECSHIFT
R8052             TIMETHET
R8053             SHIFTR1

 8100                               34,3133   77220 1  CDHMVR    STQ      VLOAD
 8101      REF  13  LAST  651       34,3134   03470 1                     SUBEXIT
 8102      REF   8  LAST  648       34,3135   02302 1                     RACT2
 8103                               34,3136   53406 0            PUSH     UNIT
 8104      REF   1                  34,3137   27544 1            STOVL    UNVEC               UR SUB A
 8105      REF   5  LAST  648       34,3140   03522 1                     RPASS2
 8106                               34,3141   50256 0            UNIT     DOT
 8107      REF   2  LAST  653       34,3142   03544 1                     UNVEC
 8108                               34,3143   72406 0            PUSH     SL1
 8109      REF   3  LAST  509       34,3144   16732 0            STODL    CSTH
 8110                               34,3145   65316 0            DSQ      PDDL
 8111      REF   5  LAST  606       34,3146   06475 1                     DP1/4TH
 8112                               34,3147   45302 1            SR2      DSU
 8113                               34,3150   72566 1            SQRT     SL1
 8114                               34,3151   57515 1            PDVL     VCOMP
 8115                               34,3152   77635 1            VXV
 8116      REF   6  LAST  653       34,3153   03522 1                     RPASS2
 8117                               34,3154   65241 0            DOT      PDDL
 8118      REF  11  LAST  652       34,3155   02252 0                     UP1
 8119                               34,3156   45565 0            SIGN     STADR
 8120      REF   5  LAST  642       34,3157   51047 0            STOVL    SNTH
 8121      REF   7  LAST  653       34,3160   03522 1                     RPASS2
 8122                               34,3161   45115 0            PDVL     CALL
 8123      REF   5  LAST  648       34,3162   03530 1                     VPASS2
 8124      REF   3  LAST  642       34,3163   46437 0                     VECSHIFT
 8125      REF   6  LAST  642       34,3164   26744 1            STOVL    VVEC
 8126                               34,3165   77614 1            CLEAR
 8127      REF   5  LAST  642       34,3166   03666 1                     RVSW
 8128      REF   5  LAST  642       34,3167   36655 1            STCALL   RVEC
 8129      REF   4  LAST  642       34,3170   24732 1                     TIMETHET
 8130                               34,3171   53754 1            LXA,2    VSL*
 8131      REF   2  LAST  623       34,3172   02777 1                     RTX2
 8132                               34,3173   57576 1                     0,2
 8133                               34,3174   00023 0            STORE    18D
 8134                               34,3175   76441 1            DOT      SL1R
 8135      REF   3  LAST  653       34,3176   03544 1                     UNVEC
 8136                               34,3177   51515 1            PDVL     ABVAL           0D = V SUB PV
 8137                               34,3200   63257 1            SL*      PDVL
 8138                               34,3201   57576 1                     0,2
 8139      REF   9  LAST  653       34,3202   02302 1                     RACT2
 8140                               34,3203   65246 1            ABVAL    PDDL            2D = LENGTH OF R SUB A
 8141                               34,3204   77625 0            DSU
 8142                        34,3205   00003 1            02D
 8143  REF   4  LAST  328    34,3206   17600 1    STODL   DIFFALT         DELTA H IN METERS          B+29
 8144  REF   2  LAST  130    34,3207   02742 1            R1A
 8145                        34,3210   65301 0    NORM    PDDL            2 - R V**/MU                         04D
 8146  REF  10  LAST  645    34,3211   00047 1            X1
 8147  REF   3  LAST  641    34,3212   00041 1            R1
 8148                        34,3213   77624 1    CALL
 8149  REF   7  LAST  643    34,3214   46447 1            SHIFTR1
 8150                        34,3215   56362 0    SR1R    DDV
 8151                        34,3216   41457 1    SL*     PUSH
 8152                        34,3217   20174 1            0 -5,1
 8153                        34,3220   65225 1    DSU     PDDL            A SUB A                    B+29      04D
 8154  REF   5  LAST  654    34,3221   03600 1            DIFFALT
 8155                        34,3222   56302 0    SR2     DDV             A SUB P                   B+31
 8156                        34,3223   00005 1            04D                                       B+2
 8157                        34,3224   75406 1    PUSH    SQRT               A SUB P/A SUB A          06D
 8158                        34,3225   41275 1    DMPR    DMP
 8159                        34,3226   00007 0            06D
 8160                        34,3227   00001 0            00D
 8161                        34,3230   65272 0    SL3R    PDDL            V SUB AV METERS/CS         B+7       08D
 8162                        34,3231   00003 1            02D             R SUB A MAGNITUDE   B+29
 8163                        34,3232   65301 0    NORM    PDDL
 8164  REF  11  LAST  654    34,3233   00047 1            X1
 8165  REF   2  LAST  639    34,3234   02312 0            RTMU
 8166                        34,3235   56342 1    SR1     DDV             2MU  B+38
 8167                        34,3236   65257 1    SL*     PDDL               2 MU/R SUBAA     B+14      10D
 8168                        34,3237   20174 1            0 -5,1
 8169                        34,3240   00005 1            04D             ASUBA                     B+29
 8170                        34,3241   65301 0    NORM    PDDL
 8171  REF   7  LAST  646    34,3242   00050 1            X2
 8172  REF   3  LAST  654    34,3243   02312 0            RTMU
 8173                        34,3244   56342 1    SR1     DDV
 8174                        34,3245   44257 1    SL*     BDSU
 8175                        34,3246   57604 1            0 -6,2           2U/R - U/A   B+14 (METERS/CS)SQ
 8176                        34,3247   63525 0    PDDL    DSQ                                                 10D
 8177                        34,3250   00011 1            08D
 8178                        34,3251   75421 1    BDSU    SQRT
 8179                        34,3252   47315 0    PDVL    VXV              SQRT(MU(2/R SUB A-1/A SUB A)-VSUBA2)10D
 8180  REF  12  LAST  653    34,3253   02252 0            UP1
 8181  REF   4  LAST  653    34,3254   03544 1            UNVEC
 8182                        34,3255   74256 0    UNIT    VXSC
 8183                        34,3256   00013 0            10D
 8184                        34,3257   74315 0    PDVL    VXSC
 8185  REF   5  LAST  654    34,3260   03544 1            UNVEC
 8186                        34,3261   00011 1            08D
 8187                        34,3262   76455 1    VAD     VSL1
 8188                        34,3263   77626 0    STADR
 8189  REF   7  LAST  648    34,3264   74233 0    STORE   VACT3
 8190                        34,3265   77651 0    VSU
 8191  REF   3  LAST  648    34,3266   03514 1            VACT2
 8199   REF   6  LAST  634   34,3267   36266 0          STCALL DELVEET2        DELTA VCDH - REFERENCE COORDINATES
 8200   REF  14  LAST  653   34,3270   03470 1                 SUBEXIT
```

```
P8201        ..... COMPTGO   .....

R8202        SUBROUTINES USED

R8203                  CLOKTASK
R8204                  2PHSCHNG

 8205                            35,2437                             BANK    35
 8206        REF   2  LAST  627  35,2000                             SETLOC  CSI/CDH
 8207                            35,2437                             BANK

 8208        REF   1             E7,1465                             EBANK=  RTRN

 8209        REF   1                                                 COUNT*  $$/P3575

 8210                            35,2437  0 0006 1  COMPTGO          EXTEND
 8211        REF   2  LAST  656  35,2440  23'465 1                   QXCH    RTRN
 8212        REF 127  LAST  608  35,2441  3 4746 0                   CAF     ZERO
 8213        REF   2  LAST  155  35,2442  55'162 1                   TS      DISPDEX
 8214        REF  35  LAST  590  35,2443  3 4743 0                   CAF     BIT2
 8215                            35,2444  0 0004 0                   INHINT
 8216        REF  24  LAST  609  35,2445  0 5205 0                   TC      WAITLIST
 8217        REF   2  LAST  253  E7,1455                             EBANK=  WHICH
 8218        REF   2  LAST  254  35,2446   02716 0                   2CADR   CLOKTASK
 8218                            35,2447   74067 0
 8219        REF   3  LAST  518  35,2450  0 5331 0                   TC      2PHSCHNG
 8220                            35,2451   40036 0                   OCT     40036
 8221                            35,2452   05024 1                   OCT     05024
 8222                            35,2453   13000 0                   OCT     13000
 8223        REF   3  LAST  656  35,2454  0 1465 1                   TC      RTRN

*** END OF LEMP30S .105 ***
```

```
L        GROUND TRACKING DETERMINATION PROGRAM - P21                              USER'S PAGE NO.   1       FO S3

P0001    GROUND TRACKING DETERMINATION PROGRAM P21
R0002    PROGRAM DESCRIPTION
R0003    MOD NO - 1
R0004    MOD BY - N.M.NEVILLE
R0005    FUNCTIONAL DECRIPTION-
R0006
R0007    TO PROVIDE THE ASTRONAUT DETAILS OF THE LM OR CSM GROUND TRACK WITHOUT
R0008    THE NEED FOR GROUND COMMUNICATION (REQUESTED BY DSKY).
R0009    CALLING SEQUENCE -
R0010
R0011    ASTRONAUT REQUEST THROUGH DSKY V37E21E
R0012    SUBROUTINES CALLED-
R0013
R0014    GOPERF4
R0015    GOFLASH
R0016    THISPREC
R0017    OTHPREC
R0018    LAT-LONG
R0019    NORMAL EXIT MODES-
R0020
R0021    ASTRONAUT REQUEST TROUGH DSKY TO TERMINATE PROGRAM V34E
R0022    ALARM OR ABORT EXIT MODES-
R0023
R0024    NONE
R0025    OUTPUT -
R0026
R0027    OCTAL DISPLAY OF OPTION CODE AND VEHICLE WHOSE GROUND TRACK IS TO BE
R0028    COMPUTED
R0029              OPTION CODE  00002
R0030              THIS         00001
R0031              OTHER        00002
R0032    DECIMAL DISPLAY OF TIME TO BE INTEGRATED TO HOURS , MINUTES , SECONDS
R0033    DECIMAL DISPLAY OF LAT,LONG,ALT
R0034    ERASABLE INITIALIZATION REQUIRED
R0035
R0036    AXO       2DEC    4.652459653 E-5   RADIANS        %68-69 CONSTANTS"
R0037
R0038    -AYO      2DEC    2.147535898 E-5   RADIANS
R0039
R0040    AZO       2DEC    .7753206164       REVOLUTIONS
R0041    FOR LUNAR ORBITS 504LM VECTOR IS NEEDED
R0042
R0043    504LM     2DEC   -2.700340600 E-5  RADIANS
R0044
R0045    504LM _2  2DEC   -7.514128400 E-4  RADIANS
R0046
R0047    504LM _4  2DEC   _2.553198641 E-4  RADIANS
R0048
R0049    NONE
R0050    DEBRIS
```

```
R0051
R0052   CENTRALS-A,Q,L
R0053   OTHER-THOSE USEO BY THE ABOVE LISTEO SUBROUTINES
R0054   SEE LEMPREC,LAT-LCNG
 0055   REF   8  LAST  507   30,2000                            SBANK= LOWSUPER        FOR LOW 2CADR'S.

 0056                        33,2113                            BANK   33
 0057   REF   6  LAST  592   24,2000                            SETLOC P20S
 0058                        24,3441                            BANK

 0059   REF   6  LAST  251   F7,1762                            EBANK= P21TIME
 0060   REF   1                                                 COUNT* $$/P21
 0061   REF  72  LAST  618   24,3441  3 4744 1  PROG21          CAF    ONE
 0062   REF   3  LAST  508   24,3442  55'144 0                  TS     OPTION2         ASSUMED VEHICLE IS LM , R2 = 00001
 0063   REF  36  LAST  656   24,3443  3 4743 0                  CAF    BIT2             OPTION 2
 0064   REF 166  LAST  633   24,3444  C 4607 1                  TC     BANKCALL
 0065   REF   2  LAST  508   24,3445   20645 1                  CAOR   GOPERF4
 0066   REF   9  LAST  633   24,3446  0 6001 0                  TC     GOTOPOOH        TERMINATE
 0067                        24,3447  0 3451 1                  TC     +2              PROCEED VALUE OF ASSUMED VEHICLE OK
 0068                        24,3450  0 3443 1                  TC     -5              R2 LOADED THROUGH DSKY
 00682  REF 128  LAST  656   24,3451  3 4746 0                  CAF    ZERO            INITIAL TIME = PRESENT TIME
 00684  REF  20  LAST  590   24,3452  55'044 1                  TS     DSPTEM1
 00686  REF  21  LAST  658   24,3453  55'C45 0                  TS     OSPTEM1 +1
 0069   REF   1              24,3454  3 3631 0  P21PROG1 CAF    V6N34           LOAD DESIRED TIME OF LAT-LONG.
 0070   REF 167  LAST  658   24,3455  0 4607 1                  TC     BANKCALL
 0071   REF  11  LAST  633   24,3456   20471 1                  CADR   GOFLASH
 0072   REF  10  LAST  658   24,3457  C 6001 0                  TC     GOTOPOOH        TERM
 0073                        24,3460  0 3462 I                  TC     +2              PROCEED VALUES OK
 0074                        24,3461  0 3454 1                  TC     -5              TIME LOADED THROUGH DSKY
 0075   REF  74  LAST  636   24,3462  0 6060 1                  TC     INTPRET
 0076                        24,3463   53145 1                  OLOAO  BZE
 0077   REF  22  LAST  658   24,3464   01045 1                         DSPTEM1
 00775  REF   1              24,3465   51623 1                         P21PRTM
 0078   REF  24  LAST  648   24,3466   34041 0  P21PROG2 STCALL TDEC1           INTEG TO TIME SPECIFIED IN TDEC1
 0079   REF  18  LAST  615   24,3467   27447 0                         INTSTALL
 0080                        24,3470   43014 0                  BON    CLEAR
 0081   REF   1              24,3471   C0304 0                         P21FLAG
 0082   REF   1              24,3472   51510 1                         P21CONT         ON---RECYCLE USING BASE VECTOR
 0083   REF  17  LAST  603   24,3473   01674 0                         VINTFLAG        OFF--IST PASS CALL BASE VECTOR
 0084                        24,3474   70535 0                  SLOAD  SR1
 0085   REF   4  LAST  658   24,3475   01145 0                         OPTION2
 0086                        24,3476   43C30 0                  BHIZ   SET
 0087                        24,3477   51501 1                         +2              ZERO--THIS VEHICLE(LM)
 0088   REF  18  LAST  658   24,3500   01474 1                         VINTFLAG        ONE--OTHER VEHICLE(CM)
 0089                        24,3501   43014 0                  CLEAR  CLEAR
 0090   REF  12  LAST  603   24,3502   01676 1                         OIMOFLAG
 0091   REF   6  LAST  603   24,3503   01673 1                         INTYPFLG        PRECISION
 0092                        24,3504   77624 1                  CALL
 0093   REF   9  LAST  604   24,3505   27172 0                         INTEGRV         CALCULATE
 0094                        24,3506   77650 1                  GOTO                   -AND
 0095    REF   1                 24,3507    51532 1                      P21VSAVE        -SAVE BASE VECTOR
 0096                            24,3510    77775 1  P21CONT    VLOAD
 0097    REF   2  LAST  155      24,3511    03676 0                      P21BASER        RECYCLE--INTEG FROM BASE VECTOR
 0098    REF   5  LAST  51C      24,3512    25535 0             STOVL    RCV             --POS
 0099    REF   2  LAST  155      24,3513    03704 1                      P218ASEV
 0100    REF   4  LAST  333      24,3514    15543 1             STODL    VCV             --VEL
 0101    REF   7  LAST  658      24,3515    03763 0                      P21TIME
 0102    REF   8  LAST  510      24,3516    01517 0             STORE    TET             --TIME
 0103                            24,3517    43014 0             CLEAR    CLEAR
 0104    REF  13  LAST  658      24,3520    01676 1                      DIMOFLAG
 0105    REF   1                 24,3521    00263 0                      MOONFLAG
 0106                            24,3522    53135 0             SLOAD    BZE
 0107    REF   1                 24,3523    01163 1                      P21ORIG
 0108                            24,3524    51527 0                      +3              ZERO=EARTH
 0109                            24,3525    77614 1             SET                      ---2=MOON
 0110    REF   2  LAST  659      24,3526    00063 1                      MOONFLAG
 0111                            24,3527    45014 0    +3       CLEAR    CALL
 01115   REF   7  LAST  658      24,3530    01673 1                      INTYPFLG
 0112    REF   1                 24,3531    27145 1                      INTEGRVS
 0113                            24,3532    77745 1  P21VSAVE   DLOAD                    SAVE CURRENT BASEVECTOR
 0114    REF   7  LAST  609      24,3533    00C15 0                      TAT
 0115    REF   8  LAST  659      24,3534    27763 0             STOVL    P21TIME         --TIME
 0116    REF   4  LAST  509      24,3535    00017 1                      RATT1
 0117    REF   3  LAST  659      24,3536    27676 0             STOVL    P218ASER        --POS B-29 OR B-27
 0118    REF   7  LAST  509      24,3537    00025 0                      VATT1
 0119    REF   3  LAST  659      24,3540    03704 1             STORE    P21BASEV        --VEL B-07 OR B-05
 01191                           24,3541    53646 0             ABVAL    SL*
 01192                           24,3542    57576 1                      0,2
 01193   REF   3  LAST  329      24,3543    27712 0             STOVL    P21VEL          VEL/ FOR N91 DISP
 01194   REF  11  LAST  623      24,3544    00001 0                      RATT
 01195                           24,3545    5C256 0             UNIT     DOT
 01196   REF   9  LAST  643      24,3546    00007 0                      VATT             U(R).V
 01197                           24,3547    67471 1             DDV      ASIN            U(R).U(V)
 01198   REF   4  LAST  659      24,3550    03712 0                      P21VEL
 01199   REF   3  LAST  329      24,3551    03714 0             STORE    P21GAM          SIN-1 U(R).U(V) , -90 TO &90
 0120                            24,3552    67334 1             SXA,2    SLOAD
 0121    REF   2  LAST  659      24,3553    01162 0                      P21ORIG         0=EARTH
 0122    REF   5  LAST  658      24,3554    01145 0                      OPTION2
 0123                            24,3555    46142 1             SR1      8HIZ
 0124                            24,3556    51561 1                      +3
 0125                            24,3557    77650 1             GOTO
 0126                            24,3560    51564 1                      +4
 0127                            24,3561    77614 1    +3       BON
 0128    REF  14  LAST  615      24,3562    04307 1                      SURFFLAG
 0129    REF   1                 24,3563    51566 0                      P21DSP
 0130                            24,3564    77614 1    +4       SET
 0131    REF   2  LAST  658      24,3565    0CC64 0                      P21FLAG
 0132                            24,3566    67214 1  P21DSP     CLEAR    SLOAD           GENERATE DISPLAY DATA
 0133    REF   1                 24,3567    01663 0                      LUNAFLAG
 0134    REF   8  LAST  654      24,3570    00050 1                      X2
 0135                              24,3571   43054 1              BZE     SET
 0136                              24,3572   51574 0                      +2                  0=EARTH
 0137   REF   2  LAST  659         24,3573   01463 1                      LUNAFLAG
 0138                              24,3574   77775 1              VLOAD
 0139   REF  12  LAST  659         24,3575   00001 0                      RATT
 0140   REF   7  LAST  118         24,3576   16032 1              STODL   ALPHAV
 0141   REF   8  LAST  659         24,3577   00015 0                      TAT
 0142                              24,3600   45014 0              CLEAR   CALL
 0143   REF   1                    24,3601   00662 0                      ERADFLAG
 0144   REF   1                    24,3602   26406 1                      LAT-LONG
 01442                             24,3603   77605 1              DMP                         MPAC = ALT,METERS B-29
 01443  REF   1                    24,3604   11633 1                      K.01
 01445  REF   2  LAST  329         24,3605   03716 1              STORE   P21ALT              ALT/100 FOR N91 DISP
 0145                              24,3606   77776 1              EXIT
 0146   REF   1                    24,3607  3 3630 1              CAF     V06N43              DISPLAY LAT,LONG,ALT
 0147   REF 168  LAST  658         24,3610  0 4607 1              TC      BANKCALL            LAT,LONG = 1/2 REVS B0
 0148   REF  12  LAST  658         24,3611   20471 1              CADR    GOFLASH             ALT = KM  B14
 0149   REF  11  LAST  658         24,3612  0 6001 0              TC      GOTOPOOH            TERM
 0150   REF  12  LAST  660         24,3613  0 6001 0              TC      GOTOPOOH
 0151   REF  75  LAST  658         24,3614  0 6060 1              TC      INTPRET             V32E RECYCLE
 0152                              24,3615   43345 1              DLOAD   DAD
 0153   REF   9  LAST  659         24,3616   03763 0                      P21TIME
 0154   REF   1                    24,3617   11627 1                      600SEC              600 SECONDS OR 10 MIN
 0155   REF  23  LAST  658         24,3620   01045 1              STORE   DSPTEM1
 0156                              24,3621   77634 0              RTB
 0157   REF   1                    24,3622   51454 0                      P21PROG1
 01572                             24,3623   52034 1  P21PRTM     RTB     GOTO
 01574  REF  14  LAST  609         24,3624   21603 1                      LOADTIME
 01576  REF   1                    24,3625   51466 1                      P21PROG2
 0158                              24,3626   00003 1  600SEC      2DEC    60000               10 MIN
 0158                              24,3627   25140 0
 0159                              24,3630   01453 1  V06N43      VN      00643
 0160                              24,3631   01442 1  V6N34       VN      00634
 01602                             24,3632   00243 1  K.01        2DEC    .01
 01602                             24,3633   32703 1
```

```
P0010   TRANSFER PHASE INITIATION (TPI) PROGRAMS (P34 AND P74)

R0011   MOD NO -1        LOG SECTION - P32-P35, P72-P75
R0012   MOD BY WHITE.P   DATE 1JUNE67

R0013   PURPOSE

R0014          (1) TO CALCULATE THE REQUIRED DELTA V AND OTHER INITIAL CONDITIONS
R0015              REQUIRED BY THE ACTIVE VEHICLE FOR EXECUTION OF THE TRANSFER
R0016              PHASE INITIATION (TPI) MANEUVER, GIVEN -

R0017              (A) TIME OF IGNITION TIG (TPI) OR THE ELEVATION ANGLE (E) OF
R0018                  THE ACTIVE/PASSIVE VEHICLE LOS AT TIG (TPI).

R0019              (B) CENTRAL ANGLE OF TRANSFER (CENTANG) FROM TIG (TPI) TO
R0020                  INTERCEPT TIME (TIG (TPF)).

R0021          (2) TO CALCULATE TIG (TPI) GIVEN E OR E GIVEN TIG (TPI).

R0022          (3) TO CALCULATE THESE PARAMETERS BASED UPON MANEUVER DATA
R0023              APPROVED AND KEYED INTO THE DSKY BY THE ASTRONAUT.

R0024          (4) TO DISPLAY TO THE ASTRONAUT AND THE GROUND CERTAIN DEPENDENT
R0025              VARIABLES ASSOCIATED WITH THE MANEUVER FOR APPROVAL BY THE
R0026              ASTRONAUT/GROUND.

R0027          (5) TO STORE THE TPI TARGET PARAMETERS FOR USE BY THE DESIRED
R0028              THRUSTING PROGRAM.

R0029   ASSUMPTIONS

R0030          (1) LM ONLY - THIS PROGRAM IS BASED UPON PREVIOUS COMPLETION OF
R0031              THE CONSTANT DELTA ALTITUDE (CDH) PROGRAM (P33/P73).
R0032              THEREFORE -

R0033              (A) AT A SELECTED TPI TIME (NOW IN STORAGE) THE LINE OF SIGHT
R0034                  BETWEEN THE ACTIVE AND PASSIVE VEHICLES WAS SELECTED TO BE
R0035                  A PRESCRIBED ANGLE (E) (NOW IN STORAGE) FROM THE
R0036                  HORIZONTAL PLANE DEFINED BY THE ACTIVE VEHICLE POSITION.

R0037              (B) THE TIME BETWEEN CDH IGNITION AND TPI IGNITION WAS
R0038                  COMPUTED TO BE GREATER THAN 10 MINUTES.

R0039              (C) THE VARIATION OF THE ALTITUDE DIFFERENCE BETWEEN THE
R0040                  ORBITS WAS MINIMIZED.

R0041              (D) THE PERICENTER ALTITUDES OF ORBITS FOLLOWING CSI AND

R0042                  CDH WERE COMPUTED TO BE GREATER THAN 35,000 FT FOR LUNAR
```

```
R0043                     ORBIT OR 85 NM FOR EARTH ORBIT.

R0044                 (E) THE CSI AND CDH MANEUVERS WERE ASSUMED TO BE PARALLEL TO
R0045                     THE PLANE OF THE PASSIVE VEHICLE ORBIT.  HOWEVER, CREW
R0046                     MODIFICATION OF DELTA V (LV) COMPONENTS MAY HAVE RESULTED
R0047                     IN AN OUT-OF-PLANE MANEUVER.

R0048             (2) STATE VECTOR UPDATED BY P27 ARE DISALLOWED DURING AUTOMATIC
R0049                 STATE VECTOR UPDATING INITIATED BY P20 (SEE ASSUMPTION (4)).

R0050             (3) THIS PROGRAM MUST BE DONE OVER A TRACKING STATION FOR REAL
R0051                 TIME GROUND PARTICIPATION IN DATA INPUT AND OUTPUT.  COMPUTED
R0052                 VARIABLES MAY BE STORED FOR LATER VERIFICATION BY THE GROUND.
R0053                 THESE STORAGE CAPABILITIES ARE LIMITED ONLY TO THE PARAMETERS
R0054                 FOR ONE THRUSTING MANEUVER AT A TIME EXCEPT FOR CONCENTRIC
R0055                 FLIGHT PLAN MANEUVER SEQUENCES.

R0056             (4) THE RENDEZVOUS RADAR MAY OR MAY NOT BE USED TO UPDATE THE LM
R0057                 OR CSM STATE VECTORS FOR THIS PROGRAM.  IF RADAR USE IS
R0058                 DESIRED THE RADAR WAS TURNED ON AND LOCKED ON THE CSM BY
R0059                 PREVIOUS SELECTION OF P20.  RADAR SIGHTING MARKS WILL BE MADE
R0060                 AUTOMATICALLY APPROXIMATELY ONCE A MINUTE WHEN ENABLED BY THE
R0061                 TRACK AND UPDATE FLAGS (SEE P20).  THE RENDEZVOUS TRACKING
R0062                 MARK COUNTER IS ZEROED BY THE SELECTION OF P20 AND AFTER EACH
R0063                 THRUSTING MANEUVER.

R0064             (5) THE ISS NEED NOT BE ON TO COMPLETE THIS PROGRAM.

R0065             (6) THE OPERATION OF THE PROGRAM UTILIZES THE FOLLOWING FLAGS -

R0066                     ACTIVE VEHICLE FLAG - DESIGNATES THE VEHICLE WHICH IS
R0067                     DOING RENDEZVOUS THRUSTING MANEUVERS TO THE PROGRAM WHICH
R0068                     CALCULATES THE MANEUVER PARAMETERS.  SET AT THE START OF
R0069                     EACH RENDEZVOUS PRE-THRUSTING PROGRAM.

R0070                     FINAL FLAG - SELECTS FINAL PROGRAM DISPLAYS AFTER CREW HAS
R0071                     SELECTED THE FINAL MANEUVER COMPUTATION CYCLE.

R0072                     EXTERNAL DELTA V FLAG - DESIGNATES THE TYPE OF STEERING
R0073                     REQUIRED FOR EXECUTION OF THIS MANEUVER BY THE THRUSTING
R0074                     PROGRAM SELECTED AFTER COMPLETION OF THIS PROGRAM.

R0075             (7) ONCE THE PARAMETWRS REQUIRED FOR COMPUTION OF THE MANEUVEP
R0076                 HAVE BEEN COMPLETELY SPECIFIED, THE VALUE OF THE ACTIVE
R0077                 VEHICLE CENTRAL ANGLE OF TRANSFER IS COMPUTED AND STORED.
R0078                 THIS NUMBER WILL BE AVAILABLE FOR DISPLAY TO THE ASTRONAUT
R0079                 THROUGH THE USE OF V06N52.

R0080                 THE ASTRONAUT WILL CALL THIS DISPLAY TO VERIFY THAT THE
R0081                 CENTRAL ANGLE OF TRANSFER OF THE ACTIVE VEHICLE IS NOT WITHIN
```

```
R0082              170 TO 190 DEGREES.  IF THE ANGLE IS WITHIN THIS ZONE THE
R0083              ASTRONAUT SHOULD REASSESS THE INPUT TARGETING PARAMETERS BASED
R0084              UPON DELTA V AND EXPECTED MANEUVER TIME.

R0085          (8) THIS PROGRAM IS SELECTED BY THE ASTRONAUT BY DSKY ENTRY -

R0086                  P34 IF THIS VEHICLE IS ACTIVE VEHICLE.

R0087                  P74 IF THIS VEHICLE IS PASSIVE VEHICLE.

R0088    INPUT

R0089          (1) TTPI      TIME OF THE TPI MANEUVER
R0090          (2) ELEV      DESIRED LOS ANGLE AT TPI
R0091          (3) CENTANG   ORBITAL CENTRAL ANGLE OF THE PASSIVE VEHICLE DURING
R0092                        TRANSFER FROM TPI TO TIME OF INTERCEPT

R0093    OUTPUT

R0094          (1) TRKMKCNT NUMBER OF MARKS
R0095          (2) TTOGO     TIME TO GO
R0096          (3) +MGA      MIDDLE GIMBAL ANGLE
R0097          (4) TTPI      COMPUTED TIME OF TPI MANEUVER
R0098               OR
R0099              ELEV      COMPUTED LOS ANGLE AT TPI
R0100          (5) POSTTPI   PERIGEE ALTITUDE AFTER THE TPI MANEUVER
R0101          (6) DELVTPI   MAGNITUDE OF DELTA V AT TPI
R0102          (7) DELVTPF   MAGNITUDE OF DELTA V AT INTERCEPT
R0103          (8) DVLOS     DELTA VELOCITY AT TPI - LINE OF SIGHT
R0104          (9) DELVLVC   DELTA VELOCITY AT TPI - LOCAL VERTICAL COORDINATES

R0105    DOWNLINK

R0114          (1) TTPI      TIME OF THE TPI MANEUVER
R0115          (2) TIG       TIME OF THE TPI MANEUVER
R0116          (3) ELEV      DESIRED LOS ANGLE AT TPI
R0117          (4) CENTANG   ORBITAL CENTRAL ANGLE OF THE PASSIVE VEHICLE DURING
R0118                        TRANSFER FROM TPI TO TIME OF INTERCEPT
R0119          (5) DELVEET3 DELTA VELOCITY AT TPI - REFERENCE COORDINATES
R0120          (6) TPASS4    TIME OF INTERCEPT
R0121    COMMUNICATION TO THRUSTING PROGRAMS

R0122          (1) TIG       TIME OF THE TPI MANEUVER
R0123          (2) RTARG     OFFSET TARGET POSITION
R0124          (3) TPASS4    TIME OF INTERCEPT
R0125          (4) XDELVFLG RESET TO INDICATE LAMBERT (AIMPOINT) VG COMPUTATION

R0126    SUBROUTINES USED

R0127          AVFLAGA
```

```
R0128          AVFLAGP
R0129          VNPOOH
R0130          DISPLAYE
R0131          SELECTMU
R0132          PRECSET
R0133          S33/34.1
R0134          ALARM
R0135          BANKCALL
R0136          GOFLASH
R0137          GOTOPOOH
R0138          TIMETHET
R0139          S34/35.2
R0140          PERIAPO1
R0141          SHIFTR1
R0142          S34/35.5
R0143          VN1645

 0144    REF   3  LAST  656   35,2000                       SETLOC CSI/CDH
 0145                         35,2455                       BANK
 0146    REF  15  LAST  655   E7,1470                       EBANK= SUBEXIT
 0147    REF   1                                            COUNT* $$/P3474
 0148    REF   3  LAST  633   35,2455  0 2354 1  P34        TC     AVFLAGA
 0149    REF   1              35,2456  0 2460 1             TC     P34/P74A
 0150    REF   3  LAST  633   35,2457  0 2361 1  P74        TC     AVFLAGP
 0151    REF   3  LAST  633   35,2460  0 2366 0  P34/P74A   TC     P20FLGON        SET UPDATFLG, TRACKFLG
 01515   REF   2  LAST  628   35,2461  3 3633 1             CAF    V06N37          TTPI
 0152    REF  10  LAST  636   35,2462  0 3622 1             TC     VNPOOH
 01521                        35,2463  0 0006 1             EXTEND
 01522   REF   1              35,2464  3 3656 1             DCA    130DEG
 01523   REF   5  LAST  640   35,2465  53'621 1             DXCH   CENTANG
 01525   REF   5  LAST  463   35,2466  3 4732 0             CAF    EBANK4
 01526   REF  93  LAST  618   35,2467  54 001 1             TS     L
 01528   REF  10  LAST  650   35,2470  3 2424 1             CAF    P30ZERO         INITIALIZE DISPLAYED REGISTERS TO ZERO
 01529   REF   5  LAST  642   35,2471  55'466 0             TS     NN              R1: NN -- NUMBER OF OFFSETS
 015294  REF   6  LAST  643   E4,1647                       EBANK= ELEV
 015295  REF  24  LAST  580   35,2472  22 003 1             LXCH   EBANK
 0153    REF   7  LAST  664   35,2473  55'647 1             TS     ELEV            R2: ELEV (D.P.) -- ELEVATION ANGLE
 01531   REF   8  LAST  664   35,2474  55'650 1             TS     ELEV +1
 01533   REF  25  LAST  664   35,2475  22 003 1             LXCH   EBANK
 01534   REF  16  LAST  664   E7,1470                       EBANK= SUBEXIT         CHNG BACK TO WHAT IT WAS BEFORE
 01535   REF   1              35,2476  0 3604 0             TC     DISPLAYE        V06N55 GOFLASH CALL: NN,ELEV,CENTANG
 0154    REF  76  LAST  660   35,2477  0 6060 1             TC     INTPRET
 0155                         35,2500   71214 0             CLEAR  DLOAD
 0156    REF   1              35,2501   01270 0                    ETPIFLAG
 0157    REF  14  LAST  650   35,2502   03636 1                    TTPI
 0158    REF  14  LAST  648   35,2503   17442 0             STODL  TIG
 0159    REF   9  LAST  664   35,2504   02250 1                    ELEV
 0160                         35,2505   43054 1             BZE    SET
 0161    REF   1              35,2506   72510 0                    P34/P74B
 0162    REF   2  LAST  664   35,2507   01070 1                    ETPIFLAG
```

```
0163                        35,2510   77624 1  P34/P74B CALL
0164   REF   3  LAST  633   35,2511   20000 0                    SELECTMU
0165                           0032            DELELO   EQUALS 26D
0166                        35,2512   43145 0  P34/P74C DLOAD  SET
0167   REF   8  LAST  615   35,2513   06505 1                    ZEROVECS
0168   REF   2  LAST  633   35,2514   03460 0                    ITSWICH
0169                        35,2515   43014 0           BON      CLEAR
0170   REF   3  LAST  664   35,2516   01310 1                    ETPIFLAG
0171   REF   1              35,2517   72521 1                    SWCHSET
0172   REF   3  LAST  665   35,2520   03660 1                    ITSWICH
0173   REF   4  LAST  634   35,2521   02310 1  SWCHSET  STORE  NOMTPI
0174                        35,2522   43345 1  INTLOOP  DLOAD  DAD
0175   REF  15  LAST  664   35,2523   03636 1                    TTPI
0176   REF   5  LAST  665   35,2524   02310 1                    NOMTPI
0177   REF  25  LAST  658   35,2525   34041 0           STCALL TDEC1
0178   REF   3  LAST  648   35,2526   46401 0                    PRECSET
0179                        35,2527   77624 1           CALL
0180   REF   2  LAST  633   35,2530   72702 1                    S33/34.1
0181                        35,2531   77454 1           BZE      EXIT
0182   REF   1              35,2532   72543 0                    SWCHCLR
0183   REF  26  LAST  633   35,2533  0 5571 1           TC       ALARM
0184                        35,2534   00611 1           OCT      611
0185   REF   3  LAST  633   35,2535  3 4777 1           CAF      V05N09
0186   REF 169  LAST  660   35,2536  0 4607 1           TC       BANKCALL
0187   REF  13  LAST  660   35,2537   20471 1           CADR     GOFLASH
0188   REF  13  LAST  660   35,2540  0 6001 0           TC       GOTOPOOH
0189   REF   2  LAST  664   35,2541  0 2460 1           TC       P34/P74A          PROCEED
0190                        35,2542  0 2533 0           TC       -7                V32

0191                        35,2543   43014 0  SWCHCLR  BONCLR BON
0192   REF   4  LAST  665   35,2544   03600 1                    ITSWICH
0193   REF   1              35,2545   72522 1                    INTLOOP
0194   REF   4  LAST  665   35,2546   01310 1                    ETPIFLAG
0195   REF   1              35,2547   72553 1                    P34/P74D          DISPLAY TTPI
0196                        35,2550   77776 1           EXIT
0197   REF   2  LAST  664   35,2551  0 3604 0           TC       DISPLAYE          DISPLAY ELEV AND CENTANG
0198   REF   1              35,2552  0 2556 0           TC       P34/P74E
0199                        35,2553   77776 1  P34/P74D EXIT
0200   REF   3  LAST  664   35,2554  3 3633 1           CAF      V06N37            TTPI
0201   REF  11  LAST  664   35,2555  0 3622 1           TC       VNPOOH
0202   REF  77  LAST  664   35,2556  0 6060 1  P34/P74E TC       INTPRET
0203                        35,2557   71201 1           SETPD    DLOAD
0204                        35,2560   00001 0                    0D
0205   REF   5  LAST  647   35,2561   02777 1                    RTX1
0206   REF  12  LAST  654   35,2562   14047 1           STODL    X1
0207   REF   6  LAST  664   35,2563   03621 1                    CENTANG
0208                        35,2564   71406 0           PUSH     COS
0209   REF   4  LAST  653   35,2565   16732 0           STODL    CSTH
0210                        35,2566   77756 0           SIN
0211   REF   6  LAST  653   35,2567   26730 1           STOVL    SNTH
```

```
 0212   REF    6  LAST  648    35,2570   03552 0                     RPASS3
 0213                          35,2571   77657 0             VSR*
 0214                          35,2572   57176 0                     0,2
 0215   REF    6  LAST  653    35,2573   26655 0             STOVL   RVEC
 0216   REF    3  LAST  648    35,2574   03560 1                     VPASS3
 0217                          35,2575   43057 1             VSR*    SET
 0218                          35,2576   57176 0                     0,2
 0219   REF    6  LAST  653    35,2577   03466 0                     RVSW
 0220   REF    7  LAST  653    35,2600   36744 0             STCALL  VVEC
 0221   REF    5  LAST  653    35,2601   24732 1                     TIMETHET
 0222                          35,2602   77745 1             DLOAD
 0223   REF   16  LAST  665    35,2603   03636 1                     TTPI
 0224   REF    1               35,2604   03610 0             STORE   INTIME          FOR INITVEL
 0225                          35,2605   77615 0             DAD
 0226   REF    2  LAST  509    35,2606   00037 0                     T               RENDEZVOUS TIME
 0227   REF    3  LAST  210    35,2607   37631 1             STCALL  TPASS4          FOR INITVEL
 0228   REF    1               35,2610   73224 1                     S34/35.2
 0229                          35,2611   51575 1             VLOAD   ABVAL
 0230   REF    3  LAST  210    35,2612   02357 1                     DELVEET3
 0231   REF    5  LAST  327    35,2613   27576 0             STOVL   DELVTPI
 0232   REF    1               35,2614   03506 1                     VPASS4
 0233                          35,2615   51451 0             VSU     ABVAL
 0234   REF    1               35,2616   03566 1                     VTPRIME
 0235   REF    3  LAST  327    35,2617   26341 0             STOVL   DELVTPF
 0236   REF    8  LAST  648    35,2620   03536 1                     RACT3
 0237                          35,2621   45115 0             PDVL    CALL
 0238   REF    1               35,2622   02330 0                     VIPRIME
 0239   REF    3  LAST  643    35,2623   46337 1                     PERIAPO1
 0240                          35,2624   77624 1             CALL
 0241   REF    8  LAST  654    35,2625   46447 1                     SHIFTR1
 0242   REF    4  LAST  327    35,2626   17606 1             STODL   POSTTPI
 0243   REF   17  LAST  666    35,2627   03636 1                     TTPI
 0244   REF   15  LAST  664    35,2630   03442 0             STORE   TIG
 0245                          35,2631   77776 1             EXIT
 0246   REF    1               35,2632  3 3635 1             CAF     V06N58
 0247   REF   12  LAST  665    35,2633  0 3622 1             TC      VNPOOH
 0248   REF   78  LAST  665    35,2634  0 6060 1             TC      INTPRET
 0249                          35,2635   77624 1             CALL
 0250   REF    1               35,2636   73440 0                     S34/35.5
 0251                          35,2637   77624 1             CALL
 0252   REF    4  LAST  634    35,2640   73516 1                     VN1645
 0253                          35,2641   77650 1             GOTO
 0254   REF    1               35,2642   72512 1                     P34/P74C
```

```
P0255    RENDEZVOUS MID-COURSE MANEUVER PROGRAMS (P35 AND P75)

R0256    MOD NO -1        LOG SECTION - P32-P35, P72-P75
R0257    MOD BY WHITE.P   DATE  1JUNE67

R0258    PURPOSE

R0259           (1) TO CALCULATE THE REQUIRED DELTA V AND OTHER INITIAL CONDITIONS
R0260               REQUIRED BY THE ACTIVE VEHICLE FOR EXECUTION OF THE NEXT
R0261               MIDCOURSE CORRECTION OF THE TRANSFER PHASE OF AN ACTIVE
R0262               VEHICLE RENDEZVOUS.

R0263           (2) TO DISPLAY TO THE ASTRONAUT AND THE GROUND CERTAIN DEPENDENT
R0264               VARIABLES ASSOCIATED WITH THE MANEUVER FOR APPROVAL BY THE
R0265               ASTRONAUT/GROUND.

R0266           (3) TO STORE THE TPM TARGET PARAMETERS FOR USE BY THE DESIRED
R0267               THRUSTING PROGRAM.

R0268    ASSUMPTIONS

R0269           (1) THE ISS NEED NOT BE ON TO COMPLETE THIS PROGRAM.

R0270           (2) STATE VECTOR UPDATES BY P27 ARE DISALLOWED DURING AUTOMATIC
R0271               STATE VECTOR UPDATING INITIATED BY P20 (SEE ASSUMPTION (3)).

R0272           (3) THE RENDEZVOUS RADAR IS ON AND IS LOCKED ON THE CSM.  THIS WAS
R0273               DONE DURING PREVIOUS SELECTION OF P20.  RADAR SIGHTING MARKS
R0274               WILL BE MADE AUTOMATICALLY APPROXIMATELY ONCE A MINUTE WHEN
R0275               ENABLED BY THE TRACK AND UPDATE FLAGS (SEE P20). THE
R0276               RENDEZVOUS TRACKING MARK COUNTER IS ZEROED BY THE SELECTION OF
R0277               P20 AND AFTER EACH THRUSTING MANEUVER.

R0278           (4) THE OPERATION OF THE PROGRAM UTILIZES THE FOLLOWING FLAGS -

R0279                   ACTIVE VEHICLE FLAG - DESIGNATES THE VEHICLE WHICH IS
R0280                   DOING RENDEZVOUS THRUSTING MANEUVERS TO THE PROGRAM WHICH
R0281                   CALCULATES THE MANEUVER PARAMETERS.  SET AT THE START OF
R0282                   EACH RENDEZVOUS PRE-THRUSTING PROGRAM.

R0283                   FINAL FLAG - SELECTS FINAL PROGRAM DISPLAYS AFTER CREW HAS
R0284                   SELECTED THE FINAL MANEUVER COMPUTATION CYCLE.

R0285                   EXTERNAL DELTA V FLAG - DESIGNATES THE TYPE OF STEERING
R0286                   REQUIRED FOR EXECUTION OF THIS MANEUVER BY THE THRUSTING
R0287                   PROGRAM SELECTED AFTER COMPLETION OF THIS PROGRAM.

R0288           (5) THE TIME OF INTERCEPT (T(INT)) WAS DEFINED BY PREVIOUS
R0289               COMPLETION OF THE TRANSFER PHASE INITIATION (TPI) PROGRAM
R0290               (P34/P74) AND IS PRESENTLY AVAILABLE IN STORAGE.
```

```
R0291          (6) ONCE THE PARAMETERS REQUIRED FOR COMPUTION OF THE MANEUVER
R0292              HAVE BEEN COMPLETELY SPECIFIED, THE VALUE OF THE ACTIVE
R0293              VEHICLE CENTRAL ANGLE OF TRANSFER IS COMPUTED AND STORED.
R0294              THIS NUMBER WILL BE AVAILABLE FOR DISPLAY TO THE ASTRONAUT
R0295              THROUGH THE USE OF V06N52.

R0296              THE ASTRONAUT WILL CALL THIS DISPLAY TO VERIFY THAT THE
R0297              CENTRAL ANGLE OF TRANSFER OF THE ACTIVE VEHICLE IS NOT WITHIN
R0298              170 TO 190 DEGREES.  IF THE ANGLE IS WITHIN THIS ZONE THE
R0299              ASTRONAUT SHOULD REASSESS THE INPUT TARGETING PARAMETERS BASED
R0300              UPON DELTA V AND EXPECTED MANEUVER TIME.

R0301          (7) THIS PROGRAM IS SELECTED BY THE ASTRONAUT BY DSKY ENTRY -

R0302                   P35 IF THIS VEHICLE IS ACTIVE VEHICLE.

R0303                   P75 IF THIS VEHICLE IS PASSIVE VEHICLE.

R0304    INPUT

R0305          (1) TPASS4   TIME OF INTERCEPT.- SAVED FROM P34/P74
R0306    OUTPUT

R0307          (1) TRKMKCNT NUMBER OF MARKS
R0308          (2) TTOGO    TIME TO GO
R0309          (3) +MGA     MIDDLE GIMBAL ANGLE
R0310          (4) DVLOS    DELTA VELOCITY AT MID - LINE OF SIGHT
R0311          (5) DELVLVC  DELTA VELOCITY AT MID - LOCAL VERTICAL COORDINATES

R0312    DOWNLINK

R0325          (1) TIG      TIME OF THE TPM MANEUVER
R0326          (2) DELVEET3 DELTA VELOCITY AT TPM - REFERENCE COORDINATES
R0327          (3) TPASS4   TIME OF INTERCEPT
R0328    COMMUNICATION TO THRUSTING PROGRAMS

R0329          (1) TIG      TIME OF THE TPM MANEUVER
R0330          (2) RTARG    OFFSET TARGET POSITION
R0331          (3) TPASS4   TIME OF INTERCEPT
R0332          (4) XDELVFLG RESET TO INDICATE LAMBERT (AIMPOINT) VG COMPUTATION

R0333    SUBROUTINES USED

R0334          AVFLAGA
R0335          AVFLAGP
R0336          LOADTIME
R0337          SELECTMU
R0338          PRECSET
R0339          S34/35.1
R0340          S34/35.2
```

```
R0341         S34/35.5
R0342         VN1645

 0343   REF   2 LAST  656 TO  658:     14     14*          COUNT* $$/P3575
 0344   REF   1                E7,1575                     EBANK= KT

 0345   REF   4  LAST  664    35,2643  0 2354 1  P35       TC      AVFLAGA
 0346                         35,2644  0 0006 1            EXTEND
 0347   REF   3  LAST  399    35,2645  3 1401 0            DCA     ATIGINC
 0348   REF   1               35,2646  0 2652 1            TC      P35/P75A
 0349   REF   4  LAST  664    35,2647  0 2361 1  P75       TC      AVFLAGP
 0350                         35,2650  0 0006 1            EXTEND
 0351   REF   1               35,2651  3 1403 1            DCA     PTIGINC
 0352   REF   2  LAST  669    35,2652  53'576 0  P35/P75A  DXCH    KT
 03525  REF   4  LAST  664    35,2653  0 2366 0            TC      P20FLGON          SET UPDATFLG, TRACKFLG
 0353   REF  79  LAST  666    35,2654  0 6060 1            TC      INTPRET
 0359                         35,2655   77624 1            CALL
 0360   REF   4  LAST  665    35,2656   20000 0                    SELECTMU
 0361                         35,2657   77634 0  P35/P75B  RTB
 0362   REF  15  LAST  660    35,2660   21603 1                    LOADTIME
 03621  REF   2  LAST  295    35,2661   03612 1            STORE   TSTRT
 03622                        35,2662   77615 0            DAD
 03623  REF   3  LAST  669    35,2663   03576 0                    KT
 03624  REF  16  LAST  666    35,2664   03442 0            STORE   TIG
 0363   REF   2  LAST  666    35,2665   03610 0            STORE   INTIME            FOR INITVEL
 0364   REF  26  LAST  665    35,2666   34041 0            STCALL  TDEC1
 0365   REF   4  LAST  665    35,2667   46401 0                    PRECSET           ADVANCE BOTH VEHICLES
 0366                         35,2670   77624 1            CALL
 0367   REF   1               35,2671   73212 1                    S34/35.1          GET NORM AND LOS FOR TRANSFORM
 0368                         35,2672   77624 1            CALL
 0369   REF   2  LAST  666    35,2673   73224 1                    S34/35.2          GET DELTA V(LV)
 0370                         35,2674   77624 1            CALL
 0371   REF   2  LAST  666    35,2675   73440 0                    S34/35.5
 0372                         35,2676   77624 1            CALL
 0373   REF   5  LAST  666    35,2677   73516 1                    VN1645
 0379                         35,2700   77650 1            GOTO
 0380   REF   1               35,2701   72657 0                    P35/P75B
```

```
P0381    ..... S33/34.1   .....

 0382                            35,2702   66220 1  S33/34.1 STQ     SSP
 0383    REF   4  LAST  636      35,2703   03463 0                   NORMEX
 0384    REF   1                 35,2704   03614 1                   TITER
 0385                            35,2705   40000 0           OCT     40000
 0386                            35,2706   40345 1           DLOAD   SETPD
 0387    REF   1                 35,2707   33644 1                   MAX250
 0388                            35,2710   00001 0                   0D
 0389    REF   1                 35,2711   27574 1           STOVL   SECMAX
 0390    REF   9  LAST  666      35,2712   03536 1                   RACT3
 0391    REF   1                 35,2713   27500 1           STOVL   PAPREC
 0392    REF   8  LAST  654      35,2714   03544 1                   VACT3
 0393    REF   1                 35,2715   27506 1           STOVL   VAPREC
 0394    REF   7  LAST  666      35,2716   03552 0                   RPASS3
 0395    REF   1                 35,2717   27522 1           STOVL   RPPREC
 0396    REF   4  LAST  666      35,2720   03560 1                   VPASS3
 0397    REF   1                 35,2721   03530 1           STORE   VPPREC
 0398                            35,2722   77624 1  ELCALC   CALL
 0399    REF   2  LAST  669      35,2723   73212 1                   S34/35.1         NORMAL AND LOS
 0400                            35,2724   63235 0           VXV     PDVL
 0401    REF  10  LAST  670      35,2725   03536 1                   RACT3            (RA*VA)*RA 0D
 0402                            35,2726   53515 0           PDVL    UNIT             ULOS AT 6D
 0403    REF  11  LAST  670      35,2727   03536 1                   RACT3
 0404                            35,2730   46315 1           PDVL    VPROJ            XCHNJ AND UP
 0405                            35,2731   51352 1           VSL2    BVSU
 0406    REF   1                 35,2732   02302 1                   ULOS
 0407                            35,2733   63256 0           UNIT    PDVL             UP AT 0D
 0408                            35,2734   63241 0           DOT     PDVL             UP.UN*RA AT 0D
 0409                            35,2735   00001 0                   0D               UP IN MPAC
 0410                            35,2736   75241 1           DOT     SIGN
 0411    REF   2  LAST  670      35,2737   02302 1                   ULOS
 0412                            35,2740   65552 0           SL1     ACOS
 0413                            35,2741   50315 0           PDVL    DOT              EA AT 0D
 0414    REF   3  LAST  670      35,2742   02302 1                   ULOS
 0415    REF  12  LAST  670      35,2743   03536 1                   RACT3
 0416                            35,2744   71244 0           BPL     DLOAD
 0417    REF   1                 35,2745   72750 0                   TESTY
 0418    REF   6  LAST  628      35,2746   06513 0                   DPPOSMAX
 0419                            35,2747   41425 1           DSU     PUSH
 0420                            35,2750   71214 0  TESTY    BOFF    DLOAD
 0421    REF   5  LAST  665      35,2751   03740 1                   LTSWICH
 0422    REF   1                 35,2752   73177 1                   ELEX
 0423    REF   1                 35,2753   03576 0                   DELEL
 0424    REF   1                 35,2754   14033 1           STODL   DELELO
 0425                            35,2755   77625 0           DSU
 0426    REF  10  LAST  664      35,2756   02250 1                   ELEV
 0427    REF   2  LAST  670      35,2757   03576 0           STORE   DELEL
 0428                            35,2760   45246 0           ABS     DSU
 0429    REF   1                 35,2761   33650 1                   ELEPS
```

```
0430                       35,2762  77640 0                  BMN
0431    REF   1            35,2763  73207 0                           TIMEX          COMMERCIALS EVERYWHERE
0432                       35,2764  70535 0    FIGTIME       SLOAD    SR1
0433    REF   2  LAST 670  35,2765  03614 1                           TITER
0434                       35,2766  72030 1                  BHIZ     LXA,1
0435    REF   5  LAST 670  35,2767  03463 0                           NORMEX         TOO MANY ITERATIONS
0436    REF 266  LAST 644  35,2770  00154 1                           MPAC
0437                       35,2771  77330 1                  SXA,1    VLOAD
0438    REF   3  LAST 671  35,2772  03613 0                           TITER
0439    REF   8  LAST 670  35,2773  03552 0                           RPASS3
0440                       35,2774  65256 0                  UNIT     PDDL
0441                       35,2775  00045 0                           36D
0442                       35,2776  53515 0                  PDVL     UNIT
0443    REF  13  LAST 670  35,2777  03536 1                           RACT3
0444                       35,3000  77725 1                  PDDL
0445                       35,3001  41525 0                  PDDL     PUSH
0446                       35,3002  00045 0                           36D
0447                       35,3003  77621 1                  BDSU
0448                       35,3004  00015 0                           12D
0449                       35,3005  14037 0                  STODL    30D            RP - RA MAGNITUDES
0450    REF   8  LAST 613  35,3006  06503 1                           DPHALF
0451                       35,3007  41425 1                  DSU      PUSH
0452    REF  11  LAST 670  35,3010  02250 1                           ELEV
0453                       35,3011  50165 0                  SIGN     BMN
0454                       35,3012  00037 0                           30D
0455    REF   6  LAST 671  35,3013  03463 0                           NORMEX
0456                       35,3014  71545 0                  DLOAD    COS
0457                       35,3015  56205 0                  DMP      DDV
0458                       35,3016  00017 1                           14D
0459                       35,3017  00015 0                           12D
0460                       35,3020  77676 0                  DCOMP                   SINCE COS(180-A)=-COS A
0461                       35,3021  00035 1                  STORE    28D
0462                       35,3022  44246 1                  ABS      BDSU
0463    REF   9  LAST 671  35,3023  06503 1                           DPHALF
0464                       35,3024  77240 1                  BMN      VLOAD
0465    REF   7  LAST 671  35,3025  03463 0                           NORMEX
0466    REF   1            35,3026  02252 0                           UNRM
0467                       35,3027  53435 0                  VXV      UNIT
0468                       35,3030  00007 0                           6D             UN*RA
0469                       35,3031  41241 0                  DOT      DMP
0470    REF   9  LAST 670  35,3032  03544 1                           VACT3
0471                       35,3033  00015 0                           12D
0472                       35,3034  47315 0                  PDVL     VXV
0473                       35,3035  00001 0                           0D
0474    REF   5  LAST 670  35,3036  03560 1                           VPASS3
0475                       35,3037  53435 0                  VXV      UNIT
0476                       35,3040  00001 0                           0D             (RP*VP)*RP
0477                       35,3041  41241 0                  DOT      DMP
0478    REF   6  LAST 671  35,3042  03560 1                           VPASS3
0479                       35,3043  00017 1                           14D
```

```
0480                           35,3044   77621 1            BDSU
0481                           35,3045   63301 0            NORM    PDVL             NURMALIZED WA - WP 12D
0482   REF  13  LAST  665      35,3046   0C047 1                    X1
0483                           35,3047   0CC07 0                    6D
0484                           35,3050   50235 0            VXV     DOT
0485                           35,3051   00001 0                    0D
0486   PFF   2  LAST  671      35,3052   02252 0                    UNRM             RA*RP.UN 14D
0487                           35,3053   50315 0            PDVL    DOT
0488                           35,3054   0CC01 0                    0D
0489                           35,3055   00007 0                    6D
0490                           35,3056   65552 0            SL1     ACOS
0491                           35,3057   77765 0            SIGN
0492                           35,3060   43225 0            DSU     DAD                ALPHA   PI
0493   REF  10  LAST  671      35,3061   06503 1                    DPHALF
0494   REF  12  LAST  671      35,3062   02250 1                    ELEV
0495                           35,3063   65525 0            PDDL    ACOS
0496                           35,3064   0CC35 1                    28D
0497                           35,3065   75221 1            BDSU    SIGN
0498   REF  11  LAST  672      35,3066   06503 1                    DPHALF
0499                           35,3067   00037 0                    30D              CUNTAINS RP-RA
0500                           35,3070   77615 0            DAD
0501                           35,3071   56205 0            DMP     DDV
0502   REF   4  LAST  650      35,3072   33642 1                    TWOPI
0503                           35,3073   77605 1            DMP
0504                           35,3074   41257 1            SL*     DMP
0505                           35,3075   20176 0                    0 -3,1
0506                           35,3076   51406 1            PUSH    ABS
0507                           35,3077   50025 0            DSU     BMN
0508   REF   2  LAST  670      35,3100   03574 1                    SECMAX
0509   REF   1                 35,3101   73105 1                    OKMAX
0510                           35,3102   75345 1            DLUAD   SIGN              REPLACE TIME WITH MAX TIME SIGNED
0511   RFF   3  LAST  672      35,3103   03574 1                    SECMAX
0512                           35,3104   77606 1            PUSH
0513                           35,3105   51135 1  OKMAX     SLOAD   BPL              TEST FIPST ITERATION
0514   REF   4  LAST  671      35,3106   03614 1                    TITER
0515   REF   1                 35,3107   73115 0                    REPETE
0516                           35,3110   71331 0            SSP     DLOAD
0517   REF   5  LAS1  672      35,3111   03614 1                    TITER
0518                           35,3112   37777 1            OCT     37777
0519                           35,3113   77650 1            GOTO
0520   REF   1                 35,3114   73153 1                    STORDELT
0521                           35,3115   41345 0  REPETE    DLOAD   DMP
0522   REF   3  LAST  670      35,3116   03576 0                    DELEL
0523   REF   2  LAST  670      35,3117   00033 1                    DELELO
0524                           35,3120   71244 0            BPL     DLOAD
0525   REF   1                 35,3121   73131 0                    NEXTES
0526   REF   4  LAST  672      35,3122   03574 1                    SECMAX
0527                           35,3123   77605 1            DMP
0528   REF   1                 35,3124   33646 0                    THIRD
0529   RFF   5  LAST  672      35,3125   17574 1            STODL   SECMAX
```

```
0530                         35,3126  70446 0           ABS     SR1        CROSSED OVER SOLUTION
0531                         35,3127  52076 1           DCOMP   GOTO       DT=(-SIGN(DTO)//DT//)/2
0532    REF   1              35,3130  73141 1                   RESIGN
0533                         35,3131  51545 1  NEXTES   DLOAD   ABS
0534    REF   4  LAST  672   35,3132  03576 0                   DELEL
0535                         35,3133  51525 1           PDDL    ABS
0536    REF   3  LAST  672   35,3134  00033 1                   DELELO
0537                         35,3135  77625 0           DSU
0538                         35,3136  71240 1           BMN     DLOAD
0539    REF   1              35,3137  73144 1                   REVERS      WRONG DIRECTION
0540                         35,3140  77646 0           ABS
0541                         35,3141  52165 1  RESIGN   SIGN    GOTO
0542    REF   1              35,3142  03606 1                   DELTEEO
0543    REF   2  LAST  672   35,3143  73153 1                   STORDELT
0544                         35,3144  57545 1  REVERS   DLOAD   DCOMP
0545    REF   2  LAST  673   35,3145  03606 1                   DELTEEO
0546                         35,3146  70406 1           PUSH    SR1
0547    REF   3  LAST  673   35,3147  03606 1           STORE   DELTEEO
0548                         35,3150  77615 0           DAD
0549                         35,3151  77650 1           GOTO
0550    REF   1              35,3152  73154 0                   ADTIME
0551    REF   4  LAST  673   35,3153  03606 1  STORDELT STORE   DELTEEO
0552                         35,3154  77615 0  ADTIME   DAD
0553    REF   6  LAST  665   35,3155  02310 1                   NOMTPI     SUM OF DELTA T:S
0554    REF   7  LAST  673   35,3156  02310 1           STORE   NOMTPI
0555                         35,3157  63375 0           VLOAD   PDVL
0556    REF   2  LAST  670   35,3160  03506 1                   VAPREC
0557    REF   2  LAST  670   35,3161  03500 1                   RAPREC
0558                         35,3162  77624 1           CALL
0559    REF   1              35,3163  73400 1                   GOINT
0560                         35,3164  77624 1           CALL
0561    REF   3  LAST  643   35,3165  46423 0                   ACTIVE     STORE NEW RACT3 VACT3
0562                         35,3166  63375 0           VLOAD   PDVL
0563    REF   2  LAST  670   35,3167  03530 1                   VPPREC
0564    REF   2  LAST  670   35,3170  03522 1                   RPPREC
0565                         35,3171  77624 1           CALL
0566    REF   2  LAST  673   35,3172  73400 1                   GOINT
0567                         35,3173  77624 1           CALL
0568    REF   3  LAST  633   35,3174  46433 1                   PASSIVE    STORE NEW RPASS3 VPASS3
0569                         35,3175  77650 1           GOTO
0570    REF   1              35,3176  72722 0                   ELCALC
0571                         35,3177  43345 1  ELEX     DLOAD   DAD
0572    REF  18  LAST  666   35,3200  03636 1                   TTPI
0573    REF   8  LAST  673   35,3201  02310 1                   NOMTPI
0574    REF  19  LAST  673   35,3202  17636 1           STODL   TTPI
0575                         35,3203  77614 1           BON
0576    REF   5  LAST  665   35,3204  01310 1                   ETPIFLAG
0577    REF   2  LAST  671   35,3205  73207 0                   TIMEX
0578    REF  13  LAST  672   35,3206  02250 1           STORE   ELEV
0579                         35,3207  52145 0  TIMEX    DLOAD   GOTO
```

```
 0580    REF    9  LAST  665    35,3210    06505 1                     ZEROVECS
 0581    REF    8  LAST  671    35,3211    03463 0                     NORMEX
```

```
P0582    ..... S34/35.1  .....

R0583    COMPUTE UNIT NORMAL AND LINE OF SIGHT VECTORS GIVEN THE ACTIVE AND
R0584    PASSIVE POS AND VEL AT TIME T3
 0585                              35,3212   52375 1  S34/35.1 VLOAD   VSU
 0586    REF   9  LAST  671        35,3213   03552 0                   RPASS3
 0587    REF  14  LAST  671        35,3214   03536 1                   RACT3
 0588                              35,3215   41456 0           UNIT    PUSH
 0589    REF   4  LAST  670        35,3216   26302 1           STOVL   ULOS
 0590    REF  15  LAST  675        35,3217   03536 1                   RACT3
 0591                              35,3220   53435 0           VXV     UNIT
 0592    REF  10  LAST  671        35,3221   03544 1                   VACT3
 0593    REF   3  LAST  672        35,3222   02252 0           STORE   UNRM
 0594                              35,3223   77616 0           RVQ
```

```
P0595    ..... S34/35.2  .....

R0596    ADVANCE PASSIVE VEH TO RENDEZVOUS TIME AND GET REQ VEL FROM LAMBERT
 0597                            35,3224   77220 1  S34/35.2 STQ      VLOAD
 0598    REF  17  LAST  664      35,3225   03470 1                    SUBEXIT
 0599    REF   7  LAST  671      35,3226   03560 1                    VPASS3
 0600                            35,3227   65315 0           PDVL     PDDL
 0601    REF  10  LAST  675      35,3230   03552 0                    RPASS3
 0602    REF   3  LAST  669      35,3231   03610 0                    INTIMF
 0603                            35,3232   65325 0           PDDL     PDDL
 0604    REF   4  LAST  666      35,3233   03631 0                    TPASS4
 0605    REF   5  LAST  672      35,3234   33642 1                    TWOPI              CONIC
 0606                            35,3235   46125 0           PDDL     BHIZ
 06061   REF   6  LAST  664      35,3236   03467 1                    NN
 06062   REF   1                 35,3237   73243 0                    S3435.23
 06063                           35,3240   77745 1           DLOAD
 06064                           35,3241   41545 0           DLOAD    PUSH
 06065   REF  10  LAST  674      35,3242   06505 1                    ZEROVECS           PRECISION
 06066                           35,3243   77624 1  S3435.23 CALL
 0607    REF   5  LAST  650      35,3244   73404 0                    INTINT             GET TARGET VECTOR
 0608    REF   2  LAST  205      35,3245   27444 0  S3435.25 STOVL    RTARG
 0609    REF  10  LAST  659      35,3246   00C07 0                    VATT
 0610    REF   2  LAST  666      35,3247   27506 1           STOVL    VPASS4
 0611    REF   3  LAST  676      35,3250   03444 0                    RTARG
R0612    COMPUTE PHI = PI +(ACOS(UNIT RA.UNIT RP)-PI)SIGN(RA*RP.U)
 0613                            35,3251   63256 0           UNIT     PDVL               UNIT RP
 0614    REF  16  LAST  675      35,3252   03536 1                    RACT3
 0615                            35,3253   41456 0           UNIT     PUSH               UNIT RA
 0616                            35,3254   5C235 0           VXV      DOT
 0617                            35,3255   00001 0                    OD
 0618    REF   4  LAST  675      35,3256   02252 0                    UNRM               RA*RP.U
 0619                            35,3257   77715 1           PDVL
 0620                            35,3260   72441 0           DOT      SL1                UNIT RA.UNIT RP
 0621                            35,3261   00001 0                    OD
 0622                            35,3262   75326 1           ACOS     SIGN
 0623                            35,3263   43244 1           BPL      DAD
 0624    REF   1                 35,3264   73266 1                    NOPIE
 0625    REF   7  LAST  670      35,3265   06513 0                    DPPOSMAX           REASONABLE TWO PI
 0626    REF   2  LAST  327      35,3266   15754 0  NOPIE    STODL    ACTCENT
 0627    REF   5  LAST  676      35,3267   03631 0                    TPASS4
 0628                            35,3270   77625 0           DSU
 0629    REF   4  LAST  676      35,3271   03610 0                    INTIMF
 0630    REF   4  LAST  210      35,3272   03452 1           STORE    DELLT4
 0631                            35,3273   40335 0           SLOAD    SETPD
 0632    REF   7  LAST  676      35,3274   03467 1                    NN                 NUMBER OF OFFSETS
 0633                            35,3275   00C01 0                    OD
 06331                           35,3276   63325 0           PDDL     PDVL
 06332   REF   1                 35,3277   33654 0                    EPSFOUR
 06333   REF  17  LAST  676      35,3300   03536 1                    RACT3
 06334   REF   1                 35,3301   26314 0           STOVL    RINIT
 06335  REF   11  LAST  675     35,3302    03544 1                   VACT3
 06336  REF    1                35,3303    36322 1            STCALL VINIT
 06337  REF    1                35,3304    22000 1                   INITVFL
 0634                           35,3305    77624 1            CALL
 0635   REF    1                35,3306    73365 0                   LOMAT
 0636                           35,3307    64375 1            VLOAD  MXV
 0637   REF    4  LAST  666     35,3310    02357 1                   DELVEET3
 0638                           35,3311    00001 0                   0D
 0639                           35,3312    77772 0            VSL1
 0640   REF   16  LAST  651     35,3313    37434 0            STCALL DELVLVC
 0641   REF   18  LAST  676     35,3314    03470 1                   SUBEXIT
```

```
P0642    ..... S34/35.3  .....

0643                          35,3315   45020 1  S34/35.3 STQ    CALL
0644     REF   9  LAST  674   35,3316   03463 0                  NORMEX
0645     REF   2  LAST  677   35,3317   73365 0                  LOMAT           GET MATRIX IN PUSH LIST
0646                          35,3320   61375 1           VLOAD  VXM
0647     REF  17  LAST  677   35,3321   03434 1                  DELVLVC         NEW DEL V TPI
0648                          35,3322   00001 0                  0D
0649                          35,3323   77772 0           VSL1
0650     REF   5  LAST  677   35,3324   02357 1           STORE  DELVEET3        SAVE FOR TRANSFORM
0651                          35,3325   63255 0           VAD    PDVL
0652     REF  12  LAST  677   35,3326   03544 1                  VACT3           NEW V REQ
0653     REF  18  LAST  676   35,3327   03536 1                  RACT3
0654                          35,3330   65325 0           PDDL   PDDL
0655     REF  17  LAST  669   35,3331   03442 0                  TIG
0656     REF   6  LAST  676   35,3332   03631 0                  TPASS4
0657                          35,3333   41525 0           PDDL   PUSH
0658     REF   8  LAST  676   35,3334   06513 0                  DPPOSMAX
0659                          35,3335   77624 1           CALL                   INTEG. FOR NEW TARGET VEC
0660     REF   6  LAST  676   35,3336   73404 0                  INTINT
0661                          35,3337   77775 1           VLOAD
0662     REF  13  LAST  660   35,3340   00001 0                  RATT
0663     REF   4  LAST  676   35,3341   03444 0           STORE  RTARG
0664                          35,3342   41575 0  NOVRWRT  VLOAD  PUSH
0665     REF   5  LAST  675   35,3343   02302 1                  ULOS
0666                          35,3344   57435 1           VXV    VCOMP
0667     REF   5  LAST  676   35,3345   02252 0                  UNRM
0668                          35,3346   41456 0           UNIT   PUSH
0669                          35,3347   76435 1           VXV    VSL1
0670     REF   6  LAST  678   35,3350   02302 1                  ULOS
0671                          35,3351   77715 1           PDVL
0672                          35,3352   64315 1           PDVL   MXV
0673     REF   6  LAST  678   35,3353   02357 1                  DELVEET3
0674                          35,3354   00001 0                  0D
0675                          35,3355   77772 0           VSL1
0676     REF   4  LAST  327   35,3356   36274 0           STCALL DVLOS
0677     REF  10  LAST  678   35,3357   03463 0                  NORMEX
```

```
P0678    ..... S34/35.4  .....

 0679                          35,3360   40220 0  S34/35.4 STQ     SETPD            NO ASTRONAUT OVERWRITE
 0680    REF  11  LAST  678    35,3361   03463 0                   NORMEX
 0681                          35,3362   00001 0                   OD
 0682                          35,3363   77650 1           GOTO
 0683    REF   1               35,3364   73342 0                   NOVRWRT
```

```
P0684     ..... LOMAT      .....

 0685                              35,3365   57575 1  LOMAT     VLOAD  VCOMP
 0686    REF   6  LAST  678        35,3366   02252 0                   UNRM
 0687                              35,3367   24007 0            STOVL  6D               Y
 0688    REF  19  LAST  678        35,3370   03536 1                   RACT3
 0689                              35,3371   57456 1            UNIT   VCOMP
 0690                              35,3372   00015 0            STORE  12D
 0691                              35,3373   76435 1            VXV    VSL1
 0692    REF   7  LAST  680        35,3374   02252 0                   UNRM             Z*-Y
 0693                              35,3375   00001 0            STORE  0D
 0694                              35,3376   43401 0            SETPD  RVQ
 0695                              35,3377   00023 0                   18D
 0696                              35,3400   65325 0  GOINT     PDDL   PDDL             DO
 0697    REF  11  LAST  676        35,3401   06505 1                   ZEROVECS           NOT
 0698    REF   9  LAST  673        35,3402   02310 1                   NOMTPI
 0699                              35,3403   41406 0            PUSH   PUSH                           ORDER OR INSERT BEFORE INTINT
 0700                              35,3404   45020 1  INTINT    STQ    CALL
 0701    REF   4  LAST  656        35,3405   03465 0                   RTRN
 0702    REF  19  LAST  658        35,3406   27447 0                   INTSTALL
 0703                              35,3407   71214 0            CLEAR  DLOAD
 0704    REF   8  LAST  659        35,3410   01673 1                   INTYPFLG
 0705                              35,3411   43054 1            BZE    SET
 0706                              35,3412   73414 1                   +2
 0707    REF   9  LAST  680        35,3413   01473 0                   INTYPFLG
 0708                              35,3414   45545 1            DLOAD  STADR
 0709    REF  27  LAST  669        35,3415   63736 0            STODL  TDEC1
 0710                              35,3416   73014 0            SET    LXA,2
 0711    REF   3  LAST  659        35,3417   00063 1                   MOONFLAG
 0712    REF   3  LAST  653        35,3420   02777 1                   RTX2
 0713                              35,3421   43014 0            BON    CLEAR
 0714    REF   3  LAST  641        35,3422   04303 0                   CMOONFLG
 0715    REF   1                   35,3423   73425 0                   ALLSET
 0716    REF   4  LAST  680        35,3424   00263 0                   MOONFLAG
 0717    REF   9  LAST  659        35,3425   25517 0  ALLSET    STOVL  TET
 0718                              35,3426   77657 0            VSR*
 0719                              35,3427   57176 0                   0,2
 0720    REF   6  LAST  659        35,3430   25535 0            STOVL  RCV
 0721                              35,3431   77657 0            VSR*
 0722                              35,3432   57176 0                   0,2
 0723    REF   5  LAST  659        35,3433   35543 0            STCALL VCV
 0724    REF   2  LAST  659        35,3434   27145 1                   INTEGRVS
 0725                              35,3435   52175 0            VLOAD  GOTO
 0726    REF  14  LAST  676        35,3436   00001 0                   RATT
 0727    REF   5  LAST  680        35,3437   03465 0                   RTRN
```

```
P0728     ..... S34/35.5  .....
R0729     SUBROUTINES USED

R0730             BANKCALL
R0731             GOFLASH
R0732             GOTOPOOH
R0733             S34/35.3
R0734             S34/35.4
R0735             VNPOOH

 0736                               35,3440   43020 1  S34/35.5 STQ     BON
 0737     REF  19  LAST  677        35,3441   03470 1                   SUBEXIT
 0738     REF   4  LAST  634        35,3442   01311 0                   FINALFLG
 0739     REF   1                   35,3443   73446 0                   FLAGON
 0740                               35,3444   77614 1           SET
 0741     REF   9  LAST  635        35,3445   00470 1                   UPDATFLG
 0743                               35,3446   77214 0  FLAGON   CLEAR   VLOAD
 0744     REF   1                   35,3447   03274 0                   NTARGFLG
 07441    REF  18  LAST  678        35,3450   03434 1                   DELVLVC
 07442    REF   1                   35,3451   01236 1           STORE   TMPDV              SAVE DV BEFORE DISPLAY
 07443                              35,3452   77776 1           EXIT
 0745     REF   2  LAST  620        35,3453  3 3637 0   +5      CAF     V06N81
 0746     REF 170  LAST  665        35,3454  0 4607 1           TC      BANKCALL
 0747     REF  14  LAST  665        35,3455   20471 1           CADR    GOFLASH
 0748     REF  14  LAST  665        35,3456  0 6001 0           TC      GOTOPOOH
 0749                               35,3457  0 3461 1           TC      +2                 PRO
 0750     REF   2  LAST  681        35,3460  0 3453 0           TC      FLAGON +5          LOAD
 0751     REF   5  LAST  530        35,3461  3 5007 0   +2      CA      EBANK7
 07511    REF  26  LAST  664        35,3462  54 003 0           TS      EBANK              TO BE SURE

 07512                              35,3463  22 007 0           ZL
 07513    REF  12  LAST  614        35,3464  3 4747 1           CA      FIVE
 07514    REF 173  LAST  614        35,3465  54 002 1  NTARGCHK TS      Q
 07515    REF 174  LAST  681        35,3466  50 002 0           INDEX   Q
 07516    REF  19  LAST  681        35,3467  4 1433 0           CS      DELVLVC
 07517    REF 175  LAST  681        35,3470  50 002 0           INDEX   Q
 07518    REF   2  LAST  681        35,3471  6 1235 1           AD      TMPDV
 07519    REF  54  LAST  664        35,3472  26 001 1           ADS     L
 0752     REF 176  LAST  681        35,3473  10 002 1           CCS     Q
 07521    REF   1                   35,3474  1 3465 1           TCF     NTARGCHK
 07522    REF 202  LAST  618        35,3475  22 000 1           LXCH    A
 07523                              35,3476  0 0006 1           EXTEND
 07524                              35,3477  1 3502 1           BZF     +3
 07525    REF  42  LAST  635        35,3500  0 5506 1           TC      UPFLAG
 0753     REF   2  LAST  681        35,3501   00146 1           ADRES   NTARGFLG

 0754     REF  80  LAST  669        35,3502  0 6060 1           TC      INTPRET
 0755                               35,3503   45014 0           BOFF    CALL
 0756     REF   3  LAST  681        35,3504   03354 0                   NTARGFLG
 0757     REF   1                   35,3505   73507 1                   NOCHG
 0758    REF    1                 35,3506    73315 1                       S34/35.3
 0759                             35,3507    77775 1  NOCHG      VLOAD
 0761    REF    7  LAST   678     35,3510    02357 1                       DELVFET3
 0762    REF    9  LAST   651     35,3511    03656 1             STORE     DELVSIN
 0763                             35,3512    77624 1  FLAGOFF    CALL
 0764    REF    1                 35,3513    73360 0                       S34/35.4
 0769                             35,3514    77650 1             GOTO
 0770    REF   20  LAST   681     35,3515    03470 1                       SUBEXIT
```

```
P0771     ..... VN1645     .....

R0772     SUBROUTINES USED

R0773            P3XORP7X
R0774            GET+MGA
R0775            BANKCALL
R0776            DELAYJOB
R0777            COMPTGO
R0778            GOFLASHR
R0779            GOTOPOOH
R0780            FLAGUP

 0781                              35,3516   71220 1  VN1645   STQ     DLOAD
 0782    REF  21  LAST  682        35,3517   03470 1                   SUBEXIT
 0783    REF   1                   35,3520   33652 0                   DP-.01
 0784    REF   3  LAST  620        35,3521   02244 1           STORE   +MGA              MGA = -.01
 0785                              35,3522   71214 0           BOFF    DLOAD
 0786    REF   5  LAST  681        35,3523   01351 1                   FINALFLG
 0787    REF   1                   35,3524   73544 0                   GET45
 0788    REF   2  LAST  683        35,3525   33652 0                   DP-.01
 0789                              35,3526   77615 0           DAD
 0790    REF   3  LAST  683        35,3527   33652 0                   DP-.01
 0791    REF   4  LAST  683        35,3530   02244 1           STORE   +MGA              MGA = -.02
 0792                              35,3531   77414 0           BOFF    EXIT
 0793    REF   1                   35,3532   01742 1                   REFSMFLG
 0794    REF   2  LAST  683        35,3533   73544 0                   GET45
 0795    REF   1                   35,3534  0 3614 1           TC      P3XORP7X
 0796                              35,3535  0 3537 0           TC      +2                P3X
 0797    REF   3  LAST  683        35,3536  0 3545 0           TC      GET45 +1          P7X
 0798    REF  81  LAST  681        35,3537  0 6060 1           TC      INTPRET
 0799                              35,3540   41575 0           VLOAD   PUSH
 0800    REF  10  LAST  682        35,3541   03656 1                   DELVSIN
 0801                              35,3542   77624 1           CALL                      COMPUTE MGA
 0802    REF   1                   35,3543   42006 1                   GET+MGA
 0803                              35,3544   77776 1  GET45    EXIT
 0804    REF   1                   35,3545  0 2437 0           TC      COMPTGO           INITIATE TASK TO UPDATE TTOGO
 0805    REF  22  LAST  683        35,3546  3 1470 0           CA      SUBEXIT
 0806    REF   1                   35,3547  55'464 1           TS      QSAVED
 0807    REF   5  LAST  393        35,3550  3 4770 0           CAF     1SEC
 0808    REF 171  LAST  681        35,3551  0 4607 1           TC      BANKCALL
 0809    REF  11  LAST  531        35,3552   01736 1           CADR    DELAYJOB
 0810    REF   1                   35,3553  3 3640 0           CAF     V16N45            TRKMKCNT, TTOGO, +MGA
 0811    REF 172  LAST  683        35,3554  0 4607 1           TC      BANKCALL
 0812    REF  15  LAST  681        35,3555   20471 1           CADR    GOFLASH
 0813    REF   1                   35,3556  0 3561 0           TC      KILCLOCK          TERMINATE
 0814    REF   1                   35,3557  0 3564 0           TC      N45PROC           PROCEED
 0815    REF   1                   35,3560  0 3574 1           TC      CLUPDATE          RECYCLE - RETURN FOR INITIAL COMPUTATION
 0816    REF  13  LAST  445        35,3561  3 0005 1  KILCLOCK CA      Z
 0817    REF   3  LAST  656        35,3562  55'162 1           TS      DISPDEX
 0818   REF  15  LAST  681    35,3563  0 6001 0           TC      GOTOPOOH
 0819   REF  11  LAST  609    35,3564  4 0076 1  N45PROC  CS      FLAGWRD2
 0820   REF  37  LAST  577    35,3565  7 4737 1           MASK    BIT6
 0821                         35,3566  0 0006 1           EXTEND
 0822   REF   2  LAST  683    35,3567  1 3561 1           BZF     KILCLOCK       FINALFLG IS SET-FLASH V37-AWAIT NEW PGM
 0823   REF  27  LAST  535    35,3570  0 5355 1           TC      PHASCHNG
 0824                         35,3571   04024 0           OCT     04024
 0825   REF  43  LAST  681    35,3572  0 5506 1           TC      UPFLAG          SET
 0826   REF   6  LAST  683    35,3573   00047 1           ADRES   FINALFLG       FINALFLG
 0827   REF  14  LAST  683    35,3574  3 0005 1  CLUPDATE CA      Z
 0828   REF   4  LAST  683    35,3575  55'162 1           TS      DISPDEX
 0829   REF  28  LAST  684    35,3576  0 5355 1           TC      PHASCHNG
 0830                         35,3577   04024 0           OCT     04024
 0831   REF  82  LAST  683    35,3600  0 6060 1           TC      INTPRET
 0832                         35,3601   52014 0           CLEAR   GOTO
 0833   REF  10  LAST  681    35,3602   0C670 0                   UPDATFLG
 0834   REF   2  LAST  683    35,3603   03464 1                   QSAVED
```

```
P0835    ..... DISPLAYE  .....

R0836    SUBROUTINES USED

R0837           BANKCALL
R0838           GOFLASHR
R0839           GOTOPOOH
R0840           BLANKET
R0841           ENDOFJOB

 0842                                 35,3604   0 0006 1  DISPLAYE EXTEND
 0843    REF  12  LAST  679    35,3605  23'463 1           QXCH    NORMEX
 0844    REF   2  LAST  628    35,3606   3 3634 0           CAF     V06N55
 0845    REF 173  LAST  683    35,3607   0 4607 1           TCR     BANKCALL
 0846    REF  16  LAST  683    35,3610    20471 1           CADR    GOFLASH
 0847    REF  16  LAST  684    35,3611   1 6001 1           TCF     GOTOPOOH
 0848    REF  13  LAST  685    35,3612   0 1463 1           TC      NORMEX
 0849                           35,3613   1 3606 0           TCF     -5
```

```
P0853    ..... P3XORP7X  .....

 0854    REF   2  LAST  257    35,3614  3 7765 1  P3XORP7X CAF     HIGH9
 0855    REF  10  LAST  513    35,3615  7 1010 0           MASK    MODREG
 0856                          35,3616  0 0006 1           EXTEND
 0857                          35,3617  1 3621 0           BZF     +2
 0858    REF 177  LAST  681    35,3620  24 002 0           INCR    Q
 0859                          35,3621  0 0002 0           RETURN

R0860    ..... VNPOOH     .....

R0861    SUBROUTINES USED

R0862          BANKCALL
R0863          GOFLASH
R0864          GOTOPOOH

 0865                          35,3622  0 0006 1  VNPOOH   EXTEND
 0866    REF   6  LAST  680    35,3623  23'465 1           QXCH    RTRN
 0867    REF   3  LAST  636    35,3624  55'615 0           TS      VERBNOUN
 0868    REF   4  LAST  686    35,3625  3 1615 1           CA      VERBNOUN
 0869    REF 174  LAST  685    35,3626  0 4607 1           TCR     BANKCALL
 0870    REF  17  LAST  685    35,3627   20471 1           CADR    GOFLASH
 0871    REF  17  LAST  685    35,3630  1 6001 1           TCF     GOTOPOOH
 0872    REF   7  LAST  686    35,3631  0 1465 1           TC      RTRN
 0873                          35,3632  1 3625 1           TCF     -5
```

```
P0874    ..... CONSTANTS .....

 0875                       35,3633   01445 0  V06N37   VN      0637
 0876                       35,3634   01467 0  V06N55   VN      0655
 0877                       35,3635   01472 1  V06N58   VN      0658
 0878                       35,3636   01473 0  V06N59   VN      0659
 0879                       35,3637   01521 0  V06N81   VN      0681
 0880                       35,3640   04055 0  V16N45   VN      1645
 0881                       35,3641   14441 0  TWOPI    2DEC    6.283185307 B-4
 0881                       35,3642   37325 1
 0882                       35,3643   00001 0  MAX250   2DEC    25 E3
 0882                       35,3644   20650 0
 0883                       35,3645   12525 0  THIRD    2DEC    .333333333
 0883                       35,3646   12525 0
 0884                       35,3647   00004 0  ELEPS    2DEC    .27777777 E-3
 0884                       35,3650   21505 1
 0886                       35,3651   77777 0  DP-.01   OCT     77777          CONSTANTS
 0887                       35,3652   61337 1           OCT     61337          ADJACENT       -.01 FOR MGA DSP
 08871                      35,3653   01252 0  EPSFOUR  2DEC    .0416666666
 08871                      35,3654   25253 1
 08872                      35,3655   13434 0  130DEG   2DEC    .3611111111
 08872                      35,3656   16162 0
```

```
P0888   ..... INITVEL .....

R0889   MOD NO -1        LOG SECTION - P34-P35, P74-P75
R0890   MOD BY WHITE.P   DATE  21NOV67

R0891   FUNCTIONAL DESCRIPTION

R0892          THIS SUBROUTINE COMPUTES THE REQUIRED INITIAL VELOCITY VECTOR FOR
R0893          A TRAJECTORY OF SPECIFIED TRANSFER TIME BETWEEN SPECIFIED INITIAL
R0894          AND TARGET POSITIONS.  THE TRAJECTORY MAY BE EITHER CONIC OR
R0895          PRECISION DEPENDING ON AN INPUT PARAMETER (NAMELY, NUMBER OF
R0896          OFFSETS).  IN ADDITION, IN THE PRECISION TRAJECTORY CASE, THE
R0897          SUBROUTINE ALSO COMPUTES AN OFFSET TARGET VECTOR, TO BE USED
R0898          DURING PURE-CONIC CROSS-PRODUCT STEERING.  THE OFFSET TARGET
R0899          VECTOR IS THE TERMINAL POSITION VECTOR OF A CONIC TRAJECTORY WHICH
R0900          HAS THE SAME INITIAL STATE AS A PRECISION TRAJECTORY WHOSE
R0901          TERMINAL POSITION VECTOR IS THE SPECIFIED TARGET VECTOR.

R0902          IN ORDER TO AVOID THE INHERENT SINGULARITIES IN THE 180 DEGREE
R0903          TRANSFER CASE WHEN THE (TRUE OR OFFSET) TARGET VECTOR MAY BE
R0904          SLIGHTLY OUT OF THE ORBITAL PLANE, THIS SUBROUTINE ROTATES THIS
R0905          VECTOR INTO A PLANE DEFINED BY THE INPUT INITIAL POSITION VECTOR
R0906          AND ANOTHER INPUT VECTOR (USUALLY THE INITIAL VELOCITY VECTOR),
R0907          WHENEVER THE INPUT TARGET VECTOR LIES INSIDE A CONE WHOSE VERTEX
R0908          IS THE ORIGIN OF COORDINATES, WHOSE AXIS IS THE 180 DEGREE
R0909          TRANSFER DIRECTION, AND WHOSE CONE ANGLE IS SPECIFIED BY THE USER.

R0910          THE LAMBERT SUBROUTINE IS UTILIZED FOR THE CONIC COMPUTATIONS AND
R0911          THE COASTING INTEGRATION SUBROUTINE IS UTILIZED FOR THE PRECISION
R0912          TRAJECTORY COMPUTATIONS.

R0913   CALLING SEQUENCE

R0914          L          CALL
R0915          L+1                 INITVEL
R0916          L+2        (RETURN - ALWAYS)

R0917   INPUT

R0918          (1) RINIT    INITIAL POSITION RADIUS VECTOR
R0919          (2) VINIT    INITIAL POSITION VELOCITY VECTOR
R0920          (3) RTARG    TARGET POSITION RADIUS VECTOR
R0921          (4) DELLT4   DESIRED TIME OF FLIGHT FROM RINIT TO RTARG
R0922          (5) INTIME   TIME OF RINIT
R0923          (6) 0D       NUMBER OF ITERATIONS OF LAMBERT/INTEGRVS
R0924          (7) 2D       ANGLE TO 180 DEGREES WHEN ROTATION STARTS
R0925          (8) RTX1     -2 FOR EARTH, -10D FOR LUNAR
R09251         (9) RTX2     COORDINATE SYSTEM ORIGIN - 0 FOR EARTH, 2 FOR LUNAR
R0926          PUSHLOC SET AT 4D
```

```
R0927   OUTPUT

R0928          (1) RTARG    OFFSET TARGET POSITION VECTOR
R0929          (2) VIPRIME  MANEUVER VELOCITY REQUIRED
R0930          (3) VTPRIME  VELOCITY AT TARGET AFTER MANEUVER
R0931          (4) DELVEET3 DELTA VELOCITY REQUIRED FOR MANEUVER

R0932   SUBROUTINES USED

R0933          LAMBERT
R0934          INTSTALL
R0935          INTEGRVS

 0936   REF   1                11,2000                          SETLOC INTVEL
 0937                          11,2000                          BANK

 0938   REF   1                                                 COUNT* $$/INITV
 0958                          11,2000    77614 1  INITVEL   SET                    COGA GUESS NOT AVAILABLE
 0959   REF   1                11,2001    0C475 1                   GUESSW
 0960                          11,2002    44175 1  HAVEGUES  VLOAD  STQ
 0961   REF   5  LAST   678    11,2003    03444 0                   RTARG
 0962   REF  14  LAST   685    11,2004    03463 0                   NORMEX
 0963   REF   1                11,2005    03472 0            STORE  RTARG1
 09631                         11,2006    77646 0            ABVAL
 09632  REF   2  LAST   149    11,2007    03723 1            STORE  RTMAG
 0964                          11,2010    46135 1            SLOAD  BHIZ
 0965   REF   4  LAST   680    11,2011    03000 1                   RTX2
 0967   REF   1                11,2012    22026 0                   INITVEL1
 0968                          11,2013    72575 0            VLOAD  VSL2
 0969   REF   2  LAST   676    11,2014    02314 0                   RINIT           B29
 0970   REF   3  LAST   689    11,2015    26314 0            STOVL  RINIT           B27
 0971   REF   2  LAST   677    11,2016    02322 0                   VINIT           B7
 0972                          11,2017    77752 1            VSL2
 0973   REF   3  LAST   689    11,2020    26322 0            STOVL  VINIT           B5
 0974   REF   2  LAST   689    11,2021    03472 0                   RTARG1
 0975                          11,2022    77752 1            VSL2
 0976   REF   3  LAST   689    11,2023    03472 0            STORE  RTARG1
 09761                         11,2024    77646 0            ABVAL
 09762  REF   3  LAST   689    11,2025    03723 1            STORE  RTMAG
R0977          INITIALIZATION

 0978                          11,2026    71331 0  INITVEL1  SSP    DLOAD           SET ITCTR TO -1,LOAD MPAC WITH E4(PL 2D)
 0979   REF   1                11,2027    C3617 1                   ITCTR
 0980                          11,2030    77776 1                   0 -1
 0981                          11,2031    70546 1            COSINE SR1             CALCULATE COSINE (E4)  (+2)
 0982   REF   1                11,2032    17667 0            STODL  COZY4           SET COZY4 TO COSINE(E4)          (PL 0D)
 0983                          11,2033    67154 0            LXA,2  SXA,2
 0984   REF 267  LAST   671    11,2034    00154 1                   MPAC
 0985   REF   2  LAST   130    11,2035    02701 0                   VTARGTAG        SET VTARGTAG TO 0D (SP)
 0986                          11,2036    77775 1            VLOAD
```

```
0987    REF  4  LAST  689   11,2037   02314 0                    RINIT
0988    REF  3  LAST  130   11,2040   26655 0             STOVL  R1VEC            R1VEC EQ RINIT
0989    REF  4  LAST  689   11,2041   03472 0                    RTARG1
0990    REF  2  LAST  130   11,2042   16663 0             STODL  R2VEC            R2VEC EQ RTARG
0991    REF  5  LAST  676   11,2043   03452 1                    DELLT4
0992    REF  2  LAST  130   11,2044   02671 0             STORE  TDESIRED         TDESIRED EQ DELLT4
0993                        11,2045   77201 1             SETPD  VLOAD
0994                        11,2046   00001 0                    0D               INITIALIZE PL TO 0D
0995    REF  5  LAST  690   11,2047   02314 0                    RINIT            MPAC EQ RINIT (+29)
0996                        11,2050   41456 0             UNIT   PUSH             UNIT(RI)  (+1)                          (PL 6D)
0997                        11,2051   53435 0             VXV    UNIT
0998    REF  4  LAST  689   11,2052   02322 0                    VINIT            MPAC EQ UNIT(RI) X VI   (+8)
0999    REF  2  LAST  130   11,2053   26674 0             STOVL  UN
1000    REF  5  LAST  690   11,2054   03472 0                    RTARG1
1001                        11,2055   50256 0             UNIT   DOT              TEMP=URT.URI  (+2)                      (PL 0D)
1002                        11,2056   43015 1             DAD    CLEAR
1003    REF  2  LAST  689   11,2057   03667 0                    COZY4
1004    REF  1              11,2060   03665 1                    NORMSW
1005    REF  3  LAST  690   11,2061   03667 0             STORE  COZY4
1006                        11,2062   43044 0   INITVEL2  BPL    SET
1007    REF  1              11,2063   22105 0                    INITVEL3         UN CALCULATED IN LAMBERT
1008    REF  2  LAST  690   11,2064   03465 0                    NORMSW
R1009       ROTATE  RC INTO YC PLANE - SET UNIT NORMAL TO YC

1010                        11,2065   41575 0             VLOAD  PUSH                                                     (PL 6D)
1011    REF  3  LAST  690   11,2066   02663 0                    R2VEC            RC TO 6D  (+29)
1012                        11,2067   63246 1             ABVAL  PDVL             RC TO MPAC, ABVAL(RC) (+29) TO 0D(PL 2D)
1013                        11,2070   46206 1             PUSH   VPROJ                                                    (PL 8D)
1014    REF  3  LAST  690   11,2071   02674 0                    UN
1015                        11,2072   51352 1             VSL2   BVSU
1016                        11,2073   74256 0             UNIT   VXSC                                                     (PL 0D)
1017                        11,2074   77772 0             VSL1
1018    REF  4  LAST  690   11,2075   02663 0             STORE  R2VEC
1019                        11,2076   67351 1             TLOAD  SLOAD
1020    REF  2  LAST   38   11,2077   24007 0                    ZEROVEC
1021    REF  2  LAST  689   11,2100   03617 1                    ITCTR
1022                        11,2101   77244 0             BPL    VLOAD
1023    REF  2  LAST  690   11,2102   22105 0                    INITVEL3
1024    REF  5  LAST  690   11,2103   02663 0                    R2VEC
1025    REF  6  LAST  690   11,2104   03472 0             STORE  RTARG1
1026                        11,2105   63345 0   INITVEL3  DLOAD  PDVL                                                     (PL 2D)
1027    REF  1              11,2106   26007 1                    MUEARTH          POSITIVE VALUE
1028    REF  6  LAST  690   11,2107   02663 0                    R2VEC
102802                      11,2110   63256 0             UNIT   PDVL             2D = UNIT(R2VEC)                        (PL 8D)
102804  REF  4  LAST  690   11,2111   02655 0                    R1VEC
102806                      11,2112   41456 0             UNIT   PUSH             8D = UNIT(R1VEC)                        (PL14D)
102808                      11,2113   57435 1             VXV    VCOMP            -N = UNIT(R2VEC) X UNIT(R1VEC)
10281                       11,2114   00003 1                    2D
10282                       11,2115   77606 1             PUSH                                                            (PL20D)
10283                       11,2116   71350 1             LXA,1  DLOAD
```

```
 10284  REF    6  LAST  665   11,2117   02776 0                      RTX1
 10285                        11,2120   00023 0                      18D
 10286                        11,2121   62040 1             BMN      INCR,1
 10287                        11,2122   22124 0                      +2
 10288                        11,2123   77767 1             DEC      -8
 10289                        11,2124   67310 1             INCR,1 SLOAD
 1029                         11,2125   00012 1                      10D
 10291  REF   14  LAST  672   11,2126   00047 1                      X1
 10292                        11,2127   77230 0             BHIZ     VLOAD                                          (PL14D)
 10293                        11,2130   22132 1                      +2
 10294                        11,2131   41476 1             VCOMP    PUSH                                           (PL20D)
 10295                        11,2132   77775 1             VLOAD                                                   (PL14D)
 10296                        11,2133   50235 0             VXV      DOT                                            (PL 2D)
 1032                         11,2134   71244 0             BPL      DLOAD                                          (PL 0D)
 1033   REF    1              11,2135   22137 1                      INITVEL4
 1034                         11,2136   41476 1             DCOMP    PUSH                                           (PL 2D)
 1035                         11,2137   67154 0   INITVEL4  LXA,2    SXA,2
 1036                         11,2140   00000 1                      0D
 1037   REF    2  LAST  130   11,2141   02672 0                      GEOMSGN
R1038      SET INPUTS UP FOR LAMBERT

 1039                         11,2142   66350 1             LXA,1    SSP
 1040   REF    7  LAST  691   11,2143   02776 0                      RTX1
 10401  REF    1              11,2144   00027 1                      ITERCTR
 10402                        11,2145   00024 1                      20D
R1041       OPERATE THE LAMBERT CONIC ROUTINE (COASTFLT SUBROUTINE)

 1042                         11,2146   77624 1             CALL
 1043   REF    1              11,2147   25212 1                      LAMBERT

R1044   ARRIVED AT SOLUTION IS GOOD ENOUGH ACCORDING TO SLIGHTLY WIDER BOUNDS.

 1045                         11,2150   77214 0             CLEAR    VLOAD
 1046   REF    2  LAST  689   11,2151   00675 0                      GUESSW
 1047   REF    8  LAST  666   11,2152   02744 1                      VVEC
R1048   STORE CALCULATED INITIAL VELOCITY REQUIRED IN VIPRIME
R1049
 1050   REF    2  LAST  666   11,2153   16330 0             STODL    VIPRIME         INITIAL VELOCITY REQUIRED  (+7)
R1051
R1052       IF NUMIT IS ZERO, CONTINUE AT INITVELB, OTHERWISE
R1053   SET UP INPUTS FOR ENCKE INTEGRATION (INTEGRVS).

 1054   REF    3  LAST  689   11,2154   02702 0                      VTARGTAG
 1055                         11,2155   45030 0             BHIZ     CALL
 1056   REF    1              11,2156   22233 0                      INITVEL7
 1057   REF   20  LAST  680   11,2157   27447 0                      INTSTALL
 1061                         11,2160   43135 1             SLOAD    CLEAR
 1062   REF    5  LAST  689   11,2161   03000 1                      RTX2
 1063   REF    5  LAST  680   11,2162   00263 0                      MOONFLAG
 1064                         11,2163   43030 0             BHIZ     SET
 1065   REF   1              11,2164   22166 0                      INITVEL5
 1066   REF   6  LAST  691   11,2165   00063 1                      MOONELAG
 1067                        11,2166   77775 1  INITVEL5 VLOAD
 1068   REF   6  LAST  690   11,2167   02314 0                      RINIT
 1069   REF   5  LAST  690   11,2170   02655 0           STORE      R1VEC
 1070   REF   7  LAST  680   11,2171   25535 0           STOVL      RCV
 1071   REF   3  LAST  691   11,2172   02330 0                      VIPRIME
 1072   REF   6  LAST  680   11,2173   15543 1           STODL      VCV
 1073   REF   5  LAST  676   11,2174   03610 0                      INTIME
 1074   REF  10  LAST  680   11,2175   01517 0           STORE      TET
 1075                        11,2176   43015 1           DAD        CLEAR
 1076   REF   6  LAST  690   11,2177   03452 1                      DELLT4
 1077   REF  10  LAST  680   11,2200   01673 1                      INTYPFLG
 1078   REF  28  LAST  680   11,2201   34041 0           STCALL     TDEC1
 1079   REF   3  LAST  680   11,2202   27145 1                      INTEGRVS
 1080                        11,2203   77775 1           VLOAD
 1081   REF   8  LAST  659   11,2204   00025 0                      VATT1
 1082   REF   2  LAST  130   11,2205   02703 1           STORE      VTARGET
R1083     IF ITERATION COUNTER (ITCTR) EQ NO. ITERATIONS (NUMIT), CONTINUE AT
R1084    INITVELC, OTHERWISE REITERATE LAMBERT AND ENCKE

 1085                        11,2206   63154 1           LXA,2      INCR,2
 1086   REF   3  LAST  690   11,2207   03616 0                      ITCTR
 1087                        11,2210   00001 0                      1D           INCREMENT ITCTR
 1088                        11,2211   55134 1           SXA,2      XSU,2
 1089   REF   4  LAST  692   11,2212   03616 0                      ITCTR
 1090   REF   4  LAST  691   11,2213   02701 0                      VTARGTAG
 1091                        11,2214   46135 1           SLOAD      BHIZ         IF SP(MPAC) EQ 0, CONTINUE AT INITVELC
 1092   REF   9  LAST  659   11,2215   00050 1                      X2
 1093   REF   1              11,2216   22230 0                      INITVEL6
R1094
R1095      OFFSET CONIC TARGET VECTOR

 1096                        11,2217   52375 1           VLOAD      VSU
 1097   REF   7  LAST  690   11,2220   03472 0                      RTARG1
 1098   REF   5  LAST  659   11,2221   00017 1                      RATT1
 1099                        11,2222   77655 1           VAD
 1100   REF   7  LAST  690   11,2223   02663 0                      R2VEC
 1101   REF   8  LAST  692   11,2224   16663 0           STODL      R2VEC
 1102   REF   4  LAST  690   11,2225   03667 0                      COZY4
 1103                        11,2226   77650 1           GOTO
 1104   REF   1              11,2227   22062 0                      INITVEL2     CONTINUE ITERATING AT INITVEL2
R1105    COMPUTE THE DELTA VELOCITY

 1106                        11,2230   77775 1  INITVEL6 VLOAD
 1107   REF   9  LAST  692   11,2231   02663 0                      R2VEC
 1108   REF   8  LAST  692   11,2232   03472 0           STORE      RTARG1
 1109                        11,2233   52375 1  INITVEL7 VLOAD      VSU
 1110   REF   4  LAST  692   11,2234   02330 0                      VIPRIME
 1111   REF   5  LAST  690   11,2235   02322 0                      VINIT
 1112    REF   8  LAST  682   11,2236   26357 1           STOVL  DELVEET3        DELVEET3 = VIPRIME-VINIT  (+7)
 1113    REF   3  LAST  692   11,2237   02703 1                  VTARGET
 1114    REF   2  LAST  666   11,2240   03566 1           STORE  VTPRIME
 1115                         11,2241   46135 1           SLOAD  BH1Z
 1116    REF   6  LAST  691   11,2242   03000 1                  RTX2
 1117    REF   1              11,2243   22260 0                  INITVELX
 11171                        11,2244   70575 1           VLOAD  VSR2
 11172   REF   3  LAST  693   11,2245   03566 1                  VTPRIME
 1118    REF   4  LAST  693   11,2246   27566 1           STOVL  VTPRIME
 1119    REF   5  LAST  692   11,2247   02330 0                  VIPRIME
 1120                         11,2250   77742 0           VSR2
 1121    REF   6  LAST  693   11,2251   26330 0           STOVL  VIPRIME
 1122    REF   9  LAST  692   11,2252   03472 0                  RTARG1
 1123                         11,2253   77742 0           VSR2
 1124    REF  10  LAST  693   11,2254   27472 0           STOVL  RTARG1
 1125    REF   9  LAST  693   11,2255   02357 1                  DELVEET3
 1126                         11,2256   77742 0           VSR2
 1127    REF  10  LAST  693   11,2257   02357 1           STORE  DELVEET3
 1128                         11,2260   70750 1  INITVELX LXA,1  DLOAD*
 11281   REF   8  LAST  691   11,2261   02776 0                  RTX1
 11282   REF   1              11,2262   10003 0                  MUTABLE -2,1
 112825                       11,2263   41206 0           PUSH   DMP
 11283   REF   3  LAST  654   11,2264   02742 1                  R1A
 11284                        11,2265   56342 1           SR1    DDV
 11285   REF   4  LAST  654   11,2266   00041 1                  R1
 11286   REF   2  LAST  149   11,2267   17721 0           STODL  MU/A
 11287                        11,2270   77661 0           SR
 112871                       11,2271   20607 1                  6
 112875  REF   2  LAST  149   11,2272   03717 0           STORE  MUASTEER
 11288                        11,2273   77201 1           SETPD  VLOAD
 1129                         11,2274   00001 0                  0D
 1130    REF  11  LAST  693   11,2275   03472 0                  RTARG1
 1131    REF   6  LAST  689   11,2276   03444 0           STORE  RTARG
 1132                         11,2277   52014 0           CLEAR  GOTO
 1133    REF   3  LAST  648   11,2300   01267 0                  XDELVFLG
 1134    REF  15  LAST  689   11,2301   03463 0                  NORMEX
R1135
R1136     ..... END OF INITVEL ROUTINE .....
```

```
P1137   ..... MIDGIM .....

R1138   MOD NO. 0, BY WILLMAN, SUBROUTINE RENDGUID, LOG P34-P35, P74-P75
R1139    REVISION 03, 17 FEB 67

R1140            IF THE ACTIVE VEHICLE IS DOING THE COMPUTATION, MIDGIM COMPUTES
R1141   THE POSITIVE MIDDLE GIMBAL ANGLE OF THE ACTIVE VEHICLE TO THE INPUT
R1142   DELTA VELOCITY VECTOR (DV IN PUSH LIST),  OTHERWISE
R1143   MIDGIM CONVERTS THE INPUT DELTA VELOCITY VECTOR FROM INERTIAL COORDIN-
R1144   ATES TO LOCAL VERTICAL COORDINATES OF THE ACTIVE VEHICLE.

R1145     .. INPUTS ..

R1146      NAME        MEANING                                  UNITS/SCALING/MODE

R1147     AVFLAG  INT FLAG - 0 IS CSM ACTIVE, 1 IS LEM ACTIVE             BIT
R1149     RINIT   ACTIVE VEHICLE RADIUS VECTOR               METERS/CSEC (+7) VT
R1150     VINIT   ACTIVE VEHICLE VELOCITY VECTOR             METERS/CSEC (+7) VT
R1151     DV (PL) ACTIVE VEHICLE DELTA VELOCITY VECTOR       METERS/CSEC (+7) VT

R1152     .. OUTPUTS ..

R1153      NAME        MEANING                                  UNITS/SCALING/MODE

R1154       +MGA  + MIDDLE GIMBAL ANGLE                     REVOLUTIONS (+0)  DP
R1155     DELVLVC DELTA VELOCITY VECTOR IN LV COORD.        METERS/CSEC (+7)  VT
R1156    MGLVFLAG INT FLAG - 0 IS +MGA COMPUTED, 1 IS DELVLVC COMP.  -     BIT

R1157     .. CALLING SEQUENCE ..

R1158   L         CALL
R1159   L+1            MIDGIM
R1160   L+2       (RETURN - ALWAYS)

R1161     .. NO SUBROUTINES CALLED ..

R1162     .. DEBRIS - ERASEABLE TEMPORARY USAGE

R1163          A,Q,L, PUSH LIST, MPAC.

R1164     .. ALARMS - NONE ..
```

```
P1165   MIDDLE GIMBAL ANGLE COMPUTATION.

1166    REF   1             22,2000                       SETLOC MIDDGIM
1167                        22,3242                       BANK

1168    REF   1                                           COUNT* $$/MIDG

1169                        22,3242   20000 0   HALFREV   2DEC   1 B-1
1169                        22,3243   00000 1
1170    REF   1             21,2000                       SETLOC MIDDGIM1
1171                        21,2006                       BANK
1172    REF   1                                           COUNT* $$/MIDG

1176                        21,2006   53575 0   GET+MGA   VLOAD  UNIT               (PL 0D) V (+7) TO MPAC, UNITIZE  UV (+1)
11765                       21,2007   77656 1             UNIT
1177                        21,2010   72441 0             DOT    SL1                DOT UV WITH Y(STABLE MEMBER) AND RESCALE
1178    REF  18  LAST  612  21,2011   01740 0                    REFSMMAT +6         FROM +2 TO +1 FOR ASIN ROUTINE
1179                        21,2012   51136 1             ARCSIN BPL
1180    REF   1             21,2013   42017 1                    SETMGA
1181                        21,2014   43215 0             DAD    DAD                CONVERT -MGA TO +MGA BY
1182    REF   1             21,2015   05243 1                    HALFREV            ADDING ONE REVOLUTION
1183    REF   2  LAST  695  21,2016   05243 1                    HALFREV
1184    REF   5  LAST  683  21,2017   02244 1   SETMGA    STORE  +MGA
1185                        21,2020   43414 1             CLR    RVQ                CLEAR MGLVFLAG TO INDICATE +MGA CALC
1186    REF   1             21,2021   02675 1                    MGLVFLAG               AND EXIT
1191                        21,2022   53575 0   GET.LVC   VLOAD  UNIT               (PL 6D)   R (+29) IN MPAC, UNITIZE  UR
1192    REF   7  LAST  692  21,2023   02314 0                    RINIT
1193                        21,2024   77676 0             VCOMP                     U(-R)
1194                        21,2025   00023 0             STORE  18D                U(-R) TO 18D
1195                        21,2026   53435 0             VXV    UNIT               U(-R)*V EQ V*U(R), U(V*R)
1196    REF   6  LAST  692  21,2027   02322 0                    VINIT
1197                        21,2030   00015 0             STORE  12D                U(V*R) TO 12D
1198                        21,2031   53435 0             VXV    UNIT               U(V*R)*U(-R), U((V*R)*(-R))
1199                        21,2032   00023 0                    18D
1200                        21,2033   24007 0             STOVL  6D                 TRANSFORMATION MATRIX IS IN 6D (+1)
1201                        21,2034   00001 0                    0D                 DELTA V (+7) IN 0D
1202                        21,2035   76521 0             MXV    VSL1               CONVERT FROM INER COOR TO LV COOR (+8)
1203                        21,2036   00007 0                    6D                  AND SCALE +7 IN MPAC
1204    REF  20  LAST  681  21,2037   03434 1             STORE  DELVLVC            STORE IN DELVLVC (+7)
1205                        21,2040   43414 1             SET    RVQ                SET MGLVFLAG TO INDICATE LVC CALC
1206    REF   2  LAST  695  21,2041   02475 0                    MGLVFLAG               AND EXIT
R1207      ..... END OF MIDGIM ROUTINE .....
```

```
P1208
 12082                         10,2000                        BANK    10
 12084  REF    1               10,2000                        SETLOC  SLCTMU
 12086                         10,2000                        BANK
 12088  REF    1                                              COUNT*  $$/MIDG

 1209                          10,2000   77160 0  SELECTMU  AXC,1   AXT,2
 1210                          10,2001   00002 0                    2D
 1211                          10,2002   00000 1                    0D
 1212                          10,2003   77614 1            BOFF
 1213   REF    4  LAST   680   10,2004   04343 1                    CMOONFLG
 1214   REF    1               10,2005   20011 0                    SETMUER
 1215                          10,2006   77160 0            AXC,1   AXT,2
 1216                          10,2007   00012 1                    10D
 1217                          10,2010   00002 0                    2D
 1218                          10,2011   66143 1  SETMUER   DLOAD*  SXA,1
 1219   REF    2  LAST   693   10,2012   10011 0                    MUTABLE +4,1
 1220   REF    9  LAST   693   10,2013   02776 0                    RTX1
 1221   REF    4  LAST   641   10,2014   22310 0            STODL*  RTSR1/MU
 1222   REF    3  LAST   696   10,2015   10003 0                    MUTABLE -2,1
 1223                          10,2016   54214 1            BOFF    SR
 1224   REF    5  LAST   696   10,2017   04343 1                    CMOONFLG
 1225   REF    1               10,2020   20022 0                    RTRNMU
 1226                          10,2021   20607 1                    6D
 1227   REF    4  LAST   654   10,2022   02312 0  RTRNMU    STORE   RTMU
 1228                          10,2023   43134 0            SXA,2   CLEAR
 1229   REF    7  LAST   693   10,2024   02777 1                    RTX2
 1230   REF    7  LAST   684   10,2025   01271 1                    FINALFLG
 1234                          10,2026   77650 1            GOTO
 1235   REF    6  LAST   669   10,2027   73516 1                    VN1645
```

```
P1236    ..... PERIAPO .....

R1237    MOD NO -1         LOG SECTION - P34-P35, P74-P75
R1238    MOD BY WHITE.P  DATE  18JAN68

R1239    FUNCTIONAL DESCRIPTION

R1240          THIS SUBROUTINE COMPUTES THE TWO BODY APOCENTER AND PERICENTER
R1241          ALTITUDES GIVEN THE POSITION AND VELOCITY VECTORS FOR A POINT ON
R1242          THE TRAJECTORY AND THE PRIMARY BODY.

R1243          SETRAD IS CALLED TO  DETERMINE THE RADIUS OF THE PRIMARY BODY.

R1244          APSIDES IS CALLED TO SOLVE FOR THE TWO BODY RADII OF APOCENTER AND
R1245          PERICENTER AND THE ECCENTRICITY OF THE TRAJECTORY.

R1246    CALLING SEQUENCE

R1247          L          CALL
R1248          L+1                PERIAPO
R1249          L+2        (RETURN - ALWAYS)

R1250    INPUT

R1251          (1) RVEC      POSITION VECTOR IN METERS
R1252                        SCALE FACTOR - EARTH +29, MOON +27
R1253          (2) VVEC      VELOCITY VECTOR IN METERS/CENTISECOND
R1254                        SCALE FACTOR - EARTH +7, MOON +5
R1255          (3) X1        PRIMARY BODY INDICATOR
R1256                        EARTH -2, MOON -10

R1257    OUTPUT

R1258          (1) 2D        APOCENTER RADIUS IN METERS
R1259                        SCALE FACTOR - EARTH +29, MOON +27
R1260          (2) 4D        APOCENTER ALTITUDE IN METERS
R1261                        SCALE FACTOR - EARTH +29, MOON P27
R1262          (3) 6D        PERICENTER RADIUS IN METERS
R1263                        SCALE FACTOR - EARTH +29, MOON +27
R1264          (4) 8D        PERICENTER ALTITUDE IN METERS
R1265                        SCALE FACTOR - EARTH +29, MOON +27
R1266          (5) ECC       ECCENTRICITY OF CONIC TRAJECTORY
R1267                        SCALE FACTOR - +3
R1268          (6) XXXALT    RADIUS OF THE PRIMARY BODY IN METERS
R1269                        SCALE FACTOR - EARTH +29, MOON +27
R1270          (7) PUSHLOC   EQUALS 10D

R1271    SUBROUTINES USED

R1272          SETRAD
```

```
R1273          APSIDES

 1274   REF    1              23,2000                            SETLOC APOPERI
 1275                         23,2335                            BANK

 1276   REF    1                                                 COUNT* $$/PERAP

 1277                         23,2335    00302 0  RPAD           2DEC    6373338 B-29    STANDARD RADIUS  OF PAD 37-B.
 1277                         23,2336    17755 0
A1278                                                                                    = 20 909 901.57 FT

 1279                         23,2337    53754 1  PERIAPO1 LXA,2  VSR*
 1280   REF    8  LAST  696   23,2340    02777 1                  RTX2
 1281                         23,2341    57176 0                  0,2
 1282   REF    9  LAST  691   23,2342    26744 1           STOVL  VVEC
 1283                         23,2343    53750 0           LXA,1  VSR*
 1284   REF   10  LAST  696   23,2344    02776 0                  RTX1
 1285                         23,2345    57176 0                  0,2
 1286   REF    7  LAST  666   23,2346    02655 0           STORE  RVEC
 1287                         23,2347    45020 1  PERIAPO  STQ    CALL
 1288   REF   16  LAST  693   23,2350    03463 0                  NORMEX
 1289   REF    1              23,2351    46365 0                  SETRAD
 1290   REF    1              23,2352    37671 0           STCALL XXXALT
 1291   REF    1              23,2353    25704 0                  APSIDES
 1292                         23,2354    41401 1           SETPD  PUSH                   2D = APOCENTER RADIUS    B29 OR B27
 1293                         23,2355    00003 1                  2D
 1294                         23,2356    65225 1           DSU    PDDL                   4D = APOGEE ALTITUDE     B29 OR B27
 1295   REF    2  LAST  698   23,2357    03671 1                  XXXALT
 1296                         23,2360    00001 0                  0D
 1297                         23,2361    45206 1           PUSH   DSU                    6D = PERICENTER RADIUS  B29 OR B27
 1298   REF    3  LAST  698   23,2362    03671 1                  XXXALT
 1299                         23,2363    52006 0           PUSH   GOTO                   8D = PERIGEE ALTITUDE    B29 OR B27
 1300   REF   17  LAST  698   23,2364    03463 0                  NORMEX
```

```
P1301    SETRAD
 1302                              23,2365   41545 0  SETRAD    DLOAD  PUSH
 1303    REF    1                  23,2366   06336 1                   RPAD
 1304                              23,2367   63130 0            SXA,1  INCR,2
 1305    REF   10  LAST  692       23,2370   00047 1                   X2
 1306                              23,2371   00002 0                   2D
 1307                              23,2372   46135 1            SLOAD  BHIZ
 1308    REF   11  LAST  699       23,2373   00050 1                   X2
 1309    REF    1                  23,2374   46400 1                   SETRADX
 1310                              23,2375   51575 1            VLOAD  ABVAL
 1311    REF    4  LAST  212       23,2376   02021 0                   RLS
 1312                              23,2377   77725 1            PDDL
 1313                              23,2400   43545 1  SETRADX   DLOAD  RVQ
```

```
P1314   PRECSET
 1315                             23,2401   77620 0  PRECSET   STQ
 1316   REF  18  LAST  698        23,2402   03463 0                     NORMEX
 1317   REF   2  LAST  628        23,2403   37574 0            STCALL   TDEC2
 1318   REF   4  LAST  622        23,2404   27115 1                     LEMPREC
 1319                             23,2405   77624 1            CALL
 1320   REF   1                   23,2406   46417 1                     LEMSTORE
 1321                             23,2407   77745 1            DLOAD
 1322   REF   3  LAST  700        23,2410   03574 1                     TDEC2
 1323   REF  29  LAST  692        23,2411   34041 0            STCALL   TDEC1
 1324   REF   3  LAST  219        23,2412   27101 1                     CSMPREC
 1325                             23,2413   77624 1            CALL
 1326   REF   1                   23,2414   46427 1                     CSMSTORE
 1327                             23,2415   77650 1            GOTO
 1328   REF  19  LAST  700        23,2416   03463 0                     NORMEX
 1329                             23,2417   43175 0  LEMSTORE  VLOAD    BOFF
 1330   REF  15  LAST  680        23,2420   00001 0                     RATT
 1331   REF   3  LAST  635        23,2421   01352 1                     AVFLAG
 1332   REF   4  LAST  673        23,2422   46433 1                     PASSIVE
 1333   REF  20  LAST  680        23,2423   27536 1  ACTIVE    STOVL    RACT3
 1334   REF  11  LAST  676        23,2424   00007 0                     VATT
 1335   REF  13  LAST  678        23,2425   03544 1            STORE    VACT3
 1336                             23,2426   77616 0            RVQ
 1337                             23,2427   43175 0  CSMSTORE  VLOAD    BOFF
 1338   REF  16  LAST  700        23,2430   00001 0                     RATT
 1339   REF   4  LAST  700        23,2431   01352 1                     AVFLAG
 1340   REF   4  LAST  673        23,2432   46423 0                     ACTIVE
 1341   REF  11  LAST  676        23,2433   27552 0  PASSIVE   STOVL    RPASS3
 1342   REF  12  LAST  700        23,2434   00007 0                     VATT
 1343   REF   8  LAST  676        23,2435   03560 1            STORE    VPASS3
 1344                             23,2436   77616 0            RVQ
```

```
P1345   VECSHIFT
 1346                              23,2437   53754 1  VECSHIFT LXA,2  VSR*
 1347   REF    9  LAST   698       23,2440   02777 1                  RTX2
 1348                              23,2441   57176 0                  0,2
 1349                              23,2442   63350 1           LXA,1  PDVL
 1350   REF   11  LAST   698       23,2443   02776 0                  RTX1
 1351                              23,2444   63257 1           VSR*   PDVL
 1352                              23,2445   57176 0                  0,2
 1353                              23,2446   77616 0           RVQ
```

```
P1354   SHIFTR1
 1355                            23,2447    53754 1  SHIFTR1  LXA,2  SL*
 1356   REF  10  LAST  701       23,2450    02777 1                  RTX2
 1357                            23,2451    57576 1                  0,2
 1358                            23,2452    77616 0           RVQ
```

```
P1359    PROGRAM DESCRIPTION
R1360    SUBROUTINE NAME       R36  OUT-OF-PLANE RENDEZVOUS ROUTINE
R1361    MOD NO.  0                      DATE      22 DECEMBER 67
R1362    MOD BY   N.M.NEVILLE            LOG SECTION  EXTENDED VERBS
R1363    FUNCTIONAL DESCRIPTION

R1364    TO DISPLAY AT ASTRONAUT REQUEST LGC CALCULATED RENDEZVOUS
R1365    OUT-OF-PLANE PARAMETERS (Y , YDOT , PSI). (REQUESTED BY DSKY).

R1366    CALLING SEQUENCE

R1367    ASTRONAUT REQUEST THROUGH DSKY  V 90 E

R1368    SUBROUTINES CALLED

R1369    EXDSPRET
R1370    GOMARKF
R1371    CSMPREC
R1372    LEMPREC
R1373    SGNAGREE
R1374    LOADTIME

R1375    NORMAL EXIT MODES

R1376    ASTRONAUT REQUEST THROUGH DSKY TO TERMINATE PROGRAM V 34 E

R1377    ALARM OR ABORT EXIT MODES

R1378    NONE

R1379    OUTPUT

R1380    DECIMAL DISPLAY OF TIME , Y , YDOT AND PSI

R1381    DISPLAYED VALUES Y , YDOT , AND PSI , ARE STORED IN ERASABLE
R1382    REGISTERS RANGE , RRATE AND RTHETA RESPECTIVELY.

R1383    ERASABLE INITIALIZATION REQUIRED

R1384    CSM AND LEM STATE VECTORS

R1385    DEBRIS

R1386    CENTRALS A,Q,L

R1387    OTHER THOSE USED BY THE ABOVE LISTED SUBROUTINES

 1388                          20,2115                    BANK    20
 1389    REF    1              04,2000                    SETLOC R36LM
 1390                          04,2677                    BANK
```

```
1391    REF  18  LAST  678   E7,1441                       EBANK= TIG
1392    REF   1                                            COUNT* $$/R36

1393                         04,2677   0 0006 1   R36      EXTEND
1394    REF  19  LAST  704   04,2700   3 1442 1            DCA     TIG        SET TIME-OF-EVENT TO TIG FOR NOMINAL
1395    REF   6  LAST  317   04,2701   53'051 0            DXCH    DSPTEMX    DISPLAY
1396    REF   1              04,2702   3 3012 1            CAF     V06N16N
1397    REF 175  LAST  686   04,2703   0 4607 1            TC      BANKCALL
1398    REF   8  LAST  290   04,2704    20323 1            CADR    GOMARKF
1399    REF  35  LAST  615   04,2705   1 5474 1            TCF     ENDEXT     TERMINATE
1400                         04,2706   1 2710 1            TCF     +2         PROCEED
1401                         04,2707   1 2702 1            TCF     -5         RECYCLE FOR ASTRONAUT INPUT TIME
1402    REF  83  LAST  684   04,2710   0 6060 1            TC      INTPRET
1403                         04,2711    53145 1            DLOAD   BZE
1404    REF   7  LAST  704   04,2712    01051 1                    DSPTEMX
1405    REF   1              04,2713    11007 0                    GETNOW     ASTOR-LOADED ZERO, GET PRES TIME
1409    REF  30  LAST  700   04,2714    34041 0   R36INT   STCALL  TDEC1
1410    REF   1              04,2715    27101 1                    OTHPREC
1411                         04,2716    63375 0            VLOAD   PDVL
1412    REF  13  LAST  700   04,2717    00007 0                    VATT
1413    REF  17  LAST  700   04,2720    00001 0                    RATT        -
1414    REF   2  LAST  122   04,2721    02200 1            STORE   RPASS36     R
1415                         04,2722    63256 0            UNIT    PDVL          P
1416                         04,2723    53435 0            VXV     UNIT        -
1417                         04,2724    77626 0            STADR
1418    REF   1              04,2725    61571 0            STODL   UNP36       U
1419    REF   9  LAST  660   04,2726    00015 0                    TAT
1420    REF  31  LAST  704   04,2727    34041 0            STCALL  TDEC1
1421    REF   1              04,2730    27115 1                    THISPREC
1422                         04,2731    63375 0            VLOAD   PDVL                         -
1423    REF  14  LAST  704   04,2732    00007 0                    VATT        VELOCITY VECTOR  V               00D
1424    REF  18  LAST  704   04,2733    00001 0                    RATT                          A
1428                         04,2734    41406 0            PUSH    PUSH        POSITION VECTOR  R   IN  06D AND 12D
1429                         04,2735    63245 1            BVSU    PDVL                          A  -   -
1430    REF   3  LAST  704   04,2736    02200 1                    RPASS36     LINE OF SIGHT VECTOR R - R       12D
1431                         04,2737    72441 0            DOT     SL1                             P   A
1432    REF   2  LAST  704   04,2740    02206 1                    UNP36            -  -
1433    REF   9  LAST  329   04,2741    26172 1            STOVL   YLEM
1434                         04,2742    00001 0                    00D                  A
1435                         04,2743    72441 0            DOT     SL1
1436    REF   3  LAST  704   04,2744    02206 1                    UNP36       .   -  -
1437    REF   3  LAST  329   04,2745    26174 1            STOVL   YDOTLEM
1438                         04,2746    00007 0                    06D         -       A   -
1439                         04,2747    41456 0            UNIT    PUSH        U   = UNIT( R )                   18D
1440                         04,2750    47235 0            VXV     VXV          RA          A
1441                         04,2751    00001 0                    00D          -   -   -     -
1442                         04,2752    00023 0                    18D         (U  XV )XU    =U
1443                         04,2753    53552 0            VSL2    UNIT          RA  A   RA    A
144305                       04,2754    77656 1            UNIT
1444                         04,2755    24001 0            STOVL   00D         UNIT HORIZONTAL IN FORWARD DIR.  00D
```

```
 1445                          04,2756   00023 0                   18D
 1446                          04,2757   74241 0            DOT    VXSC          -
 1447                          04,2760   00015 0                   12D           U
 1448                          04,2761   77752 1            VSL2                  L
 1449                          04,2762   53445 1            BVSU   UNIT
 144905                        04,2763   77656 1            UNIT
 1450                          04,2764   50206 0            PUSH   DOT           LOS PROJECTED INTO HORIZONTAL     12D
 1451                          04,2765   00001 0                   00D           PLANE
 1452                          04,2766   65552 0            SL1    ARCCOS                  -  -
 1453   REF   2  LAST  329     04,2767   26176 0            STOVL  PHILEM
 1454                          04,2770   50235 0            VXV    DOT                     A  L
 1455                          04,2771   00001 0                   00D
 1456                          04,2772   71244 0            BPL    DLOAD
 1457   REF   1                04,2773   11000 1                   R36TAG2
 1458   REF   2  LAST   38     04,2774   24020 0                   LODPMAX
 1459                          04,2775   77625 0            DSU
 1460   REF   3  LAST  705     04,2776   02176 0                   PHILEM
 1461   REF   4  LAST  705     04,2777   02176 0            STORE  PHILEM
 1466                          04,3000   77776 1  R36TAG2   EXIT
 1467   REF   1                04,3001  3 3013 0            CAF    V06N90N       DISPLAY Y , YDOT , AND PSI
 1468   REF 176  LAST  704     04,3002  0 4607 1            TC     BANKCALL
 1469   REF   9  LAST  704     04,3003   20323 1            CADR   GOMARKF
 1470   REF  36  LAST  704     04,3004  1 5474 1            TCF    ENDEXT       TERMINATE
 1471   REF  37  LAST  705     04,3005  1 5474 1            TCF    ENDEXT       PROCEED , END OF PROGRAM
 1472   REF   2  LAST  296     04,3006  1 2677 1            TCF    R36          RECYCLE, TIG OR ASTRO-OPTION
 1473                          04,3007   52034 1  GETNOW    RTB    GOTO         ASTRO-SELECTED PRESENT TIME
 1474   REF  16  LAST  669     04,3010   21603 1                   LOADTIME
 1475   REF   1                04,3011   10714 1                   R36INT
 1482                          04,3012   01420 0  V06N16N   VN     00616
 1483                          04,3013   01532 1  V06N90N   VN     00690
```

```
L        R31                                                                                         USER'S PAGE NO.   1       EO S3

P0001
 0002                          40,3741                          BANK    40
 0003   REF   1                40,2000                          SETLOC  R31LOC
 0004                          40,3741                          BANK

 0005   REF   1                                                 COUNT*  $$/R31

 0006   REF   1                40,3741  3 5006 1   R31CALL      CAF     PRIO3
 0007   REF  24   LAST  612    40,3742  0 5076 0                TC      FINDVAC
 0008   REF  23   LAST  683    E7,1470                          EBANK=  SUBEXIT
 0009   REF   1                40,3743   03113 1                2CADR   V83CALL
 0009   REF   1                40,3744   76067 1
 0010   REF  10   LAST  579    40,3745  0 5223 1   DSPDELAY     TC      FIXDELAY
 0011                          40,3746   00144 0                DEC     100
 0012   REF   9   LAST  503    40,3747  3 1043 1                CA      EXTVBACT
 0013   REF  23   LAST  566    40,3750  7 4731 1                MASK    BIT12
 0014                          40,3751  0 0006 1                EXTEND
 0015   REF   1                40,3752  1 3745 0                BZF     DSPDELAY

 0016   REF   5   LAST  503    40,3753  3 5010 0                CAF     PRIO5
 0017   REF  14   LAST  522    40,3754  0 5063 1                TC      NOVAC
 0018   REF   3   LAST  669    E7,1611                          EBANK=  TSTRT
 0019   REF   1                40,3755   03761 1                2CADR   DISPN5X
 0019   REF   1                40,3756   60107 1
 0020   REF  29   LAST  612    40,3757  1 5263 1                TCF     TASKOVER

 00205                         40,3760   04066 0   V16N54       VN      1654
 0021   REF   1                40,3761  3 3760 0   DISPN5X      CAF     V16N54
 0022   REF 177   LAST  705    40,3762  0 4607 1                TC      BANKCALL
 0023   REF  10   LAST  705    40,3763   20323 1                CADR    GOMARKF
 0024   REF   6   LAST  504    40,3764  0 5565 1                TC      B5OFF
 0025   REF   7   LAST  706    40,3765  0 5565 1                TC      B5OFF
 0026   REF   2   LAST  706    40,3766  1 3761 0                TCF     DISPN5X

 00262                         37,3113                          BANK    37
 00264  REF   1                37,2000                          SETLOC  R31
 00266                         37,3113                          BANK

 0027   REF   7   LAST  296    37,3113  4 0103 1   V83CALL      CS      FLAGWRD7          TEST AVERAGE G FLAG
 0028   REF   4   LAST  278    37,3114  7 4740 1                MASK    AVEGFBIT
 0029                          37,3115  0 0006 1                EXTEND
 0030   REF   1                37,3116  1 3371 0                BZF     MUNG?            ON - TEST MUNFLAG

 0031   REF   8   LAST  555    37,3117  4 0104 0                CS      FLAGWRD8
 0032   REF   6   LAST  555    37,3120  7 4735 0                MASK    SURFFBIT
 0033                          37,3121  0 0006 1                EXTEND
 0034   REF   1                37,3122  1 3375 1                BZF     ONEBASE          ON SURFACE - BYPASS LEMPREC

 0035   REF  84   LAST  704    37,3123  0 6060 1                TC      INTPRET          EXTRAPOLATE BOTH STATE VECTORS
 0036                          37,3124   77634 0                RTB
 0037    REF  17  LAST  705   37,3125    21603 1                     LOADTIME
 0038    REF  32  LAST  704   37,3126    34041 0           STCALL    TDEC1
 0039    REF   5  LAST  700   37,3127    27115 1                     LEMPREC             PRECISION BASE VECTOR FOR LM
 0040                         37,3130    77775 1           VLOAD
 0041    REF   6  LAST  692   37,3131    00017 1                     RATT1
 0042    REF   1              37,3132    26161 0           STOVL     BASETHP
 0043    REF   9  LAST  692   37,3133    00025 0                     VATT1
 0044    REF   1              37,3134    16104 0           STODL     BASETHV
 0045    REF  10  LAST  704   37,3135    00015 0                     TAT
 0046    REF   1              37,3136    02113 0  DOCMBASE STORE     BASETIME            PRECISION BASE VECTOR FOR CM
 0047    REF  33  LAST  707   37,3137    34041 0           STCALL    TDEC1
 0048    REF   4  LAST  700   37,3140    27101 1                     CSMPREC
 0049                         37,3141    77775 1           VLOAD
 0050    REF   7  LAST  707   37,3142    00017 1                     RATT1
 0051    REF   1              37,3143    26131 0           STOVL     BASEOTP
 0052    REF  10  LAST  707   37,3144    00025 0                     VATT1
 0053    REF   1              37,3145    02172 1           STORE     BASEOTV
 0054                         37,3146    77776 1           EXIT

 0055    REF   8  LAST  706   37,3147  4 0103 1  REV83     CS        FLAGWRD7
 0056    REF   5  LAST  706   37,3150  7 4740 1            MASK      AVEGFBIT
 0057                         37,3151  0 0006 1            EXTEND
 0058    REF   1              37,3152  1 3320 1            BZF       GETRVN              IF AVEGFLAG SET, USE RN,VN

 0059    REF   9  LAST  706   37,3153  4 0104 0            CS        FLAGWRD8
 0060    REF   7  LAST  706   37,3154  7 4735 0            MASK      SURFFBIT
 0061                         37,3155  0 0006 1            EXTEND
 0062    REF   1              37,3156  1 3362 1            BZF       R31SURF             IF ON SURFACE,USE LEMAREC

 0063    REF  85  LAST  706   37,3157  0 6060 1            TC        INTPRET             DO CONIC EXTRAPOLATION FOR BOTH VEHICLES
 0064                         37,3160    77634 0           RTB
 0065    REF  18  LAST  707   37,3161    21603 1                     LOADTIME
 0066    REF  34  LAST  707   37,3162    34041 0           STCALL    TDEC1
 0067    REF  21  LAST  691   37,3163    27447 0                     INTSTALL
 0068                         37,3164    43175 0           VLOAD     CLEAR
 0069    REF   2  LAST  707   37,3165    02161 0                     BASETHP
 0070    REF   7  LAST  692   37,3166    00263 0                     MOONFLAG
 0071    REF   8  LAST  692   37,3167    25535 0           STOVL     RCV
 0072    REF   2  LAST  707   37,3170    02104 0                     BASETHV
 0073    REF   7  LAST  692   37,3171    15543 1           STODL     VCV
 0074    REF   2  LAST  707   37,3172    02113 0                     BASETIME
 0075                         37,3173    43014 0           BOF       SET                 GET APPROPRIATE MOONFLAG SETTING
 0076    REF   2  LAST  309   37,3174    04344 0                     MOONTHIS
 0077                         37,3175    77177 0                     +2
 0078    REF   8  LAST  707   37,3176    00063 1                     MOONFLAG
 0079                         37,3177    77614 1           SET
 0080    REF  11  LAST  692   37,3200    01473 0                     INTYPFLG            CONIC EXTRAP.
 0081    REF  11  LAST  692   37,3201    35517 1           STCALL    TET
 0082    REF   4  LAST  692   37,3202    27145 1                     INTEGRVS            INTEGRATION --- AT LAST---
 0083                         37,3203    77775 1  OTHCONIC VLOAD
 0084   REF  19  LAST  704    37,3204    00001 0                     RATT
 0085   REF   7  LAST  351    37,3205    26200 1            STOVL    RONF
 0086   REF  15  LAST  704    37,3206    00007 0                     VATT
 0087   REF   2  LAST  120    37,3207    36206 0            STCALL   VONE          GET SET FOR CONIC EXTRAP.,OTHER.
 0088   REF  22  LAST  707    37,3210    27447 0                     INTSTALL
 0089                         37,3211    71214 0            SET      DLOAD
 0090   REF  12  LAST  707    37,3212    01473 0                     INTYPFLG
 0091   REF  11  LAST  707    37,3213    00015 0                     TAT
 0092   REF  35  LAST  707    37,3214    00041 1  OTHINT    STORE    TDEC1
 0093                         37,3215    43175 0            VLOAD    CLEAR
 0094   REF   2  LAST  707    37,3216    02131 0                     BASEOTP
 0095   REF   9  LAST  707    37,3217    00263 0                     MOONFLAG
 0096   REF   9  LAST  707    37,3220    25535 0            STOVL    RCV
 0097   REF   2  LAST  707    37,3221    02172 1                     BASEOTV
 0098   REF   8  LAST  707    37,3222    15543 1            STODL    VCV
 0099   REF   3  LAST  707    37,3223    02113 0                     BASETIME
 0100                         37,3224    43014 0            BOF      SET
 0101   REF   3  LAST  707    37,3225    04344 0                     MOONTHIS
 0102                         37,3226    77230 0                     +2
 0103   REF  10  LAST  708    37,3227    00063 1                     MOONFLAG
 0104   REF  12  LAST  707    37,3230    35517 1            STCALL   TET
 0105   REF   5  LAST  707    37,3231    27145 1                     INTEGRVS
 0106                         37,3232    52375 1  COMPDISP  VLOAD    VSU
 0107   REF  20  LAST  708    37,3233    00001 0                     RATT
 0108   REF   8  LAST  708    37,3234    02200 1                     RONF
 0109                         37,3235    65234 1            RTB      PDDL
 0110   REF   2  LAST  695    37,3236    21722 0                     NORMUNX1      UNIT(RANGE) TO PD 0-5
 0111                         37,3237    00045 0                     36D
 0112                         37,3240    77657 0            SL*                    RESCALE AFTER NORMUNIT
 0113                         37,3241    20201 0                     0,1
 0114   REF   4  LAST  511    37,3242    26214 1            STOVL    RANGE         SCALED 2(29)M
 0115   REF  16  LAST  708    37,3243    00007 0                     VATT
 0116                         37,3244    50251 1            VSU      DOT           (VCM- VLM).UNIT(LOS), PD=0
 0117   REF   3  LAST  708    37,3245    02206 1                     VONE
 0118                         37,3246    77752 1            SL1                    SCALED 2(7)M/CS
 0119   REF   5  LAST  511    37,3247    26216 0            STOVL    RRATE
 0120   REF   9  LAST  708    37,3250    02200 1                     RONE
 0121                         37,3251    63256 0            UNIT     PDVL          UNIT(R) TO PD 0-5
 0122   REF   6  LAST  600    37,3252    06477 0                     UNITZ
 0123                         37,3253    77624 1            CALL
 0124   REF   1               37,3254    47653 1                     CDU*NBSM
 0125                         37,3255    41505 1            VXM      PUSH          UNIT (Z)/4 TO PD 6-11
 0126   REF  19  LAST  695    37,3256    01732 0                     REFSMMAT
 0127                         37,3257    72431 1            VPROJ    VSL2          UNIT(P)=UNIT(UZ -(UZ)PROJ(UR))
 0128                         37,3260    00001 0                     0D
 0129                         37,3261    53445 1            BVSU     UNIT
 0130                         37,3262    00007 0                     6D
 0131                         37,3263    47315 0            PDVL     VXV           UNIT(P) TO PD 12-17
 0132                         37,3264    00001 0                     0D            UNIT(RL)
 0133   REF   4  LAST  708    37,3265    02206 1                     VONE
 0134                            37,3266   50235 0               VXV     DOT              (UR * VL)*UR . U(P)
 0135                            37,3267   00001 0                       0D
 0136                            37,3270   00015 0                       12D
 0137                            37,3271   77715 1               PDVL                     SIGN TO 12-13 , LOAD U(P)
 0138                            37,3272   75241 1               DOT     SIGN
 0139                            37,3273   00007 0                       6D
 0140                            37,3274   00015 0                       12D
 0141                            37,3275   65512 1               SL2     ACOS             ARCCOS(UP.UZ(SIGN))
 0142   REF   3  LAST  511       37,3276   26220 0               STOVL   RTHETA
 0143                            37,3277   00001 0                       0D
 0144                            37,3300   51041 0               DOT     BPL              IF UR.UZ NEG,
 0145                            37,3301   00007 0                       6D                 RTHETA = 1 - RTHETA
 0146                            37,3302   77307 0                       +5
 0147                            37,3303   45345 1               DLOAD   DSU
 0148   REF   9  LAST  678       37,3304   06513 0                       DPPOSMAX
 0149   REF   4  LAST  709       37,3305   02220 0                       RTHETA
 0150   REF   5  LAST  709       37,3306   02220 0               STORE   RTHETA
 0151                            37,3307   77776 1               EXIT

 0152   REF  30  LAST  619       37,3310  3 4740 0               CA      BIT5
 0153   REF  10  LAST  706       37,3311  7 1043 0               MASK    EXTVBACT
 0154                            37,3312  0 0006 1               EXTEND                   IF ANSWERED,
 0155   REF  38  LAST  705       37,3313  1 5474 1               BZF     ENDEXT                  TERMINATE

 0156   REF  11  LAST  709       37,3314  4 1043 0               CS      EXTVBACT
 0157   REF  24  LAST  706       37,3315  7 4731 1               MASK    BIT12
 0158   REF  12  LAST  709       37,3316  2 7043 0               ADS     EXTVBACT         SET BIT 12
 0159   REF   1                  37,3317  1 3147 1               TCF     REV83            AND START AGAIN.


 0160   REF   4  LAST  550       37,3320  3 7731 0   GETRVN      CA      PRIO22           INHIBIT SERVICER
 0161   REF  10  LAST  512       37,3321  0 5137 1               TC      PRIOCHNG
 0162   REF  86  LAST  707       37,3322  0 6060 1               TC      INTPRET
 0163                            37,3323   40375 1               VLOAD   SETPD
 0164   REF   5  LAST  332       37,3324   01220 0                       RN               LM STATE VECTOR IN PN,VN
 0165                            37,3325   00001 0                       0
 0166   REF  10  LAST  708       37,3326   26200 1               STOVL   RONE
 0167   REF   5  LAST  332       37,3327   01226 0                       VN
 0168   REF   5  LAST  708       37,3330   26206 1               STOVL   VONE             LOAD R(CSM),V(CSM) IN CASE MUNFLAG SET
 0169   REF   1                  37,3331   01724 1                       V(CSM)           (TO INSURE TIME COMPATABILITY)
 0170                            37,3332   65315 0               PDVL    PDDL
 0171   REF   1                  37,3333   01716 0                       R(CSM)
 0172   REF   4  LAST  348       37,3334   01234 0                       PIPTIME
 0173                            37,3335   77776 1               EXIT
 0174   REF   2  LAST  706       37,3336  3 5006 1               CA      PRIO3
 0175   REF  11  LAST  709       37,3337  0 5137 1               TC      PRIOCHNG
 0176   REF  87  LAST  709       37,3340  0 6060 1               TC      INTPRET
 0177                            37,3341   77214 0               BOFF    VLOAD
 0178   REF   2  LAST  240       37,3342   03347 1                       MUNFLAG
 0179   REF   1                  37,3343   77355 1                       GETRVN2          IF MUNFLAG RESET, DO CM DELTA PRECISION
```

```
0180                          37,3344   60505 1              VXM     VSR4              CHANGE TO REFERENCE SYSTEM AND RESCALE
0181    REF  20  LAST  708    37,3345   01732 0                      REFSMMAT
0182                          37,3346   77715 1              PDVL                      R TO PD 0-5
0183                          37,3347   76505 0              VXM     VSL1
0184    REF  21  LAST  710    37,3350   01732 0                      REFSMMAT
0185                          37,3351   40206 1              PUSH    SETPD             V TO PD 5-11
0186                          37,3352   00001 0                      0
0187                          37,3353   77650 1              GOTO
0188    REF   1               37,3354   77232 1                      COMPDISP


0189                          37,3355   77624 1   GETRVN2    CALL
0190    REF  23  LAST  708    37,3356   27447 0                      INTSTALL
0191                          37,3357   52014 0              CLEAR   GOTO
0192    REF  13  LAST  708    37,3360   01673 1                      INTYPFLG          PREC EXTRAP FOR OTHER
0193    REF   1               37,3361   77214 0                      OTHINT
0194    REF  88  LAST  709    37,3362  0 6060 1   R31SURF    TC      INTPRET
0195                          37,3363   77634 0              RTB                       LM IS ON SURFACE, SO PRECISION
0196    REF  19  LAST  707    37,3364   21603 1                      LOADTIME          INTEGRATION USES PLANETARY INERTIAL
0197    REF  36  LAST  708    37,3365   34041 0              STCALL  TDEC1             ORIENTATION SUBROUTINE
0198    REF   6  LAST  707    37,3366   27115 1                      LEMPREC
0199                          37,3367   77650 1              GOTO                      DO CSM CONIC
0200    REF   1               37,3370   77203 0                      OTHCONIC
0201    REF   2  LAST  197    37,3371  4 0102 0   MUNG?      CS      FLAGWRD6
0202    REF   2  LAST  197    37,3372  7 4735 0              MASK    MUNFLBIT
0203                          37,3373  0 0006 1              EXTEND
0204    REF   2  LAST  707    37,3374  1 3320 1              BZF     GETRVN            IF MUNFLAG SET, CSM BASE NOT NEEDED

0205    REF  89  LAST  710    37,3375  0 6060 1   UNERASE    TC      INTPRET           GET CSM BASE VECTOR
0206                          37,3376   52034 1              RTB     GOTO
0207    REF  20  LAST  710    37,3377   21603 1                      LOADTIME
0208    REF   1               37,3400   77136 0                      DOCMBASE
```

```
P5000    1) PROGRAM NAME - TARGET DELTA V PROGRAM (P76).
R5001    2) FUNCTIONAL DESCRIPTION - UPON ENTRY BY ASTRONAUT ACTION, P76 FLASHES DSKY REQUESTS TO THE ASTRONAUT
R5003             TO PROVIDE VIA DSKY (1) THE DELTA V TO BE APPLIED TO THE OTHER VEHICLE STATE VECTOR AND (2) THE
R5005             TIME (TIG) AT WHICH THE OTHER VEHICLE VELOCITY WAS CHANGED BY  EXECUTION OF A THRUSTING MANEUVER. THE
R5007             OTHER VEHICLE STATE VECTOR IS INTEGRATED TO TIG AND UPDATED BY THE ADDITION OF DELTA V (DELTA V HAVING
R5009             BEEN TRANSFORMED FROM LV TO REF COSYS). USING INTEGRVS, THE     PROGRAM THEN INTEGRATES THE OTHER
R5011    VEHICLE STATE VECTOR TO THE STATE VECTOR OF THIS VEHICLE, THUS INSURING THAT THE W-MATRIX AND BOTH VEHICLE
R5013    STATES CORRESPOND TO THE SAME TIME.
R5014    3) ERASABLE INITIALIZATION REQUIRED - NONE.
R5015    4) CALLING SEQUENCES AND EXIT MODES - CALLED BY ASTRONAUT REQUEST THRU DSKY V 37 E 76 E.
R5017             EXITS BY TCF ENDOFJOB.
R5018    5) OUTPUT - OTHER VEHICLE STATE VECTOR INTEGRATED TO TIG AND INCREMENTED BY DELTA V IN REF COSYS.
R5020             THE PUSHLIST CONTAINS THE MATRIX BY WHICH THE INPUT DELTA V MUST BE POST-MULTIPLIED TO CONVERT FROM LV
R5022             TO REF COSYS.
R5023    6) DEBRIS - OTHER VEHICLE STATE VECTOR.
R5024    7) SUBROUTINES CALLED - BANKCALL,GOXDSPF,CSMPREC (OR LEMPREC),ATOPCSM (OR ATOPLEM),INTSTALL,INTWAKE, PHASCHNG
R5026             INTPRET, INTEGRVS, AND MINIRECT.

R5027    8) FLAG USE - MOONFLAG,CMOONFLAG,INTYPFLG,RASFLAG, AND MARKCTR.

 5028                             30,2061                         BANK    30
 5029    REF    1                 13,2000                         SETLOC P76LOC
 5030                             13,2207                         BANK

 5031    REF    1                                                 COUNT* $$/P76

 5032    REF   20  LAST   704     E7,1441                         EBANK= TIG

 50321   REF   11  LAST   686     13,2207  3 1010 1  P76ER77      CA      MODREG
 50322   REF   34  LAST   592     13,2210  7 4744 0               MASK    BIT1
 50323   REF    1                 13,2211  55'235 0               TS      OPTFLAG            OPTFLAG = 0  CM (P76)
 5033    REF   44  LAST   684     13,2212  0 5506 1               TC      UPFLAG                     = 1  LM (P77)
 5034    REF    5  LAST   635     13,2213   00031 0               ADRES   TRACKFLG

 50341   REF   90  LAST   710     13,2214  0 6060 1               TC      INTPRET
 50342                            13,2215   77775 1               VLOAD
 50343   REF   21  LAST   695     13,2216   03434 1                       DELVLVC
 50344   REF    4  LAST   329     13,2217   01251 0               STORE   DELVOV
 50345                            13,2220   77776 1               EXIT

 5035    REF    1                 13,2221  3 2356 0               CAF     V06N3376
 5040    REF  178  LAST   706     13,2222  0 4607 1               TC      BANKCALL           AND WAIT FOR KEYBOARD ACTION.
 5041    REF   18  LAST   686     13,2223   20471 1               CADR    GOFLASH
 5042    REF    1                 13,2224  1 2351 0               TCF     ENDP76
 5043                             13,2225  0 2227 1               TC      +2                 PROCEED
 5044                             13,2226  0 2221 1               TC      -5                 STORE DATA AND REPEAT FLASHING
 50441   REF   29  LAST   684     13,2227  0 5355 1               TC      PHASCHNG
 50442                            13,2230   04024 0               OCT     04024
 50443   REF    2  LAST   711     13,2231  51'235 1               INDEX   OPTFLAG
 5045    REF    1                 13,2232  3 2354 1               CAF     V06N84             FLASH V06 N84 (OR N81), LAST DELTV,
 5046    REF 179  LAST  711   13,2233  0 4607 1             TC      BANKCALL        AND WAIT FOR KEYBOARD ACTION.
 5047    REF  19  LAST  711   13,2234   20471 1             CADR    GOFLASH
 5048    REF   2  LAST  711   13,2235  1 2351 0             TCF     ENDP76
 5049                         13,2236  0 2240 0             TC      +2
 5050                         13,2237  0 2231 0             TC      -6              STORE DATA & REPEAT FLASHING DSP
 5051    REF  91  LAST  711   13,2240  0 6060 1             TC      INTPRET         RETURN TO INTERPRETIVE CODE
 5052                         13,2241   43145 0             DLOAD   SET
 5053    REF  21  LAST  711   13,2242   03442 0                     TIG
 50535   REF   2  LAST  248   13,2243   01076 1                     NODOFLAG
 5054    REF  37  LAST  710   13,2244   00041 1             STORE   TDEC1
 5055                         13,2245   77711 0             CCALL
 50553   REF   3  LAST  711   13,2246   01236 1                     OPTFLAG
 50556   REF   1              13,2247   26357 1                     INTADR
 5056                         13,2250   53575 0  COMPMAT    VLOAD   UNIT
 5057    REF  21  LAST  708   13,2251   00001 0                     RATT
 5058                         13,2252   77676 0             VCOMP                   U(-R)
 5059                         13,2253   00031 0             STORE   24D             U(-R) TO 24D
 5060                         13,2254   53435 0             VXV     UNIT            U(-R)XV = U(VXR)
 5061    REF  17  LAST  708   13,2255   00007 0                     VATT
 5062                         13,2256   00023 0             STORE   18D
 5063                         13,2257   53435 0             VXV     UNIT            U(VXR)XU(-R) = U((RXV)XR)
 5064                         13,2260   00031 0                     24D
 5065                         13,2261   00015 0             STORE   12D
 50652                        13,2262   46135 1             SLOAD   BHIZ
 50654   REF   4  LAST  712   13,2263   01236 1                     OPTFLAG
 50656                        13,2264   26270 0                     +4
 50658 *                      13,2265   77775 1             VLOAD
 5066    REF  22  LAST  711   13,2266   03434 1                     DELVLVC         FROM CM
 50662  *REF   5  LAST  711   13,2267   01251 0             STORE   DELVOV
 50664                        13,2270   77775 1             VLOAD
 50666   REF   6  LAST  712   13,2271   01251 0                     DELVOV          FROM LM
 5067                         13,2272   76505 0  DVTRANS    VXM     VSL1            V(MPAC) = DELTA V IN REFCOSYS
 5068                         13,2273   00015 0                     12D
 5069                         13,2274   77655 1             VAD
 5070    REF  18  LAST  712   13,2275   00007 0                     VATT
 5071                         13,2276   00007 0             STORE   6               V(PD6)=VATT + DELTA V
 5072                         13,2277   77624 1             CALL                    PREVENT WOULD-BE USER OF ORBITAL
 5073    REF  24  LAST  710   13,2300   27447 0                     INTSTALL        INTEG FROM INTERFERING WITH UPDATING
 5074                         13,2301   77624 1             CALL
 5075    REF   1              13,2302   26363 0                     P76SUB1
 5076                         13,2303   53775 1             VLOAD   VSR*
 5077                         13,2304   00007 0                     6
 5078                         13,2305   57176 0                     0,2
 5079    REF   9  LAST  708   13,2306   25543 1             STOVL   VCV
 5080    REF  22  LAST  712   13,2307   00001 0                     RATT
 5081                         13,2310   77657 0             VSR*
 5082                         13,2311   57176 0                     0,2
 5083    REF  10  LAST  708   13,2312   15535 0             STODL   RCV
 5084    REF  22  LAST  712   13,2313   03442 0                     TIG
 5085    REF  13  LAST  708   13,2314   01517 0             STORE   TET
 5086                            13,2315   71214 0             CLEAR   DLOAD
 5087    REF  14   LAST   710    13,2316   01673 1                     INTYPFLG
 5088    REF   1                 13,2317   01643 1                     TETTHIS
 5089    REF  38   LAST   712    13,2320   34041 0  INTOTHIS   STCALL  TDEC1
 5090    REF   6   LAST   708    13,2321   27145 1                     INTEGRVS
 5091                            13,2322   77624 1             CALL
 5093    REF  25   LAST   712    13,2323   27447 0                     INTSTALL
 5094                            13,2324   77775 1             VLOAD
 5095    REF   8   LAST   707    13,2325   00017 1                     RATT1
 5096    REF   3   LAST   510    13,2326   01503 0             STORE   RRECT
 5097    REF  11   LAST   712    13,2327   15535 0             STODL   RCV
 5098    REF  12   LAST   708    13,2330   00015 0                     TAT
 5099    REF  14   LAST   712    13,2331   25517 0             STOVL   TET
 5100    REF  11   LAST   707    13,2332   00025 0                     VATT1
 5101                            13,2333   77624 1             CALL
 5102    REF   2   LAST   510    13,2334   27734 1                     MINIRECT
 5103                            13,2335   77776 1             EXIT
 5104    REF  30   LAST   711    13,2336 0 5355 1              TC      PHASCHNG
 5105                            13,2337   04024 0             OCT     04024

 5106    REF  92   LAST   712    13,2340 0 6060 1              TC      INTPRET
 5107                            13,2341   62214 1             SET     CCALL
 5108    REF   1                 13,2342   05070 0                     REINTFLG
 5109    REF   5   LAST   712    13,2343   01236 1                     OPTFLAG
 5110    REF   1                 13,2344   26361 1                     UPDATADR
 5111                            13,2345   77624 1             CALL
 5116    REF   2   LAST   510    13,2346   27456 0                     INTWAKE0
 5119                            13,2347   77414 0  OUT        CLEAR   EXIT             ALLOW V37.  NO NEED TO CLEAR NODOFLAG AT
 5120    REF   3   LAST   712    13,2350   01276 0                     NODOFLAG          ENDP76 SINCE FLAG NOT SET WHEN DISPLAY
A5121                                                                                    RESPONSES TRANSFER THERE FROM P76+.
 5125    REF 129   LAST   658    13,2351 3 4746 0   ENDP76     CAF     ZERO
 5126    REF   5   LAST   605    13,2352   55462 1             TS      MARKCTR          CLEAR RR TRACKING MARK COUNTER
 5129    REF  18   LAST   686    13,2353 1 6001 1              TCF     GOTOPOOH

 5130                            13,2354   01524 0  V06N84     NV      0684
 5131                            13,2355   01521 0             NV      0681
 51311                           13,2356   01441 1  V06N3376   VN      0633
 51312   REF   2   LAST   704    13,2357   27101 1  INTADR     CADR    OTHPREC
 51314   REF   2   LAST   704    13,2360   27115 1             CADR    THISPREC
 51316   REF   1                 13,2361   26717 1  UPDATADR   CADR    ATOPOTH
 51318   REF   1                 13,2362   26772 1             CADR    ATOPTHIS
 5132                            13,2363   43174 1  P76SUB1    AXT,2   SET
 5133                            13,2364   00002 0                     2
 5134    REF  11   LAST   708    13,2365   00063 1                     MOONFLAG         SET MEANS MOON IS SPHERE OF INFLUENCE.
 5135                            13,2366   77014 1             BON     AXT,2
 5136    REF   6   LAST   696    13,2367   04303 0                     CMOONFLG         SET MEANS PERM CM STATE IN LUNAR SPHERE.
 5137    REF   3   LAST   616    13,2370   00052 0                     QPRET
 5138                            13,2371   00000 1                     0
 5139                            13,2372   43414 1             CLEAR   RVQ
 5140    REF  12   LAST   713    13,2373   00263 0                     MOONFLAG
```

```
P0001   SUBROUTINE NAME:     V82CALL
R0002   MOD NO:  0                                                              DATE:           16 FEB 67
R0004   MOD BY:  RR BAIRNSFATHER                                                LOG SECTION:    R30
R0006   MOD NO: 1                    MOD BY: RR BAIRNSFATHER       DATE: 11 APR 67     SR30.1 CHANGED TO ALLOW MONITOR OPERN
R0008   MOD  NO: 2                   MOD  BY ALONSO                DATE : 11 DEC 67    VB82 PROGRAM REWRITTEN
R0010   MOD NO: 3                    MOD  BY ALONSO                DATE: 26 MAR 68     PROG MOD TO HANDLE DIF EARTH/MOON SCALE
R0012    NEW FUNCTIONAL DESCRIPTION:    CALLED BY VERB 82 ENTER.  PRIORITY 10
R0013     USED THROUGHOUT.              CALCULATE AND DISPLAY ORBITAL PARAMETERS

R0014   1. IF AVERAGE G IS OFF:
R0015            FLASH DISPLAY V04N06. R2 INDICATES WHICH SHIP'S STATE VECTOR IS
R0016             TO BE UPDATED. INITIAL CHOICE IS THIS SHIP (R2=1). ASTRONAUT
R0017             CAN CHANGE TO OTHER SHIP BY V22EXE, WHERE X NOT EQ 1.
R0018            SELECTED STATE VECTOR UPDATED BY THISPREC (OTHPREC).
R0019            CALLS SR30.1 (WHICH CALLS TFFCONMU + TFFRP/RA) TO CALCULATE
R0020             RPER (PERIGEE RADIUS), RAPO (APOGEE RADIUS), HPER (PERIGEE
R0021             HEIGHT ABOVE LAUNCH PAD OR LUNAR LANDING SITE), HAPO (APOGEE
R0022             HEIGHT AS ABOVE), TPER (TIME TO PERIGEE), TFF (TIME TO
R0023             INTERSECT 300 KFT ABOVE PAD OR 35KFT ABOVE LANDING SITE).
R0024            FLASH MONITOR V16N44 (HAPO, HPER, TFF).TFF IS -59M59S IF IT WAS
R0025             NOT COMPUTABLE, OTHERWISE IT INCREMENTS ONCE PER SECOND.
R0026             ASTRONAUT HAS OPTION TO MONITOR TPER BY KEYING IN N 32 E.
R0027             DISPLAY IS IN HMS, IS NEGATIVE (AS WAS TFF), AND INCREMENTS
R0028             ONCE PER SECOND ONLY IF TFF DISPLAY WAS -59M59S.

R0029   2. IF AVERAGE G IS ON:
R0030            CALLS SR30.1 APPROX EVERY TWO SECS.  STATE VECTOR IS ALWAYS
R0031             FOR THIS VEHICLE. V82 DOES NOT DISTURB STATE VECTOR.  RESULTS
R0032             OF SR30.1 ARE RAPO, RPER, HAPO, HPER, TPER, TFF.
R0033            FLASH MONITOR V16N44 (HAPO, HPER, TFF).
R0036   ADDENDUM: HAPO AND HPER SHOULD BE CHANGED TO READ HAPOX AND HPERX IN THE
R0037             ABOVE REMARKS.

R0038   CALLING SEQUENCE:  VERB 82 ENTER.


R0039   SUBROUTINES CALLED:  SR30.1, GOXDSPF
R0040                        MAYBE - THISPREC , OTHPREC, LOADTIME, DELRSPL
R0041   NORMAL EXIT MODES:  TC ENDEXT

R0042   ALARMS:  NONE

R0043   OUTPUT:  HAPOX    (-29) M
R0044            HPERX    (-29) M
R0045            RAPO     (-29) M  EARTH
R0046                     (-27) M  MOON
R0047            RPER     (-29) M  EARTH
R0048                     (-27) M  MOON
R0049            TFF      (-28) CS      CONTAINS NEGATIVE QUANTITY
R0050            -TPER    (-28) CS      CONTAINS NEGATIVE QUANTITY
```

```
R0051
R0052  ERASABLE INITIALIZATION REQUIRED: STATE VECTOR.

R0053  DEBRIS:  QPRET, RONE, VONE,TFF/RTMU, HPERMIN, RPADTEM, V82EMFLG.
R0054           MAYBE: TSTART82, V82FLAGS, TDEC1.


 0055   REF   3  LAST  326   E4,1512                    EBANK= HAPOX
 0056                        31,2144                    BANK   31
 0057   REF   2  LAST   46   22,2000                    SETLOC R30LOC
 0058                        22,3244                    BANK
 0059   REF   2 LAST   46 TO  46:      4      4*        COUNT* $$/R30

 0060   REF  93  LAST  713   22,3244  0 6060 1  V82CALL  TC     INTPRET
 0061                        22,3245   52014 0           BON    GOTO
 0062   REF   2  LAST  239   22,3246   03712 0                  AVEGFLAG
 0063   REF   1              22,3247   45467 0                  V82GON          IF AVERAGE G ON
 0064   REF   1              22,3250   45251 0                  V82GOFF         IF AVERAGE G OFF


 0065                        22,3251   77776 1  V82GOFF  EXIT                   ALLOW ASTRONAUT TO SELECT VEHICLE
 0066   REF  43  LAST  581   22,3252  3 4743 0           CAF    TWO             DESIRED FOR ORBITAL PARAMETERS
 0067   REF  11  LAST  351   22,3253  55'050 1           TS     OPTIONX         CALCULATION AND DISPLAY.
 0068   REF  73  LAST  658   22,3254  3 4744 1           CAF    ONE
 0069   REF  12  LAST  716   22,3255  55'051 0           TS     OPTIONX +1
 0070   REF   1              22,3256  3 3320 0           CAF    OPTIONVN        V 04 N 06
 0071   REF 180  LAST  712   22,3257  0 4607 1           TC     BANKCALL
 0072   REF   8  LAST  614   22,3260   20323 1           CADR   GOXDSPF
 0073   REF  39  LAST  709   22,3261  0 5474 0           TC     ENDEXT          TERMINATE
 0074                        22,3262  0 3264 1           TC     +2              PROCEED
 0075                        22,3263  0 3256 0           TC     -5              DATA IN. OPTION1+1 = 1 FOR THIS VEHICLE.
A0076                                                                                               UNEQ 1 FOR OTHER VEHICLE.
 0077   REF  30  LAST  612   22,3264  3 4741 1           CAF    BIT4            80 MS
 0078   REF  25  LAST  656   22,3265  0 5205 0           TC     WAITLIST
 0079   REF   3  LAST  326   E4,1531                    EBANK= TFF
 0080   REF   1              22,3266   03432 1           2CADR  TICKTEST
 0080   REF   1              22,3267   44064 0
 0081                        22,3270  0 0003 1           RELINT
 0082   REF   1              22,3271  3 3322 1  V82GOFLP CAF    TFFBANK         MAJOR RECYCLE LOOP ENTRY
 0083   REF  27  LAST  681   22,3272  54 003 0           TS     EBANK
 0084   REF 130  LAST  713   22,3273  3 4746 0           CAF    ZERO
 0085   REF   2  LAST  120   22,3274  55'530 1           TS     V82FLAGS        ZERO FLAGS FOR TICKTEST. INHIBITS
A0086                                                                           DECREMENTING OF TFF AND -TPER.
 0087   REF   6  LAST  304   22,3275  3 5012 1           CAF    PRIO7
 0088   REF  25  LAST  706   22,3276  0 5076 0           TC     FINDVAC         V82GOFF1 WILL EXECUTE STATE VECTOR
 0089   REF   4  LAST  716   E4,1531                    EBANK= TFF              UPDATE AND ORBIT CALCULATIONS FOR
 0090   REF   1              22,3277   03323 0           2CADR  V82GOFF1        SELECTED VEHICLE ABOUT PROPER BODY.
 0090   REF   1              22,3300   44064 0
 0091                        22,3301  0 0003 1           RELINT
 0092   REF  20  LAST  581   22,3302  3 6266 0  V82STALL CAF    THREE           STALL IN THIS LOOP AND WITHOLD V 16 N 44
 0093    REF   3  LAST  716     22,3303  7 1530 1             MASK     V82FLAGS          UNTIL STATE VECTOR UPDATE SETS ONE OF
 0094    REF 203  LAST  681     22,3304  10 000 0             CCS      A                 OUR FLAG BITS.
 0095    REF   1                22,3305  0 3312 1             TC       FLAGGON           EXIT FROM STALL LOOP.
 0096    REF   6  LAST  683     22,3306  3 4770 0             CAF      1SEC
 0097    REF 181  LAST  716     22,3307  0 4607 1             TC       BANKCALL
 0098    REF  12  LAST  683     22,3310   01736 1             CADR     DELAYJOB
 0099    REF   1                22,3311  0 3302 0             TC       V82STALL

 0100    REF   1                22,3312  3 3321 1  FLAGGON    CAF      V16N44            MONITOR HAPO,HPER,TFF.
 0101    REF 182  LAST  717     22,3313  0 4607 1             TC       BANKCALL
 0102    REF   9  LAST  716     22,3314   20323 1             CADR     GOXDSPF
 0103    REF   8  LAST  706     22,3315  0 5565 1             TC       B5OFF             TERM  THIS TELLS TICKTEST TO KILL ITSELF
 0104    REF   9  LAST  717     22,3316  0 5565 1             TC       B5OFF             PROCEED  DITTO
 0105    REF   1                22,3317  0 3271 0             TC       V82GOFLP          RECYCLE  RECOMPUTE STATE VECT + DISPLAY

 0106                           22,3320   01014 0  OPTIONVN   VN       412
 0107                           22,3321   04054 1  V16N44     VN       1644
 0108    REF   5  LAST  716     22,3322   02131 0  TFFBANK    ECADR    TFF


 0109    REF  94  LAST  716     22,3323  0 6060 1  V82GOFF1   TC       INTPRET
 0110                           22,3324   77634 0             RTB
 0111    REF  21  LAST  710     22,3325   21603 1                      LOADTIME
 0112    REF  39  LAST  713     22,3326   00041 1             STORE    TDEC1             TIME FOR STATE VECTOR UPDATE.
 0113    REF   3  LAST  351     22,3327   02176 0             STORE    TSTART82          TIME FOR INTERNAL USE.
 0114                           22,3330   77776 1             EXIT
 0115    REF  13  LAST  716     22,3331  4 1051 0             CS       OPTIONX +1        1 FOR THIS VEHICLE, NOT 1 FOR OTHER.
 0116    REF  74  LAST  716     22,3332  6 4744 1             AD       ONE
 0117                           22,3333  0 0006 1             EXTEND
 0118    REF   1                22,3334  1 3360 0             BZF      THISSHIP
 0119    REF  95  LAST  717     22,3335  0 6060 1  OTHSHIP    TC       INTPRET
 0120                           22,3336   77624 1             CALL                       CALL STATE VECTOR UPDATE FOR OTHER SHIP.
 0121    REF   3  LAST  713     22,3337   27101 1                      OTHPREC
 0122                           22,3340   77775 1  BOTHSHIP   VLOAD                      MOVE RESULTS INTO TFFCONIC STORAGE AREAS
 0123    REF  23  LAST  712     22,3341   00001 0                      RATT               TO BE CALLED BY SR30.1.
 0124    REF  11  LAST  709     22,3342   26200 1             STOVL    RONE              RATT AT (-29)M FOR EARTH OR MOON
 0125    REF  19  LAST  712     22,3343   00007 0                      VATT
 0126    REF   6  LAST  709     22,3344   02206 1             STORE    VONE               VATT AT (-7)M/CS FOR EARTH OR MOON
 0127                           22,3345   77743 1             DLOAD*
 0128    REF   1                22,3346   73774 1                      1/RTMUE,2          X2 IS 0 FOR EARTH CENTERED STATE VEC
 0129    REF   1                22,3347   00037 0             STORE    TFF/RTMU           X2 IS 2 FOR MOON
 0130                           22,3350   77743 1             DLOAD*                     AS LEFT BY THISPREC OR OTHPREC.
 0131    REF   1                22,3351   72407 1                      MINPERE,2
 0132    REF   2  LAST  120     22,3352   02172 1             STORE    HPERMIN             TFFRTMU, HPERMIN AND RPADTEM ARE ALL
 0133                           22,3353   46135 1             SLOAD    8HIZ              EARTH/MOON PARAMETERS AS SET HERE.
 0134    REF  12  LAST  699     22,3354   00050 1                      X2
 0135    REF   1                22,3355   45371 0                      EARTHPAD
 0136                           22,3356   77650 1             GOTO
 0137    REF   1                22,3357   45375 1                      MOONPAD
 0138    REF  96  LAST  717    22,3360   0 6060 1  THISSHIP TC      INTPRET
 0139                          22,3361    77624 1           CALL                    CALL STATE VECTOR UPDATE FOR THIS SHIP.
 0140    REF   3  LAST  713    22,3362    27115 1                   THISPREC
 0141                          22,3363    77650 1           GOTO
 0142    REF   1               22,3364    45340 1                   BOTHSHIP

R0143    THE FOLLOWING CONSTANTS ARE PAIRWISE INDEXED. DO NOT SEPARATE PAIRS.

 0146                          22,3365    00001 0  MINPERM  2DEC    10668 B-27      35 KFT MIN PERIGEE HEIGHT FOR MOON(-27)M
 0146                          22,3366    11530 1
 0147                          22,3367    00002 0  MINPERE  2DEC    91440 B-29      300 KFT (-29)M FOR EARTH
 0147                          22,3370    31230 1

 0148                          22,3371    43145 0  EARTHPAD DLOAD   CLRGO            PAD 37-8 RADIUS.  SCALED AT (-29)M.
 0149    REF   2  LAST  699    22,3372    06336 1                   RPAD
 0150    REF   1               22,3373    03635 1                   V82EMFLG         INDICATE EARTH SCALING FOR SR30.1
 0151    REF   1               22,3374    45401 0                   BOTHPAD

 0152                          22,3375    51575 1  MOONPAD  VLOAD   ABVAL           COMPUTE MOON PAD RADIUS FROM RLS VECTOR.
 0153    REF   5  LAST  699    22,3376    02021 0                   RLS              SCALED AT (-27)M.
 0154                          22,3377    77614 1           SET
 0155    REF   2  LAST  718    22,3400    03475 1                   V82EMFLG         INDICATE MOON  SCALING FOR SR30.1
 0156    REF   2  LAST  120    22,3401    36174 0  BOTHPAD  STCALL  RPADTEM
 0157    REF   1               22,3402    45553 0                   SR30.1          CALCULATE ORBITAL PARAMETERS
 0158                          22,3403    45234 0           RTB     DSU
 0159    REF  22  LAST  717    22,3404    21603 1                   LOADTIME
 0160    REF   4  LAST  717    22,3405    02176 0                   TSTART82        PRESENT TIME - TIME V82GOFF1 BEGAN
 0161    REF   5  LAST  718    22,3406    02176 0           STORE   TSTART82                          SAVE IT
 0162                          22,3407    53145 1           DLOAD   BZE             SR30.1 SETS -TPER=0 IF HPER L/
 0163    REF   2  LAST  318    22,3410    02134 0                   -TPER            HPERMIN (300 OR 35) KFT.
 0164    REF   1               22,3411    45422 1                   TICKTFF         (-TPER = 0)
 0165                          22,3412    43345 1  TICKTPER DLOAD   DAD             (-TPER NON ZERO)  TFF WAS NOT COMPUTED,
 0166    REF   3  LAST  718    22,3413    02134 0                   -TPER           BUT WAS SET TO 59M59S.DONT TICK TFF, DO
 0167    REF   6  LAST  718    22,3414    02176 0                   TSTART82        TICK -TPER. DISPLAY BOTH.
 0168    REF   4  LAST  718    22,3415    02134 0           STORE   -TPER           -TPER CORRECTED FOR TIME SINCE V82GOFF1
 0169                          22,3416    77776 1           EXIT                    BEGAN.
 0170    REF  35  LAST  711    22,3417   3 4744 1           CAF     BIT1
 0171    REF   4  LAST  717    22,3420   55'530 1           TS      V82FLAGS        INFORMS TICKTEST TO INCREMENT ONLY -TPER
 0172    REF 100  LAST  613    22,3421   0 5146 1           TC      ENDOFJOB

 0173                          22,3422    43345 1  TICKTFF  DLOAD   DAD             (-TPER=0)  TFF WAS COMPUTED.TICK TFF.
 0174    REF   6  LAST  717    22,3423    02132 0                   TFF             DO NOT TICK -TPER.DISPLAY TFF, BUT NOT
 0175    REF   7  LAST  718    22,3424    02176 0                   TSTART82        -TPER.
 0176    REF   7  LAST  718    22,3425    02132 0           STORE   TFF             TFF CORRECTED FOR TIME SINCE V82GOFFI
 0177                          22,3426    77776 1           EXIT                    BEGAN.
 0178    REF  37  LAST  658    22,3427   3 4743 0           CAF     BIT2
 0179    REF   5  LAST  718    22,3430   55'530 1           TS      V82FLAGS        INFORMS TICKTEST TO INCREMENT ONLY TFF.
 0180    REF 101  LAST  718    22,3431   0 5146 1           TC      ENDOFJOB
 0181   REF  31  LAST  709   22,3432  3 4740 0  TICKTEST CAF     BIT5        THIS WAITLIST PROGRAM PERPETUATES ITSELF
 0182   REF  13  LAST  709   22,3433  7 1043 0           MASK    EXTVBACT    ONCE A SEC UNTIL BIT 5 OF EXTVBACT =0.
 0183   REF 204  LAST  717   22,3434  10 000 0           CCS     A
 0184   REF   1              22,3435  0 3443 1           TC      DOTICK
 0185   REF   3  LAST  612   22,3436  3 7734 0           CAF     PRIO25
 0186   REF  15  LAST  706   22,3437  0 5063 1           TC      NOVAC       TERMINATE V 82.CANT CALL ENDEXT IN RUPT.
 0187   REF  14  LAST  719      1043                     EBANK=  EXTVBACT
 0188   REF  40  LAST  716   22,3440   05474 0           2CADR   ENDEXT
 0188                        22,3441   04062 1
 0189   REF  30  LAST  706   22,3442  0 5263 0           TC      TASKOVER
 0190   REF   7  LAST  717   22,3443  3 4770 0  DOTICK   CAF     1SEC        RE-REQUEST TICKTEST.
 0191   REF  26  LAST  716   22,3444  0 5205 0           TC      WAITLIST
 0192   REF   8  LAST  718   E4,1531                     EBANK=  TFF
 0193   REF   2  LAST  716   22,3445   03432 1           2CADR   TICKTEST
 0193                        22,3446   44064 0
 0194   REF  21  LAST  716   22,3447  3 6266 0           CAF     THREE
 0195   REF   6  LAST  718   22,3450  7 1530 1           MASK    V82FLAGS
 0196   REF 205  LAST  719   22,3451  50 000 1           INDEX   A
 0197                        22,3452  0 3453 0           TC      +1
 0198   REF  31  LAST  719   22,3453  0 5263 0           TC      TASKOVER    IF NO FLAGBITS SET DONT CHANGE TFF OR
A0199                                                                        -TPER, BUT CONTINUE LOOP.
 0200   REF   1              22,3454  0 3462 1           TC      TPERTICK    ONLY BIT 1 SET. INCR -TPER BY 1 SEC.
 0201   REF   8  LAST  719   22,3455  3 4770 0  TFFTICK  CAF     1SEC        ONLY BIT 2 SET. INCR TFF BY 1 SEC.
 0202   REF  95  LAST  681   22,3456  54 001 1           TS      L
 0203   REF 131  LAST  716   22,3457  3 4746 0           CAF     ZERO
 0204   REF   9  LAST  719   22,3460  21'532 0           DAS     TFF
 0205   REF  32  LAST  719   22,3461  0 5263 0           TC      TASKOVER
 0206   REF   9  LAST  719   22,3462  3 4770 0  TPERTICK CAF     1SEC
 0207   REF  96  LAST  719   22,3463  54 001 1           TS      L
 0208   REF 132  LAST  719   22,3464  3 4746 0           CAF     ZERO
 0209   REF   5  LAST  718   22,3465  21'534 0           DAS     -TPER
 0210   REF  33  LAST  719   22,3466  0 5263 0           TC      TASKOVER
 0211                            22,3467   77776 1  V82GON    EXIT                 AVERAGE G ON. USE CURRENT STATE VECTOR
A0212                                                                             FOR ORBITAL PARAMETER CALCULATIONS.
 0213    REF   7  LAST  716      22,3470  3 5012 1            CAF     PRIO7       LESS THAN LAMBERT
 0214    REF  26  LAST  716      22,3471  0 5076 0            TC      FINDVAC     V82GON1 WILL PERFORM ORBIT CALCULATIONS
 0215    REF  10  LAST  719      E4,1531                      EBANK=  TFF         ABOUT PROPER BODY APPROX ONCE PER SEC.
 0216    REF   1                 22,3472   03505 1            2CADR   V82GON1
 0216    REF   1                 22,3473   44064 0
 0217                            22,3474  C 0003 1            RELINT
 0218    REF   5  LAST  568      22,3475  10 067 1            CCS     NEWJOB      WITHOLD V16 N44 UNTIL FIRST ORBIT CALC
 0219    REF   4  LAST  568      22,3476  0 5113 1            TC      CHANG1      IS DONE. NOTE: V82GON1 (PRIO7, FINDVAC
A0220                                                                             JOB) IS COMPLETED BEFORE V82GON (PRIO7,
A0221                                                                             NOVAC JOB).
 0222    REF   2  LAST  717      22,3477  3 3321 1  V82REDSP  CAF     V16N44      MONITOR HAPO, HPER, TFF
 0223    REF 183  LAST  717      22,3500  C 4607 1            TC      BANKCALL
 0224    REF  10  LAST  717      22,3501   20323 1            CADR    GOXDSPF
 0225    REF  10  LAST  717      22,3502  0 5565 1            TC      B5OFF       TERM THIS TELLS V82GON1 TO KILL ITSELF.
 0226    REF  11  LAST  720      22,3503  0 5565 1            TC      B5OFF       PROC DITTO.
 0227    REF   1                 22,3504  0 3477 0            TC      V82REDSP    RECYCLE

 0228    REF  97  LAST  718      22,3505  0 6060 1  V82GON1   TC      INTPRET     THIS EXEC PROGRAM PERPETUATES ITSELF
A0229                                                                             ONCE A SEC UNTIL BIT 5 OF EXTVBACT =0.
 0230                            22,3506   52175 0            VLOAD   GOTO        HOLDS OFF CCS NEWJOB BETWEEN RN AND
 0231    REF   6  LAST  709      22,3507   01220 0                    RN            VN FETCH SO RN , VN ARE FROM SAME
 0232    REF   1                 22,3510   45511 0                    NEXTLINE      STATE VECTOR UPDATE.
 0233    REF  12  LAST  717      22,3511   26200 1  NEXTLINE  STOVL   RONE         RN AT (-29)M FOR EARTH OR MOON
 0234    REF   6  LAST  709      22,3512   01226 0                    VN
 0235    REF   7  LAST  717      22,3513   02206 1            STORE   VONE        VN AT (-7)M/CS FOR EARTH OR MOON
 0236                            22,3514   52014 0            BON     GOTO
 0237    REF   4  LAST  708      22,3515   04304 1                    MOUNTHIS    FLAG INDICATES BODY ABOUT WHICH ORBITAL
 0238    REF   1                 22,3516   45520 1                    MOONGON        CALCULATIONS ARE TO BE PERFORMED.
 0239    REF   1                 22,3517   45531 1                    EARTHGON      IF SET - MOON , IF RESET - EARTH.

 0240                            22,3520   71214 0  MOONGON   SET     DLOAD
 0241    REF   3  LAST  718      22,3521   03475 1                    V82EMFLG    INDICATE MOON SCALING FOR SR30.1
 0242    REF   1                 22,3522   04001 1                    1/RTMUM     LUNAR PARAMETERS LOADED HERE FOR SR30.1
 0243    REF   2  LAST  717      22,3523   14037 0            STODL   TFF/RTMU
 0244    REF   1                 22,3524   05366 1                    MINPERM
 0245    REF   3  LAST  717      22,3525   26172 1            STOVL   HPERMIN
 0246    REF   6  LAST  718      22,3526   02021 0                    RLS          SCALED AT (-27)M.
 0247                            22,3527   52046 1            ABVAL   GOTO
 0248    REF   1                 22,3530   45540 1                    V82GON2
 0249                            22,3531   71214 0  EARTHGON  CLEAR   DLOAD
 0250    REF   4  LAST  720      22,3532   03675 0                    V82EMFLG    INDICATE EARTH SCALING FOR SR30.1
 0251    REF   2  LAST  717      22,3533   04003 0                    1/RTMUE     EARTH PARAMETERS LOADED HERE FOR SR30.1
 0252    REF   3  LAST  720      22,3534   14037 0            STODL   TFF/RTMU
 0253    REF   2  LAST  717      22,3535   05370 0                    MINPERE
 0254    REF   4  LAST  720      22,3536   16172 1            STODL   HPERMIN
 0255    REF   3  LAST  718      22,3537   06336 1                    RPAD
 0256    REF   3  LAST  718      22,3540   36174 0  V82GON2   STCALL  RPADTEM     COMMON CODE FOR EARTH & MOON.
 0257    REF   2  LAST  718      22,3541   45553 0                    SR30.1
 0258                              22,3542   77776 1              EXIT
 0259   REF  32   LAST  719        22,3543  3 4740 0   V82GON3    CAF       BIT5
 0260   REF  15   LAST  719        22,3544  7 1043 0              MASK      EXTVBACT          SEE IF ASTRONAUT HAS SIGNALLED TERMINATE
 0261                              22,3545  0 0006 1              EXTEND
 0262   REF  41   LAST  719        22,3546  1 5474 1              BZF       ENDEXT            YES, TERMINATE VB 82 LOOP
 0263   REF  10   LAST  719        22,3547  3 4770 0              CAF       1SEC
 0264   REF 184   LAST  720        22,3550  C 4607 1              TC        BANKCALL          WAIT ONE SECOND BEFORE REPEATING
 0265   REF  13   LAST  717        22,3551   01736 1              CADR      DELAYJOB            ORBITAL PARAMETER COMPUTATION.
 0266   REF   2   LAST  720        22,3552  C 3505 1              TC        V82GON1

 0267   REF   1                    22,3543             SPLRET     =         V82GON3
```

```
R0268   SUBROUTINE NAME:     SR30.1
R0269   MOD NO:  0                                                                          DATE:             16 FEB 67
R0271   MOD BY:  RR BAIRNSFATHER                                                            LOG SECTION:      R32
R0273   MOD NO:  1              MOD BY:  RR BAIRNSFATHER        DATE: 11 APR 67             SR30.1 CHANGED TO ALLOW MONITOR OPERN
R0275   MOD NO:  2              MOD BY:  RR BAIRNSFATHER        DATE:  14 APR 67            ADD OVFL CK FOR RAPO
R0277   MOD NO:  3              MOD BY ALONSO                   DATE: 11 DEC 67             SUBROUTINE REWRITTEN
R0279   MOD NO: 4               MOD BY ALONSO                   DATE: 26 MAR 68             PROG MOD TO HANDLE DIF EARTH/MOON SCALE
R0281   MOD NO:  5              MOD BY:  RR BAIRNSFATHER        DATE:   6 AUG 68            OVFL CK FOR HAPO & HPER.VOIDS MOD #2.
R0283

R0284   NEW FUNCTIONAL DESCRIPTION:     ORBITAL PARAMETERS DISPLAY FOR NOUNS 32  AND 44.
R0286   SR30.1 CALLS TFFCONMU AND TFFRP/RA TO CALCULATE RPER (PERIGEE RADIUS),
R0287   RAPO (APOGEE RADIUS), HPER (PERIGEE HEIGHT ABOVE LAUNCH PAD OR LUNAR
R0288   LANDING SITE), HAPO (APOGEE HEIGHT AS ABOVE), TPER (TIME TO PERIGEE),
R0289   TFF (TIME TO INTERSECT 300 KFT ABOVE PAD OR 35KFT ABOVE LANDING SITE).
R0290   IF HPER IS GREATER THAN OR EQUAL TO HPERMIN, CALCULATES TPER AND STORES
R0291   NEGATIVE    IN -TPER. OTHERWISE STORES +0 IN -TPER. WHENEVER TPER IS
R0292   CALCULATED, TFF IS NOT COMPUTABLE AND DEFAULTS TO -59MIN 59SEC. IF HAPO
R0293   WOULD EXCEED 9999.9 NM, IT IS LIMITED TO THAT VALUE FOR DISPLAY.

R0294   ADDENDUM: HAPO AND HPER SHOULD BE CHANGED TO READ HAPOX AND HPERX IN THE
R0295             ABOVE REMARKS.

R0296   CALLING SEQUENCE:         CALL
R0297                                    SR30.1
R0298   SUBROUTINES CALLED:       TFFCONMU, TFFRP/RA, CALCTPER, CALCTFF
R0299   NORMAL EXIT MODE:         CALLING LINE +1 (STILL IN INTERPRETIVE MODE)
R0300   ALARMS:                   NONE
R0301   OUTPUT:  RAPO    (-29) M EARTH    APOGEE RADIUS    EARTH CENTERED COORD.
R0302                    (-27) M MOON                      MOON CENTERED COORD.
R0303            RPER    (-29) M EARTH    PERIGEE RADIUS   EARTH CENTERED COORD.
R0304                    (-27) M MOON                      MOON  CENTERED COORD.
R0305            HAPOX   (-29) M          APOGEE ALTITUDE ABOVE PAD OR LAND. SITE MAX VALUE LIMITED TO 9999.9 NM.
R0307            HPERX   (-29) M          PERIGEE ALT. ABOVE PAD OR LAND. SITE    MAX VALUE LIMITED TO 9999.9 NM.
R0309            TFF     (-28) CS         TIME TO 300KFT OR 35KFT ALTITUDE
R0310            -TPER   (-28) CS         TIME TO PERIGEE
R0311   ERASABLE INITIALIZATION REQUIRED-
R0312            TFF/RTMU (+17) EARTH     RECIPROCAL OF PROPER GRAV CONSTANT FOR
R0313                     (+14) MOON      EARTH OR MOON = 1/SQRT(MU).
R0314            RONE     (-29) M         STATE VECTOR
R0315            VONE     (-7)  M/CS      STATE VECTOR
R0316            RPADTEM (-29) M EARTH    RADIUS OF LAUNCH PAD OR LUNAR LANDING
R0317                    (-27) M MOON     SITE.
R0318            HPERMIN (-29) M EARTH    (300 OR 35)KFT MINIMUM PERIGEE ALTITUDE
R0319                    (-27) M MOON     ABOVE LAUNCH PAD OR LUNAR LANDING SITE.
R0320            V82EMFLG (INT SW BIT) RESET FOR EARTH, SET FOR MOON.

R0321   DEBRIS:  QPRET, PDL, S2
```

```
 0322   REF   1                                      COUNT* $$/SR30S

 0323                        22,3553  44001 0  SR30.1   SETPD  STQ                INITIALIZE PUSHDOWN LIST.
 0324                        22,3554  00001 0                  0
 0325   REF   8  LAST  616   22,3555  00C51 0                  S2
A0326                                                                            SR30.1 INPUT: RONE AT (-29)M EARTH/MOON
A0327                                                                                          VONE AT (-7)M/CS
A0328                                                                             TFFCONMU,TFFRP/RA,CALCTPER AND CALCTFF
A0329                                                                             CALLS REQUIRE :
A0330                                                                             EARTH CENTERED (NO RESCALING REQUIRED)
A0331                                                                                           RONE SCALED TO B-29 M
A0332                                                                                           VONE SCALED TO B-7 M/CS
A0333                                                                             MOON CENTERED  (RESCALING REQUIRED)
A0334                                                                                           RONE SCALED TO B-27 M
A0335                                                                                           VONE SCALED TO B-5  M/CS
 0336                        22,3556  77214 0           BOFF   VLOAD
 0337   REF   5  LAST  720   22,3557  03755 0                  V82EMFLG             OFF FOR EARTH ,  ON FOR MOON.
 0338   REF   1              22,3560  45567 1                  TFFCALLS
 0339   REF  13  LAST  720   22,3561  C2200 1                  RONE
 0340                        22,3562  77752 1           VSL2
 0341   REF  14  LAST  723   22,3563  26200 1           STOVL  RONE
 0342   REF   8  LAST  720   22,3564  02206 1                  VONE
 0343                        22,3565  77752 1           VSL2
 0344   REF   9  LAST  723   22,3566  02206 1           STORE  VONE
 0345                        22,3567  77624 1  TFFCALLS CALL
 0346   REF   1              22,3570  57364 1                  TFFCONMU
 0347                        22,3571  77624 1           CALL                     TFFRP/RA COMPUTES RAPO,RPER.
 0348   REF   1              22,3572  57432 0                  TFFRP/RA
A0349                                                                            RETURNS WITH RAPO IN D(MPAC).
 0350                        22,3573  77625 0           DSU
 0351   REF   4  LAST  720   22,3574  02174 1                  RPADTEM
 0352                        22,3575  64414 1           BOFF   SR2R              NEED HAPO AT (-29)M FOR DISPLAY.
A0353                                                                            IF MOON CENTERED, RESCALE FROM (-27)M.
A0354                                                                             IF EARTH CENTERED ALREADY AT (-29)M.
 0355   REF   6  LAST  723   22,3576  03755 0                  V82EMFLG           OFF FOR EARTH , ON FOR MOON.
 0356                        22,3577  45600 0                  +1
 0357                        22,3600  77624 1           CALL                     IF HAPO > MAXNM, SET HAPO =9999.9 NM.
 0358   REF   3  LAST  623   22,3601  45640 1                  MAXCHK            OTHERWISE STORE (RAPO-RPADTEM) IN HAPO.
 0359   REF   4  LAST  716   22,3602  16113 0  STORHAPO STODL  HAPOX
 0360   REF   1              22,3603  00017 1                  RPER
 0361                        22,3604  77625 0           DSU
 0362   REF   5  LAST  723   22,3605  02174 1                  RPADTEM           GIVES HPER AT (-29)M EARTH, (-27)M MOON.
 0363   REF 268  LAST  689   22,3606  00161 1           STORE  MPAC +4           SAVE THIS FOR COMPARISON TO HPERMIN.
 0364                        22,3607  64414 1           BOFF   SR2R              NEED HPER AT (-29)M FOR DISPLAY.
A0365                                                                            IF MOON CENTERED, RESCALE FROM (-27)M.
A0366                                                                            IF EARTH CENTERED ALREADY AT (-29)M.
 0367   REF   7  LAST  723   22,3610  03755 0                  V82EMFLG          OFF FOR EARTH,  ON FOR MOON.
 0368                        22,3611  45612 0                  +1
 0369                        22,3612  77624 1           CALL                     IF HPER > MAXNM, SET HPER = 9999.9 NM.
 0370   REF   4  LAST  723   22,3613  45640 1                  MAXCHK
 0371   REF   2  LAST  326    22,3614   16115 0  STORHPER STODL  HPERX          STORE (RPER - RPADTEM) INTO HPERX.
 0372   REF 269  LAST  723    22,3615   00161 1                  MPAC +4
 0373                         22,3616   51025 1           DSU    BPL            HPERMIN AT (-29)M FOR EARTH, (-27)M MOON
 0374   REF   5  LAST  720    22,3617   02172 1                  HPERMIN        IF HPER L/   HPERMIN (300 OR 35)KFT,
 0375   REF   1               22,3620   45624 0                  DOTPER          THEN ZERO INTO -TPER.
 0376                         22,3621   52145 0           DLOAD  GOTO             OTHERWISE CALCULATE TPER.
 0377   REF   4  LAST  613    22,3622   06505 1                  HI6ZEROS
 0378   REF   1               22,3623   45630 0                  SKIPTPER
 0379                         22,3624   45145 0  DOTPER   DLOAD  CALL
 0380   REF   2  LAST  723    22,3625   00017 1                  RPER
 0381   REF   1               22,3626   57470 0                  CALCTPER
 0382                         22,3627   77676 0           DCOMP                 TPER IS PUT NEG INTO -TPER.
 0383   REF   6  LAST  719    22,3630   16134 0  SKIPTPER STODL  -TPER
 0384   REF   6  LAST  724    22,3631   02172 1                  HPERMIN        HPERMIN AT (-29)M FOR EARTH, (-27)M MOON
 0385                         22,3632   45015 1           DAD    CALL
 0386   REF   6  LAST  723    22,3633   02174 1                  RPADTEM        RPADTEM AT (-29)M FOR EARTH, (-27)M MOON
 0387   REF   1               22,3634   57473 0                  CALCTFF        GIVES 59M59S FOR TFF IE RPER G/
 0388                         22,3635   77676 0           DCOMP                   HPERMIN + RPADTEM. (TPER WAS NON ZERO)
 0389   REF  11  LAST  720    22,3636   36132 1           STCALL TFF            OTHERWISE COMPUTES TFF.       (GOTO)
 0390   REF   9  LAST  723    22,3637   00051 0                  S2

 0391                         22,3640   51025 1  MAXCHK   DSU    BPL            IF C(MPAC) > 9999.9 NM, MPAC = 9999.9 NM
 0392   REF   1               22,3641   05650 1                  MAXNM
 0393                         22,3642   45645 1                  +3             OTHERWISE C(MPAC) = B(MPAC).
 0394                         22,3643   43415 0           DAD    RVQ
 0395   REF   2  LAST  724    22,3644   05650 1                  MAXNM
 0396                         22,3645   43545 1  +3       DLOAD  RVQ            (USED BY P30 - P37 ALSO)
 0397   REF   3  LAST  724    22,3646   05650 1                  MAXNM

 0398                         22,3647   01065 0  MAXNM    2DEC   01065 05603
 0398                         22,3650   05603 1
```

```
*** END OF KISSING .067 ***
```

```
 0001                            36,2024                       BANK    36
 0002   REF    3  LAST    41     36,2000                       SETLOC P40S
 0003                            36,2024                       BANK
 0004   REF    3  LAST   656     E7,1455                       EBANK= WHICH
 0005   REF    3 LAST    41 TO    41:       2     20*          COUNT* $$/P40
R0006        THE MASTER IGNITION ROUTINE IS DESIGNED FOR USE BY THE FOLLOWING LEM PROGRAMS:  P12, P40, P42, P61, P63.
R0008   IT PERFORMS ALL FUNCTIONS IMMEDIATELY ASSOCIATED WITH APS OR DPS IGNITION:  IN PARTICULAR, EVERYTHING LYING
R0010   BETWEEN THE PRE-IGNITION TIME CHECK -- ARE WE WITHIN 45 SECONDS OF TIG? -- AND TIG + 26 SECONDS, WHEN DPS
R0012   PROGRAMS THROTTLE UP.

R0013        VARIATIONS AMONG PROGRAMS ARE ACCOMODATED BY MEANS OF TABLES CONTAINING CONSTANTS (FOR AVEGEXIT, FOR
R0015   WAITLIST, FOR PINBALL) AND TCF INSTRUCTIONS.   USERS PLACE THE ADRES OF THE HEAD OF THE APPROPRIATE TABLE
R0017   (OF P61TABLE FOR P61LM, FOR EXAMPLE) IN ERASABLE REGISTER 'WHICH' (E4).   THE IGNITION ROUTINE THEN INDEXES BY
R0019   WHICH TO OBTAIN OR EXECUTE THE PROPER TABLE ENTRY.   THE IGNITION ROUTINE IS INITIATED BY A TCF BURNBABY,
R0021   THROUGH BANKJUMP IF NECESSARY.   THERE IS NO RETURN.

R0022        THE MASTER IGNITION ROUTINE WAS CONCEIVED AND EXECUTED, AND (NOTA BENE) IS MAINTAINED BY ADLER AND EYLES.


R0024                                                 HONI SOIT QUI MAL Y PENSE


R0025                                           ****************************************
R0026                                           TABLES FOR THE IGNITION ROUTINE
R0027                                           ****************************************

R0028                                                       NOLI SE TANGERE

 0029                            36,2024   01512 0  P12TABLE VN      0674           (0)
 0030   REF    1                 36,2025  1 2327 1           TCF     ULLGNOT        (1)
 0031   REF    1                 36,2026  1 2611 1           TCF     COMFAIL3       (2)
 0032   REF    1                 36,2027  1 3061 1           TCF     GOCUTOFF       (3)
 0033   REF   34  LAST   719     36,2030  1 5263 1           TCF     TASKOVER       (4)
 0034   REF    1                 36,2031  1 2150 0           TCF     P12SPOT        (5)
 0035                            36,2032   00000 1           DEC     0              (6)        NO ULLAGE
 0036   REF    4  LAST   726     E7,1455                     EBANK=  WHICH
 0037   REF    1                 36,2033   03656 1           2CADR   SERVEXIT       (7)
 0037   REF    1                 36,2034   64067 1
 0038   REF    1                 36,2035  1 2402 1           TCF     DISPCHNG       (11)
 0039   REF    1                 36,2036  1 2562 0           TCF     WAITABIT       (12)
 0040   REF    1                 36,2037  1 2523 0           TCF     P12IGN         (13)
R0043


 0044                            36,2040   01450 1  P40TABLE VN      0640           (0)
 0045   REF    2  LAST   726     36,2041  1 2327 1           TCF     ULLGNOT        (1)
 0046   REF    1                 36,2042  1 2613 0           TCF     COMFAIL4       (2)
 0047   REF    1                 36,2043  1 3046 1           TCF     GOPOST         (3)
 0048   REF   35  LAST   726     36,2044  1 5263 1           TCF     TASKOVER       (4)
 0049   REF    1                 36,2045  1 2150 0           TCF     P40SPOT        (5)
```

```
L        BURN, BABY, BURN -- MASTER IGNITION ROUTINE                                      USER'S PAGE NO.   2       E7 S3

 0050                            36,2046   04300 0             DEC     2240           (6)
 0051    REF   5  LAST  215      E6,1422                       EBANK= OMEGAQ
 0052    REF   1                 36,2047   03667 0             2CADR   STEERING       (7)
 0052    REF   1                 36,2050   74066 1
 0053    REF   1                 36,2051  1 2372 1             TCF     P40SJUNK       (11)
 0054    REF   2  LAST  726      36,2052  1 2562 0             TCF     WAITABIT       (12)
 0055    REF   1                 36,2053  1 2506 1             TCF     P40IGN         (13)
 0056    REF   1                 36,2054  1 3122 1             TCF     REP40ALM       (14)
R0058


 0060    REF   1                 36,2055  1 2153 0   P41TABLE TCF     P41SPOT        (5)
 0061                            36,2056   77776 1             DEC     -1             (6)
 0062    REF   6  LAST  727      E6,1422                       EBANK= OMEGAQ
 0063    REF   1                 36,2057   02570 1             2CADR   CALCN85        (7)
 0063    REF   1                 36,2060   64066 0
 0064    REF   1                 36,2061  1 2404 1             TCF     COMMON         (11)
 0065    REF   1                 36,2062  1 2566 1             TCF     TIGTASK        (12)
R0066


 0067                            36,2063   01450 1   P42TABLE VN      0640           (0)
 0068    REF   1                 36,2064  1 2324 1             TCF     WANTAPS        (1)
 0069    REF   2  LAST  726      36,2065  1 2613 0             TCF     COMFAIL4       (2)
 0070    REF   2  LAST  726      36,2066  1 3046 1             TCF     GOPOST         (3)
 0071    REF  36  LAST  726      36,2067  1 5263 1             TCF     TASKOVER       (4)
 0072    REF   1                 36,2070  1 2150 0             TCF     P42SPOT        (5)
 0073                            36,2071   04526 1             DEC     2390           (6) ULLAGE ON AT TIG-6 SECS.
 0074    REF   7  LAST  727      E6,1422                       EBANK= OMEGAQ
 0075    REF   2  LAST  727      36,2072   03667 0             2CADR   STEERING       (7)
 0075                            36,2073   74066 1
 0076    REF   2  LAST  727      36,2074  1 2372 1             TCF     P40SJUNK       (11)
 0077    REF   3  LAST  727      36,2075  1 2562 0             TCF     WAITABIT       (12)
 0078    REF   1                 36,2076  1 2540 0             TCF     P42IGN         (13)
 0079    REF   1                 36,2077  1 3421 1             TCF     P42STAGE       (14)
R0081


 0082                            36,2100   01476 0   P63TABLE VN      0662           (0)
 0083    REF   3  LAST  726      36,2101  1 2327 1             TCF     ULLGNOT        (1)
 0084    REF   2  LAST  726      36,2102  1 2611 1             TCF     COMFAIL3       (2)
 0085    REF   1                 36,2103  1 2776 1             TCF     V99RECYC       (3)
 0086    REF  37  LAST  727      36,2104  1 5263 1             TCF     TASKOVER       (4)
 0087    REF   1                 36,2105  1 2153 0             TCF     P63SPOT        (5)
 0088                            36,2106   04300 0             DEC     2240           (6)
 0089    REF   5  LAST  726      E7,1455                       EBANK= WHICH
 0090    REF   2  LAST  726      36,2107   03656 1             2CADR   SERVEXIT       (7)
 0090                            36,2110   64067 1
 0091    REF   2  LAST  726      36,2111  1 2402 1             TCF     DISPCHNG       (11)
 0092    REF   4  LAST  727      36,2112  1 2562 0             TCF     WAITABIT       (12)
 0093   REF    1                36,2113  1 2465 0            TCF      P63IGN            (13)
R0096


 0112                           36,2114   01477 1  ABRTABLE VN       0663              (0)
 0113   REF    4  LAST   727    36,2115  1 2327 1            TCF      ULLGNOT           (1)
 0114   REF    3  LAST   727    36,2116  1 2611 1            TCF      COMFAIL3          (2)
 0115   REF    2  LAST   726    36,2117  1 3061 1            TCF      GOCUTOFF          (3)
 0116   REF   38  LAST   727    36,2120  1 5263 1            TCF      TASKOVER          (4)
 0117                           36,2121  12 122 0            NOOP                       (5)
 0118                           36,2122  12 123 1            NOOP                       (6)
 0119                           36,2123  12 124 0            NOOP                       (7)
 0120                           36,2124  12 125 1            NOOP
 0121   REF    3  LAST   727    36,2125  1 2402 1            TCF      DISPCHNG          (11)
 0122   REF    5  LAST   727    36,2126  1 2562 0            TCF      WAITABIT          (12)
 0123   REF    1                36,2127  1 2533 1            TCF      ABRTIGN           (13)
R0126


R0127                                              ***************************************
R0128                                              GENERAL PURPOSE IGNITION ROUTINES
R0129                                              ***************************************

 0130   REF   31  LAST   713    36,2130  0 5355 1  BURNBABY TC       PHASCHNG          GROUP 4 RESTARTS HERE
 0131                           36,2131   04024 0            OCT      04024

 0132   REF 133   LAST   719    36,2132  3 4746 0            CAF      ZERO              EXTIRPATE JUNK LEFT IN DVTOTAL
 0133   REF    5  LAST   327    36,2133  55'507 0            TS       DVTOTAL
 0134   REF    6  LAST   728    36,2134  55'510 0            TS       DVTOTAL +1

 0135   REF 185   LAST   721    36,2135  0 4607 1            TC       BANKCALL          P40AUTO MUST BE BANKCALLED EVEN FROM ITS
 0136   REF    1                36,2136   73710 0            CADR     P40AUTO             OWN BANK TO SET UP RETURN PROPERLY

 0141                           36,2137  0 0006 1  B*RNB*B*  EXTEND
 0142   REF   23  LAST   712    36,2140  3 1442 1            DCA      TIG               STORE NOMINAL TIG FOR OBLATENESS COMP.
 0143   REF    2  LAST   154    36,2141  53'512 1            DXCH     GOBLTIME          AND FOR P70 OR P71.

 0173                           36,2142  0 0004 0            INHINT
 0174   REF   24  LAST   575    36,2143  0 4665 0            TC       IBNKCALL
 0175   REF    1                36,2144   75565 0            CADR     FNGINOF3
 0176                           36,2145  0 0003 1            RELINT

 0179   REF    6  LAST   727    36,2146  51'455 1            INDEX    WHICH
 0180                           36,2147  0 0005 1            TC       5

 0182   REF    2  LAST   726    36,2150            P42SPOT  =        P40SPOT           (5)
 0183   REF    3  LAST   728    36,2150            P12SPOT  =        P40SPOT           (5)
 0185   REF    2  LAST   727    36,2153            P63SPOT  =        P41SPOT           (5)      IN P63 CLOKTASK ALREADY GOING
 0186   REF    1                36,2150  4 4753 0  P40SPOT  CS       CNTDNDEX          (5)
 01361  REF 186   LAST   728    35,2151  0 4607 1            TC       BANKCALL          MUST BE BANKCALLED FOR GENERALIZED
 01862  REF   1               36,2152   74663 1            CADR     STCLDK2                 RETURN
 0187   REF  98  LAST  720    36,2153  0 6060 1  P41SPDT   TC       INTPRET          (5)
 01871                        36,2154   45345 1            DLDAD    DSU
 0188   REF  24  LAST  728    36,2155   03442 0                     TIG
 0189   REF   1               36,2156   35142 0                     D29.9SEC
 01891  REF  40  LAST  717    36,2157   34041 0            STCALL   TDEC1
 01892  REF   1               36,2160   61063 0                     INITCDUW
 0190                         36,2161   45014 0            BOFF     CALL
 0191   REF   3  LAST  709    36,2162   03347 1                     MUNFLAG
 0192   REF   1               36,2163   74202 1                     GOMIDAV
 0193   REF   5  LAST  707    36,2164   27101 1                     CSMPREC
 0194                         36,2165   64375 1            VLDAD    MXV
 0195   REF  12  LAST  713    36,2166   00025 0                     VATT1
 0196   REF  22  LAST  710    36,2167   01732 0                     REFSMMAT
 0197                         36,2170   77762 1            VSR1
 0198   REF   2  LAST  709    36,2171   25724 1            STOVL    V(CSM)          CSM VELOCITY - M/CS*2(7)
 0199   REF   9  LAST  713    36,2172   00017 1                     RATT1
 0200                         36,2173   64312 0            VSL4     MXV
 0201   REF  23  LAST  729    36,2174   01732 0                     REFSMMAT
 0202   REF   2  LAST  709    36,2175   35716 1            STCALL   R(CSM)          CSM POSITION - M*2(24)
 0203   REF   1               36,2176   67037 1                     MUNGRAV
 0204   REF   2  LAST  124    36,2177   16310 1            STODL    G(CSM)          CSM GRAVITY VEC. - M/CS*2(7)
 02042  REF  13  LAST  713    36,2200   00015 0                     TAT
 02044  REF  41  LAST  729    36,2201   00041 1            STORE    TDEC1           RELOAD TDEC1 FOR MIDTOAV.
 0205                         36,2202   77624 1  GOMIDAV   CALRB
 0206   REF   1               36,2203   27606 1                     MIDTOAV1
 0207   REF   1               36,2204  1 2213 1            TCF      CALLT-35        MADE IT IN TIME.

 0208                         36,2205  0 0006 1            EXTEND                   TIG WAS SLIPPED, SO RESET TIG TO 29.9
 0209   REF   4  LAST  576    36,2206  3 1561 1            DCA      PIPTIME1        SECONDS AFTER THE TIME TO WHICH WE DID
 0210   REF  25  LAST  729    36,2207  53'442 0            DXCH     TIG             INTEGRATE.
 0211                         36,2210  0 0006 1            EXTEND
 0212   REF   2  LAST  729    36,2211  3 3142 0            DCA      D29.9SEC
 0213   REF  26  LAST  729    36,2212  21'442 0            DAS      TIG

 0214   REF 270  LAST  724    36,2213  52 155 1  CALLT-35  DXCH     MPAC
 0215   REF   5  LAST  252    36,2214  53'500 1            DXCH     SAVET-30        DELTA-T UNTIL TIG-30
 0216                         36,2215  0 0006 1            EXTEND
 0217   REF   1               36,2216  4 3751 0            DCS      5SECDP
 0218   REF   6  LAST  729    36,2217  21'500 1            DAS      SAVET-30        DELTA-T UNTIL TIG-35
 0219                         36,2220  0 0006 1            EXTEND
 0220   REF   7  LAST  729    36,2221  3 1500 0            DCA      SAVET-30
 0221   REF   3  LAST  527    36,2222  0 5301 0            TC       LONGCALL
 0222   REF  17  LAST  573    F7,1453                      EBANK=   TTOGO
 0223   REF   3  LAST  252    36,2223   02242 1            2CADR    TIG-35
 0223                         36,2224   74067 0
 0224   REF  32  LAST  728    36,2225  0 5355 1            TC       PHASCHNG
 0225                         36,2226   20254 0            OCT      20254           4.25SPOT FOR TIG-35 RESTART.

 0226   REF   1               36,2227  0 5323 0            TC       CHECKMM
 0227                          36,2230   00077 1             DEC     63
 0228   REF 102  LAST  718     36,2231  1 5146 0             TCF     ENDOFJOB        NOT P63
 0229   REF   2  LAST  728     36,2232  4 4753 0             CS      CNTDNDEX        P63 CAN START DISPLAYING NOW.
 0230   REF   5  LAST  634     36,2233  55'162 1             TS      DISPDEX
 0231   REF  99  LAST  729     36,2234  0 6060 1             TC      INTPRET
 0232                          36,2235   51575 1             VLOAD   ABVAL
 0233   REF   2  LAST  154     36,2236   03553 1                     VN1
 0234   REF   5  LAST  328     36,2237   03472 0             STORE   ABVEL           INITIALIZE ABVEL FOR P63 DISPLAY
 0235                          36,2240   77776 1             EXIT
 0236   REF 103  LAST  730     36,2241  1 5146 0             TCF     ENDOFJOB


R0237                                     *************************************

 0238   REF   1                36,2242  3 3751 1   TIG-35    CAF     5SEC
 0239   REF  10  LAST  535     36,2243  0 5175 1             TC      TWIDDLE
 0240   REF   2  LAST  252     36,2244   02300 0             ADRES   TIG-30

 0241   REF  33  LAST  729     36,2245  0 5355 1             TC      PHASCHNG
 0242                          36,2246   40154 0             OCT     40154           4.15SPOT FOR TIG-30 RESTART

 0243   REF   1                36,2247  4 4743 1             CS      BLANKDEX        BLANK DSKY FOR 5 SECONDS
 0244   REF   6  LAST  730     36,2250  55'162 1             TS      DISPDEX

 0245   REF   7  LAST  728     36,2251  51'455 1             INDEX   WHICH
 0246                          36,2252  4 0006 0             CS      6               CHECK ULLAGE TIME.
 0247                          36,2253  0 0006 1             EXTEND
 0248   REF  39  LAST  728     36,2254  6 5263 0             BZMF    TASKOVER
 0249   REF   1                36,2255  3 3144 0             CAF     4.9SEC          SET UP TASK TO RESTORE DISPLAY AT TIG-30
 0250   REF  11  LAST  730     36,2256  0 5175 1             TC      TWIDDLE
 0251   REF   1                36,2257   02270 0             ADRES   TIG-30.1

 0252   REF   1                36,2260  3 5020 0             CAF     PRIO17          A NEGATIVE ULLAGE TIME INDICATES P41, IN
 0253   REF  16  LAST  719     36,2261  0 5063 1             TC      NOVAC           WHICH CASE WE HAVE TO SET UP A JOB TO
 0254   REF  18  LAST  729     E7,1453                       EBANK=  TTOGO           BLANK THE DSKY FOR FIVE SECONDS, SINCE
 0255   REF   1                36,2262   02265 1             2CADR   P41BLANK        CLOKJOB IS NOT RUNNING DURING P41.
 0255   REF   1                36,2263   74067 0
 0256   REF  40  LAST  730     36,2264  1 5263 1             TCF     TASKOVER

 0257   REF 187  LAST  728     36,2265  0 4607 1   P41BLANK  TC      BANKCALL        BLANK DSKY.
 0258   REF   2  LAST  512     36,2266   20451 0             CADR    CLEANDSP
 0259   REF 104  LAST  730     36,2267  1 5146 0             TCF     ENDOFJOB

 0260   REF   2  LAST  730     36,2270  3 5020 0   TIG-30.1  CAF     PRIO17          SET UP JOB  TO RESTORE DISPLAY AT TIG-30
 0261   REF  17  LAST  730     36,2271  0 5063 1             TC      NOVAC
 0262   REF  19  LAST  730     E7,1453                       EBANK=  TTOGO
 0263   REF   1                36,2272   02275 0             2CADR   TIG-30A
 0263   REF   1                36,2273   74067 0
 0264   REF  41  LAST  730     36,2274  1 5263 1             TCF     TASKOVER
 0265   REF   1                36,2275  3 3753 0  TIG-30A  CAF     V16N85B
 0266   REF 188  LAST  730     36,2276  0 4607 1           TC      BANKCALL        RESTORE DISPLAY.
 0267   REF   1                36,2277   20460 1           CADR    REGODSP         REGODSP DOES A TCF ENDOFJOB

R0268                                      *****************************************


 0269   REF   1                36,2300  3 3143 1  TIG-30   CAF     S24.9SEC
 0270   REF  12  LAST  730     36,2301  0 5175 1           TC      TWIDDLE
 0271   REF   3  LAST  252     36,2302   02354 1           ADRES   TIG-5

 0272   REF   3  LAST  730     36,2303  4 4753 0           CS      CNTDNDEX        START UP CLOKTASK AGAIN
 0273   REF   7  LAST  730     36,2304  55'162 1           TS      DISPDEX

 0274   REF   8  LAST  730     36,2305  51'455 1           INDEX   WHICH           PICK UP APPROPRIATE ULLAGE-ON TIME
 0275                          36,2306  3 0006 1           CA      6
 0276                          36,2307  0 0006 1           EXTEND
 0277   REF   5  LAST  728     36,2310  6 2327 0           BZMF    ULLGNOT         DON'T SET UP ULLAGE IF DT IS NEG OR ZERO
 0278   REF   8  LAST  729     36,2311  55'477 0           TS      SAVET-30        SAVE DELTA-T FOR RESTART
 0279   REF  13  LAST  731     36,2312  0 5175 1           TC      TWIDDLE
 0280   REF   3  LAST  250     36,2313   02350 0           ADRES   ULLGTASK

 0281   REF  22  LAST  719     36,2314  3 6266 0           CA      THREE           RESTART PROTECT ULLGTASK (1.3SPOT)
 0282   REF  97  LAST  719     36,2315  54 001 1           TS      L
 0283   REF  23  LAST  731     36,2316  4 6266 1           CS      THREE
 0284   REF   3  LAST  227     36,2317  52 752 0           DXCH    -PHASE1
 0285   REF  11  LAST  379     36,2320  4 0025 1           CS      TIME1
 0286   REF   1                36,2321  55'052 0           TS      TBASE1

 02861  REF   9  LAST  731     36,2322  51'455 1           INDEX   WHICH
 02862                         36,2323  0 0001 0           TC      1

 02863  REF  14  LAST  307     36,2324  4 0106 1  WANTAPS  CS      FLGWRD10        (1) FOR P42 ENSURE APSFLAG IS SET. IF IT
 02864  REF   7  LAST  307     36,2325  7 4730 0           MASK    APSFLBIT        WASN'T SET, DAP WILL BE INITIALIZED TO
 02865  REF  15  LAST  731     36,2326  26 106 1           ADS     FLGWRD10        ASCENT VALUES BY 1/ACCS IN 2 SECONDS.

 0287                          36,2327  0 0006 1  ULLGNOT  EXTEND                  (1)
 0288   REF  10  LAST  731     36,2330  5 1455 1           INDEX   WHICH
 0289                          36,2331  3 0010 0           DCA     7               LOAD AVEGEXIT WITH APPROPRIATE 2CADR
 0290   REF   3  LAST  108     36,2332  53'252 1           DXCH    AVEGEXIT

 0291   REF  44  LAST  716     36,2333  3 4743 0           CAF     TWO             4.2SPOT RESTARTS IMMEDIATELY AT REDO4.2
 0292   REF  98  LAST  731     36,2334  54 001 1           TS      L
 0293   REF  45  LAST  731     36,2335  4 4743 1           CS      TWO             AND ALSO AT TIG-5 AT THE CORRECT TIME.
 0294   REF   3  LAST  235     36,2336  52 760 1           DXCH    -PHASE4

 0295   REF  12  LAST  731     36,2337  4 0025 1           CS      TIME1
 0296   REF   2  LAST  244     36,2340  55'060 1           TS      TBASE4          SET TBASE4 FOR TIG-5 RESTART

 02961                         36,2341  0 0006 1  REDO2.17 EXTEND
 02962   REF  10  LAST  552    36,2342  3 4746 0            DCA     NEGO             CLEAR OUT GROUP 2 SO LAMBERT CAN START
 02963   REF   4  LAST  242    36,2343  52 754 0            DXCH    -PHASE2               IF NEEDED.

 0297    REF   1               36,2344  10 762 0  REDO4.2   CCS     PHASE5           IS SERVICER GOING?
 0298    REF  42  LAST  730    36,2345  1 5263 1            TCF     TASKOVER         YES, DON'T START IT UP AGAIN.

 0299    REF  42  LAST  617    36,2346  0 4626 1            TC      POSTJUMP
 0300    REF   1               36,2347   77401 1            CADR    PREREAD          PREREAD ENDS THIS TASK


R0301                                         ****************************************

 0302    REF   1               36,2350  0 2656 0  ULLGTASK  TC      ONULLAGE         THIS COMES AT TIG-7.5 OR TIG-3.5
 0303    REF  34  LAST  730    36,2351  0 5355 1            TC      PHASCHNG
 0304                          36,2352   00001 0            OCT     1
 0305    REF  43  LAST  732    36,2353  1 5263 1            TCF     TASKOVER


R0306                                         ****************************************

 0307                          36,2354  0 0006 1  TIG-5     EXTEND
 03072   REF  11  LAST  732    36,2355  3 4746 0            DCA     NEGO             INSURE THAT GROUP 3 IS INACTIVE.
 03074   REF   2  LAST  225    36,2356  52 756 1            DXCH    -PHASE3

 03076   REF   2  LAST  730    36,2357  3 3751 1            CAF     5SEC
 0308    REF  14  LAST  731    36,2360  0 5175 1            TC      TWIDDLE
 0309    REF   2  LAST  252    36,2361   02407 0            ADRES   TIG-0

 0310    REF  58  LAST  635    36,2362  0 5520 0            TC      DOWNFLAG         RESET IGNFLAG AND ASTNFLAG
 0311    REF   1               36,2363   00153 0            ADRES   IGNFLAG            FOR LIGHT-UP LOGIC
 0312    REF  59  LAST  732    36,2364  0 5520 0            TC      DOWNFLAG
 0313    REF   1               36,2365   00154 1            ADRES   ASTNFLAG
 0314    REF  60  LAST  732    36,2366  0 5520 0            TC      DOWNFLAG
 0315    REF   1               36,2367   00122 0            ADRES   ZOOMFLAG

 0318    REF  11  LAST  731    36,2370  51'455 1            INDEX   WHICH
 0319                          36,2371  0 0011 1            TC      11

 0320    REF   1               36,2372  10 756 1  P40SJUNK  CCS     PHASE3           (11) P40 AND P42.  S40.13 IN PROGRESS?
 03202   REF   4  LAST  728    36,2373  1 2402 1            TCF     DISPCHNG         YES

 03204   REF   4  LAST  396    36,2374  3 4727 1            CAF     PRIO20
 0321    REF  27  LAST  720    36,2375  0 5076 0            TC      FINDVAC
 0322    REF  20  LAST  730    E7,1453                      EBANK=  TTOGO
 0323    REF   2  LAST  251    36,2376   02536 0            2CADR   S40.13
 0323                          36,2377   56067 0


 03232   REF  35  LAST  732    36,2400  0 5355 1            TC      PHASCHNG         3.5SPOT FOR S40.13
 03234                         36,2401   00053 1            OCT     00053
 0324   REF   1               36,2402  4 4751 1  DISPCHNG CS       VB99DEX          (11)
 0325   REF   8  LAST   731   36,2403  55'162 1           TS       DISPDEX
 03252  REF  36  LAST   732   36,2404  0 5355 1  COMMON   TC       PHASCHNG         RESTART TIG-0 (4.7SPOT)
 03254                        36,2405   40074 0           OCT      40074
 0326   REF  44  LAST   732   36,2406  1 5263 1           TCF      TASKOVER


R0327                                        *****************************************

 0328   REF   9  LAST   707   36,2407  4 0103 1  TIG-0    CS       FLAGWRD7         SET IGNFLAG SINCE TIG HAS ARRIVED
 0329   REF   1               36,2410  7 4730 0           MASK     IGNFLBIT
 0330   REF  10  LAST   733   36,2411  26 103 1           ADS      FLAGWRD7

 0331   REF   2  LAST   729   36,2412  0 5323 0           TC       CHECKMM          IN P63 CASE, THROTTLE-UP IS ZOOMTIME
 0332                         36,2413   00077 1           DEC      63                 AFTER NOMINAL IGNITION, NOT ACTUAL
 0333   REF   1               36,2414  1 2425 1           TCF      IGNYET?
 0334   REF   2  LAST   251   36,2415  3 1422 1           CA       ZOOMTIME
 0335   REF  27  LAST   719   36,2416  0 5205 0           TC       WAITLIST
 0336   REF  21  LAST   254   E7,1515                     EBANK=   DVCNTR
 03365  REF   2  LAST   251   36,2417   03670 0           2CADR    ZOOM
 03365                        36,2420   72067 0
 0337   REF   4  LAST   656   36,2421  0 5331 0           TC       2PHSCHNG
 0338                         36,2422   40033 0           OCT      40033

 0339                         36,2423   05014 1           OCT      05014
 0340                         36,2424   77777 0           OCT      77777

 0341   REF   1               36,2425  3 4731 0  IGNYET?  CAF      ASTNBIT          CHECK ASTNFLAG:  HAS ASTRONAUT RESPONDED
 0342   REF  11  LAST   733   36,2426  7 0103 1           MASK     FLAGWRD7           TO OUR ENGINE ENABLE REQUEST?
 0343   REF 206  LAST   719   36,2427  10 000 0           CCS      A
 03435  REF   2  LAST   252   36,2430  1 2433 0           TCF      IGNITION
 0344   REF  12  LAST   732   36,2431  51'455 1           INDEX    WHICH
 03445                        36,2432  0 0012 1           TC       12

 0346   REF  20  LAST   590   36,2433  4 0101 0  IGNITION CS       FLAGWRD5         INSURE ENGONFLG IS SET.
 03461  REF   3  LAST   227   36,2434  7 4736 0           MASK     ENGONBIT
 03462  REF  21  LAST   733   36,2435  26 101 0           ADS      FLAGWRD5
 03463  REF   6  LAST   238   36,2436  4 4346 0           CS       PRIO30           TURN ON THE ENGINE.
 0347                         36,2437  0 0006 1           EXTEND
 0348   REF  22  LAST   485   36,2440  02 011 0           RAND     DSALMOUT
 0349   REF  25  LAST   580   36,2441  6 4730 1           AD       BIT13
 0350                         36,2442  0 0006 1           EXTEND
 0351   REF  23  LAST   733   36,2443  01 011 0           WRITE    DSALMOUT
 0352                         36,2444  0 0006 1           EXTEND                    SET TEVENT FOR DOWNLINK
 0353   REF  17  LAST   588   36,2445  3 0025 0           DCA      TIME2
 0354   REF   4  LAST   212   36,2446  53'342 1           DXCH     TEVENT

 03542  REF   1               36,2447  4 4726 1           CS       PULSES           MAKE SURE THAT DAP IS NOT IN MINIMUM
 03544  REF  14  LAST   307   36,2450  7 0111 1           MASK     DAPBOOLS         IMPULSE MODE IN P12,P40,P42,AND P63
 03546  REF  15  LAST   733   36,2451  54 111 1           TS       DAPBOOLS
 0355                           36,2452  0 0006 1            EXTEND              UPDATE TIG USING TGO FROM S40.13
 0356     REF   4  LAST  252    36,2453  3 1517 0            DCA     TGO
 0357     REF  27  LAST  729    36,2454  53'442 0            DXCH    TIG
 0358                           36,2455  0 0006 1            EXTEND
 0359     REF  18  LAST  733    36,2456  3 0025 0            DCA     TIME2
 0360     REF  28  LAST  734    36,2457  21'442 0            DAS     TIG

 03601    REF   1               36,2460  4 4733 0            CS      FLUNDBIT        PERMIT GUIDANCE LOOP DISPLAYS
 03602    REF  10  LAST  707    36,2461  7 0104 0            MASK    FLAGWRD8
 03603    REF  11  LAST  734    36,2462  54 104 0            TS      FLAGWRD8

 0361     REF  13  LAST  733    36,2463  51'455 1            INDEX   WHICH
 0362                           36,2464  0 0013 0            TC      13

 0363                           36,2465  0 0006 1  P63IGN    EXTEND                  (13)      INITIATE BURN DISPLAYS
 0364     REF   1               36,2466  3 3136 0            DCA     LUNLANAD
 0366     REF   1               36,2467  53'252 1            DXCH    AVGEXIT

 03661    REF  15  LAST  684    36,2470  3 0005 1            CA      Z               ASSASSINATE CLOKTASK
 03662    REF   9  LAST  733    36,2471  55'162 1            TS      DISPDEX

 0370     REF   2  LAST  265    36,2472  4 0105 1            CS      FLAGWRD9        SET FLAG FOR P70-P71
 0371     REF   1               36,2473  7 4734 1            MASK    LETABBIT
 0372     REF   3  LAST  734    36,2474  26 105 1            ADS     FLAGWRD9

 03754                          36,2475  0 0006 1            EXTEND                  INITIALIZE TIG FOR P70 AND P71.
 03755    REF  19  LAST  734    36,2476  3 0025 0            DCA     TIME2
 03756    REF  29  LAST  734    36,2477  53'442 0            DXCH    TIG

 0376     REF 134  LAST  728    36,2500  3 4746 0            CAF     ZERO            INITIALIZE WCHPHASE AND FLPASS0
 0377     REF   1               36,2501  55'346 0            TS      WCHPHASE
 03771    REF   2  LAST  156    36,2502  55'621 1            TS      WCHPHOLD        ALSO WHCPHOLD
 0378     REF  46  LAST  731    36,2503  3 4743 0            CA      TWO
 0379     REF   3  LAST  156    36,2504  55'623 0            TS      FLPASS0

 0380     REF   2  LAST  727    36,2505  1 2540 0            TCF     P42IGN
 0381     REF  22  LAST  733    36,2506  4 0101 0  P40IGN    CS      FLAGWRD5        (13)
 0382     REF   1               36,2507  7 4731 1            MASK    NOTHRBIT
 0383                           36,2510  0 0006 1            EXTEND
 0384     REF   3  LAST  734    36,2511  1 2540 0            BZF     P42IGN
 0385     REF   3  LAST  733    36,2512  3 1422 1            CA      ZOOMTIME
 0386     REF  23  LAST  733    36,2513  0 5205 0            TC      WAITLIST
 0387     REF  22  LAST  733    E7,1515                      EBANK=  DVCNTR
 03875    REF   3  LAST  733    36,2514   03670 0            2CADR   ZOOM
 03875                          36,2515   72067 0
 0388     REF   5  LAST  733    36,2516  0 5331 0  P63IGN1   TC      2PHSCHNG
 0389                           36,2517   40033 0            OCT     40033           3.3SPOT FOR ZOOM RESTART.
 0390                           36,2520   05014 1            OCT     05014           TYPE C   RESTARTS HERE IMMEDIATELY
 0391                           36,2521   77777 0            OCT     77777
```

```
0392     REF   4  LAST  734    36,2522   1 2540 0              TCF      P42IGN
0398     REF   6  LAST  536    36,2523   3 5006 1   P12IGN     CAF      EBANK6
039805   REF  28  LAST  716    36,2524   54 003 0              TS       EBANK
03981    REF   8  LAST  234    E6,1536                         EBANK=   AOSQ

039814   REF   1               36,2525   3 1412 1              CA       IGNAOSQ          INITIALIZE DAP BIAS ACCELERATION
039815   REF   9  LAST  735    36,2526   55'536 1              TS       AOSQ                   ESTIMATES AT P12 IGNITION.
03982    REF   1               36,2527   3 1413 0              CA       IGNAOSR
039825   REF   1               36,2530   55'540 0              TS       AOSR

03983    REF   6  LAST  681    36,2531   3 5007 0              CAF      EBANK7
039835   REF  29  LAST  735    36,2532   54 003 0              TS       EBANK
03984    REF  23  LAST  734    E7,1515                         EBANK=   DVCNTR

0399     REF  16  LAST  734    36,2533   3 0005 1   ABRTIGN    CA       Z                (13) KILL CLOKTASK
0400     REF  10  LAST  734    36,2534   55'162 1              TS       DISPDEX

04001                          36,2535   0 0006 1              EXTEND                    CONNECT ASCENT GYIDANCE TO SERVICER.
04002    REF   1               36,2536   3 3140 1              DCA      ATMAGADR
04003    REF   2  LAST  734    36,2537   53'252 1              DXCH     AVGEXIT

0405     REF   1               36,2540   4 4735 0   P42IGN     CS       DRIFTBIT         ENSURE THAT POWERED-FLIGHT SWITCHING
0409     REF  16  LAST  733    36,2541   7 0111 1              MASK     DAPBOOLS           CURVES ARE USED.
0410     REF  17  LAST  735    36,2542   54 111 1              TS       DAPBOOLS
0411     REF   1               36,2543   3 4734 0              CAF      IMPULBIT         EXAMINE IMPULSF SWITCH
0412     REF  12  LAST  684    36,2544   7 0076 1              MASK     FLAGWRD2
0413     REF 207  LAST  733    36,2545   10 000 0              CCS      A
0414     REF   1               36,2546   1 3523 1              TCF      IMPLBURN

0415     REF  61  LAST  732    36,2547   0 5520 0   DVMONCON   TC       DOWNFLAG
0416     REF   2  LAST  732    36,2550    00153 0              ADRES    IGNFLAG          CONNECT DVMON
0417     REF  62  LAST  735    36,2551   0 5520 0              TC       DOWNFLAG
0418     REF   2  LAST  732    36,2552    00154 1              ADRES    ASTNFLAG
0419     REF  63  LAST  735    36,2553   0 5520 0              TC       DOWNFLAG
0420     REF   1               36,2554    00161 1              ADRES    IDLEFLAG

0421     REF  37  LAST  733    36,2555   0 5355 1              TC       PHASCHNG
0422                           36,2556    40054 1              OCT      40054

0423     REF  11  LAST  706    36,2557   0 5223 1              TC       FIXDELAY         TURN ULLAGE OFF HALF A SECOND AFTER
0424                           36,2560    00062 0              DEC      50               LIGHT UP.

0425     REF   1               36,2561   0 2652 1   ULLAGOFF   TC       NOULLAGE

0426                           36,2562   0 0006 1   WAITABIT   EXTEND                    KILL GROUP 4
0427     REF  12  LAST  732    36,2563   3 4746 0              DCA      NEGO
0428     REF   4  LAST  731    36,2564   52 760 1              DXCH     -PHASE4

0429     REF  45  LAST  733    36,2565   1 5263 1              TCF      TASKOVER
```

```
 04292  REF  43  LAST  732   36,2566  0 4626 1  TIGTASK  TC      POSTJUMP        (12)
 04293  REF   1              36,2567   73657 1           CADR    TIGTASK1

R0430                                   ****************************************

 04302                       31,2144                     BANK    31
 04303  REF   1              35,2000                     SETLOC  P40S3
 04304                       35,3657                     BANK
 04305  REF   1                                          COUNT*  $$/P40

 0431   REF   6  LAST  485   35,3657  3 5017 1  TIGTASK1 CAF     PRIO16
 0432   REF  18  LAST  730   35,3660  0 5063 1           TC      NOVAC
 0433   REF   8  LAST  326   E7,1462                     EBANK=  TRKMKCNT
 0434   REF   1              35,3661   03240 1           2CADR   TIGNOW
 0434   REF   1              35,3662   74067 0
 04342  REF  64  LAST  735   35,3663  0 5520 0           TC      DOWNFLAG
 04344  REF   3  LAST  297   35,3664   00303 1           ADRES   PULSEFLG

 0435   REF  38  LAST  735   35,3665  0 5355 1           TC      PHASCHNG
 0436                        35,3666   00006 1           OCT     6               KILL GROUP 6.

 0437   REF  46  LAST  735   35,3667  1 5263 1           TCF     TASKOVER


R0438                                   ****************************************

 0439   REF   3  LAST  733   35,3670  0 5323 0  ZOOM     TC      CHECKMM         P40 OR P63?
 0440                        35,3671   00077 1           DEC     63
 0441   REF   1              35,3672  1 3700 1           TCF     P40ZOOM

 0442   REF  45  LAST  711   35,3673  0 5506 1  P63ZOOM  TC      UPFLAG          INDICATE THAT THROTTLE-UP HAS COME
 0443   REF   2  LAST  732   35,3674   00122 0           ADRES   ZOOMFLAG

 0445   REF  25  LAST  728   35,3675  0 4665 0           TC      IBNKCALL
 0446   REF   1              35,3676   62334 1           CADR    FLATOUT
 04462  REF   1              35,3677  1 3705 1           TCF     P40ZOOMA

 04463  REF  26  LAST  733   35,3700  3 4730 1  P40ZOOM  CAF     BIT13
 04464  REF   2  LAST  222   35,3701  54 055 0           TS      THRUST
 04465  REF  31  LAST  716   35,3702  3 4741 1           CAF     BIT4

 04466                       35,3703  0 0006 1           EXTEND
 04467  REF   8  LAST  552   35,3704  05 014 1           WOR     CHAN14

 0447   REF  39  LAST  736   35,3705  0 5355 1  P40ZOOMA TC      PHASCHNG
 0448                        35,3706   00003 1           OCT     3
 0449   REF  47  LAST  736   35,3707  1 5263 1           TCF     TASKOVER


 04493                       36,2570                     BANK    36
 04494  REF   4  LAST  726   36,2000                          SETLOC P40S
 04495                       36,2570                          BANK
 04496  REF   4 LAST  726 TO  736:    356   376*              COUNT* $$/P40

R0450                                       **********************************

 0451   REF  46  LAST  736   36,2570  0 5506 1  COMFAIL   TC     UPFLAG          (15)
 0452   REF   2  LAST  735   36,2571   00161 1            ADRES  IDLEFLAG
 0453   REF  47  LAST  737   36,2572  0 5506 1            TC     UPFLAG          SET FLAG TO SUPPRESS CONFLICTING DISPLAY
 0454   REF   1              36,2573   00175 1            ADRES  FLUNDISP
 0455   REF   9  LAST  580   36,2574  3 4742 1            CAF    FOUR            RESET DVMON
 0456   REF  24  LAST  735   36,2575  55'515 0            TS     DVCNTR
 0457   REF   1              36,2576  10 764 0            CCS    PHASE6          CLOCKTASK ACTIVE?
 0458                        36,2577  1 2602 0            TCF    +3              YES
 0460   REF 189  LAST  731   36,2600  0 4607 1            TC     BANKCALL        OTHERWISE, START IT UP
 0461   REF   1              36,2601   74662 0            CADR   STCLOK1
 0462   REF   1              36,2602  4 4756 0     +3     CS     VB97DEX
 0463   REF  11  LAST  735   36,2603  55'162 1            TS     DISPDEX
 0464   REF  40  LAST  736   36,2604  0 5355 1            TC     PHASCHNG        TURN OFF GROUP 4.
 0465                        36,2605   00004 0            OCT    00004
 04655  REF 105  LAST  730   36,2606  1 5146 0            TCF    ENDOFJOB

 0466   REF  14  LAST  734   36,2607  51'455 1  COMFAIL1  INDEX  WHICH
 0467                        36,2610  0 0002 0            TC     2

 0468   REF  17  LAST  735   36,2611  3 0005 1  COMFAIL3  CA     Z               (15)        KILL CLOKTASK USING Z
 0469                        36,2612  1 2614 1            TCF     +2

 0470   REF   4  LAST  731   36,2613  4 4753 0  COMFAIL4  CS     CNTDNDEX
 0471   REF  12  LAST  737   36,2614  55'162 1            TS     DISPDEX

 0472   REF  65  LAST  736   36,2615  0 5520 0            TC     DOWNFLAG        RECONNECT DV MONITOR
 0473   REF   3  LAST  737   36,2616   00161 1            ADRES  IDLEFLAG
 0474   REF  66  LAST  737   36,2617  0 5520 0            TC     DOWNFLAG        PERMIT GUIDANCE LOOP DISPLAYS
 0475   REF   2  LAST  737   36,2620   00175 1            ADRES  FLUNDISP
 0476   REF 106  LAST  737   36,2621  1 5146 0            TCF    ENDOFJOB


 0477   REF  41  LAST  737   36,2622  0 5355 1  COMFAIL2  TC     PHASCHNG        KILL ZOOM RESTART PROTECTION
 0478                        36,2623   00003 1            OCT    00003

 0479                        36,2624  0 0004 0            INHINT
 0480   REF  11  LAST  613   36,2625  0 6050 1            TC     KILLTASK        KILL ZOOM, IN CASE IT'S STILL TO COME
 0481   REF   4  LAST  734   36,2626   73670 1            CADR   ZOOM
 0482   REF  26  LAST  736   36,2627  0 4665 0            TC     IBNKCALL        COMMAND ENGINE OFF
 0483   REF   1              36,2630   75562 1            CADR   ENGINOF4
 04832  REF  48  LAST  737   36,2631  0 5506 1            TC     UPFLAG          SET THE DRIFT BIT FOR THE DAP.
 04834  REF   1              36,2632   00312 1            ADRES  DRIFTDFL
 0484   REF   1              36,2633  0 2644 0            TC     INVFLAG         USE OTHER RCS SYSTEM
 0485   REF   1              36,2634   00310 0            ADRES  AORBTFLG
 0486   REF  49  LAST  737   36,2635  0 5506 1            TC      UPFLAG            TURN ON ULLAGE
 0487   REF   2  LAST  236   36,2636   0C314 1            ADRES   ULLAGFLG
 0488   REF  36  LAST  718   36,2637  3 4744 1            CAF     BIT1
 0489                        36,2640  0 0004 0            INHINT
 0490   REF  15  LAST  732   36,2641  0 5175 1            TC      TWIDDLE
 0491   REF   4  LAST  731   36,2642   02354 1            ADRES   TIG-5
 0492   REF 107  LAST  737   36,2643  1 5146 0            TCF     ENDOFJOB

R0493                                               ****************************************
R0494                                               SUBROUTINES OF THE IGNITION ROUTINE
R0495                                               ****************************************

 0496   REF 178  LAST  686   36,2644  3 0002 0  INVFLAG   CA      Q
 0497   REF   1              36,2645  0 5524 1            TC      DEBIT
 0498                        36,2646  4 0000 0            COM
 0499                        36,2647  0 0006 1            EXTEND
 0500   REF  11  LAST  574   36,2650  06 001 0            RXOR    LCHAN
 0501   REF   1              36,2651  1 5513 1            TCF     COMFLAG

R0502                                               ****************************************

 0503   REF   1              36,2652  4 4737 1  NOULLAGE  CS      ULLAGER           MUST BE CALLED IN A TASK OR UNDER INHINT
 0504   REF  18  LAST  735   36,2653  7 0111 1            MASK    DAPBOOLS
 0505   REF  19  LAST  738   36,2654  54 111 1            TS      DAPBOOLS
 0506   REF 179  LAST  738   36,2655  0 0002 0            TC      Q

R0507                                               ****************************************

 0508   REF  20  LAST  738   36,2656  4 0111 1  ONULLAGE  CS      DAPBOOLS          TURN ON ULLAGE.  MUST BE CALLED IN
 0509   REF   2  LAST  738   36,2657  7 4737 1            MASK    ULLAGER           A TASK OR WHILE INHINTED.
 0510   REF  21  LAST  738   36,2660  26 111 1            ADS     DAPBOOLS
 0511   REF 180  LAST  738   36,2661  0 0002 0            TC      Q

R0512                                               ****************************************

 0513   REF 135  LAST  734   36,2662  3 4746 0  STCLOK1   CA      ZERO              THIS ROUTINE STARTS THE COUNT-DOWN
 0514   REF  13  LAST  737   36,2663  55'162 1  STCLOK2   TS      DISPDEX             (CLOKTASK AND CLOKJOB).   SETTING
 0515   REF   9  LAST  592   36,2664  0 4636 0  STCLOK3   TC      MAKECADR          SETTING DISPDEX POSITIVE KILLS IT.
 0516   REF   3  LAST  731   36,2665  55'060 1            TS      TBASE4            RETURN SAVE (NOT FOR RESTARTS)
 0517                        36,2666  0 0006 1            EXTEND
 0518   REF  30  LAST  734   36,2667  3 1442 1            DCA     TIG
 0519   REF 271  LAST  729   36,2670  52 155 1            DXCH    MPAC
 0520                        36,2671  0 0006 1            EXTEND
 0521   REF  20  LAST  734   36,2672  4 0025 1            DCS     TIME2
 0522   REF 272  LAST  738   36,2673  20 155 1            DAS     MPAC              HAVE TIG - TIME2, UNDOUBTEDLY A + NUMBER
 0523   REF   7  LAST  449   36,2674  0 7300 0            TC      TPAGREE           POSITIVE, SINCE WE PASSED THE
 0524    REF  11  LAST  721    36,2675  3 4770 0              CAF     1SEC               45 SECOND CHECK
 0525    REF 181  LAST  738    36,2676  54 002 1              TS      Q
 0526    REF 273  LAST  738    36,2677  52 155 1              DXCH    MPAC
 0527    REF  10  LAST  577    36,2700  7 4337 0              MASK    LOW5              RESTRICT MAGNITUDE OF NUMBER IN A
 0528                          36,2701  0 0006 1              EXTEND
 0529    REF 182  LAST  739    36,2702  10 002 1              DV      Q
 0530    REF  99  LAST  731    36,2703  3 0001 0              CA      L                 GET REMAINDER
 0531    REF  47  LAST  734    36,2704  6 4743 0              AD      TWO
 0532                          36,2705  0 0004 0              INHINT
 0533    REF  16  LAST  738    36,2706  0 5175 1              TC      TWIDDLE
 0534    REF   3  LAST  656    36,2707   02716 0              ADRES   CLOKTASK
 0535    REF   6  LAST  734    36,2710  0 5331 0              TC      2PHSCHNG
 0536                          36,2711   40036 0              OCT     40036             6.3SPOT FOR CLOKTASK
 0537                          36,2712   05024 1              OCT     05024
 0538                          36,2713   13000 0              OCT     13000

 0539    REF   4  LAST  738    36,2714  3 1060 0              CA      TBASE4
 0540    REF  12  LAST  593    36,2715  0 4631 1              TC      BANKJUMP


 0541    REF  13  LAST  731    36,2716  4 0025 1  CLOKTASK CS      TIME1             SET TBASE6 FOR GROUP 6 RESTART
 0542    REF   1               36,2717  55'064 0              TS      TBASE6

 0543    REF  14  LAST  738    36,2720  11'162 1              CCS     DISPDEX
 0544    REF   1               36,2721  1 2732 1              TCF     KILLCLOK
 0545                          36,2722  12 723 1              NOOP
 0546    REF   4  LAST  522    36,2723  3 7736 1              CAF     PRIO27
 0547    REF  19  LAST  736    36,2724  0 5063 1              TC      NOVAC
 0548    REF  21  LAST  732    E7,1453                        EBANK=  TTOGO
 0549    REF   1               36,2725   02736 1              2CADR   CLOKJOB
 0549    REF   1               36,2726   74067 0


 0550    REF  12  LAST  735    36,2727  0 5223 1              TC      FIXDELAY          WAIT A SECOND BEFORE STARTING OVER
 0551                          36,2730   00144 0              DEC     100
 0552    REF   4  LAST  739    36,2731  1 2716 1              TCF     CLOKTASK


 0553                          36,2732  0 0006 1  KILLCLOK EXTEND                   KILL RESTART
 0554    REF  13  LAST  735    36,2733  3 4746 0              DCA     NEGO
 0555    REF   2  LAST  225    36,2734  52 764 0              DXCH    -PHASE6
 0556    REF  48  LAST  736    36,2735  1 5263 1              TCF     TASKOVER


 0557                          36,2736  0 0006 1  CLOKJOB  EXTEND
 0558    REF  31  LAST  738    36,2737  4 1442 0              DCS     TIG
 0559    REF  22  LAST  739    36,2740  53'454 1              DXCH    TTOGO
 0560                          36,2741  0 0006 1              EXTEND
 0561    REF  21  LAST  738    36,2742  3 0025 0              DCA     TIME2
 0562    REF  23  LAST  739    36,2743  21'454 1              DAS     TTOGO
 0563                          36,2744  0 0004 0             INHINT
 0564   REF  15  LAST  739     36,2745  11'162 1             CCS     DISPDEX          IF DISPDEX HAS BEEN SET POSITIVE BY A
 0565   REF 108  LAST  738     36,2746  1 5146 0             TCF     ENDOFJOB         TASK OR A HIGHER PRIORITY JOB SINCE THE
 0566   REF 109  LAST  740     36,2747  1 5146 0             TCF     ENDOFJOB         LAST CLOKTASK, AVOID USING IT AS AN
 0567                          36,2750  4 0000 0             COM                      INDEX.
 0568                          36,2751  0 0003 1             RELINT                   *****  DISPDEX MUST NEVER BE -0  *****
 0569   REF 208  LAST  735     36,2752  50 000 1             INDEX   A
 0570   REF   1                36,2753  1 3010 1             TCF     DISPNOT -1       ( -1 DUE TO EFFECT OF CCS )

 0571   REF   1                   4756             VB97DEX   =       OCT35            NEGATIVE OF THIS IS PROPER FOR DISPDEX

 05711  REF 136  LAST  738     36,2754  4 4746 1   -35       CS      ZERO             INDICATE VERB 97 PASTE
 05712  REF   1                36,2755  55'066 1             TS      NVWORD1
 0572   REF   1                36,2756  3 0370 0             CA      NVWORD +2        NVWROD+2 CONTAINS V06 & APPROPRIATE NOUN
 0573   REF 190  LAST  737     36,2757  0 4607 1             TC      BANKCALL
 0574   REF   1                36,2760   20466 1             CADR    CLOCPLAY
 0575   REF   1                36,2761  1 3012 0             TCF     STOPCLOK         TERMINATE CLOKTASK ON THE WAY TO POOH
 0576   REF   1                36,2762  1 2607 0             TCF     COMFAIL1
 0577   REF   1                36,2763  1 2622 1             TCF     COMFAIL2

A0583                                                                                 THIS DISPLAY IS CALLED VIA ASTNCLOK
 0584   REF   1                36,2764  3 3145 1   -25       CAF     V06N61           IT IS PRIMARILY USED BY THE CREW IN P63
 0585   REF 191  LAST  740     36,2765  0 4607 1             TC      BANKCALL         TO RESET HIS EVENT TIMER TO AGREE WITH
 0586   REF   1                36,2766   20452 0             CADR    REFLASH          TIG.
 0587   REF   2  LAST  740     36,2767  1 3012 0             TCF     STOPCLOK
 0588   REF   1                36,2770  1 3027 0             TCF     ASTNRETN
 0589                          36,2771  1 2764 1             TCF     -5

 0590   REF   1                   4753             CNTDNDEX =       LOW4             OCT17; NEGATIVE PROPER FOR DISPDEX

 0591   REF  15  LAST  737     36,2772  51'455 1   -17       INDEX   WHICH            THIS DISPLAY COMES UP AT ONE SECOND
 0592                          36,2773  3 0000 1             CA      0                INTERVALS. IT IS NORMALLY OPERATED
 0593   REF 192  LAST  740     36,2774  0 4607 1             TC      BANKCALL         BETWEEN TIG-30 SECONDS AND TIG-5 SECONDS
 0594   REF   2  LAST  731     36,2775   20460 1             CADR    REGODSP          REGODSP DOES ITS OWN TCF ENDOFJOB

 0595   REF   2  LAST  482        4751             VB99DEX   =       ELEVEN           OCT13; NEGATIVE PROPER FOR DISPDEX

 05955                         36,2776             V99RECYC EQUALS

 05956  REF  18  LAST  573     36,2776  4 4734 1   -13       CS      BIT9             INDICATE VERB 99 PASTE
 05957  REF   2  LAST  740     36,2777  55'066 1             TS      NVWORD1
 0596   REF  16  LAST  740     36,3000  51'455 1             INDEX   WHICH            THIS IS THE "PLEASE ENABLE ENGINE"
 0597                          36,3001  3 0000 1             CA      0                DISPLAY; IT IS INITIATED AT TIG-5 SEC.
 0598   REF 193  LAST  740     36,3002  0 4607 1             TC      BANKCALL         THE DISPLAY IS A V99NXX, WHERE XX IS THE
 0599   REF   2  LAST  740     36,3003   20466 1             CADR    CLOCPLAY         NOUN THAT HAD PREVIOUSLY BEEN DISPLAYED
 0600   REF   3  LAST  740     36,3004  1 3012 0             TCF     STOPCLOK         TERMINATE  GOTOPOOH TURNS OFF ULLAGE.
 0601   REF   1                36,3005  1 3040 1             TCF     *PROCEED
 0602   REF   1                36,3006  1 3043 1             TCF     *ENTER

 0606   REF  48  LAST  739        4743             BLANKDEX  =       TWO              NEGATIVE OF THIS IS PROPER FOR DISPDEX
 0607   REF 194  LAST  740   36,3007  0 4607 1   -2      TC      BANKCALL       BLANK DSKY.  THE DSKY IS BLANKED FOR
 0608   REF   3  LAST  730   36,3010   20451 0           CADR    CLEANDSP       5 SECONDS AT TIG-35 TO INDICATE THAT
 0609   REF 110  LAST  740   36,3011  1 5146 0  DISPNOT  TCF     ENDOFJOB       AVERAGE G IS STARTING.


 0610   REF   1              36,3012  0 3014 1  STOPCLOK TC      NULLCLOK       STOP CLOKTASK & TURN OFF ULLAGE ON THE
 0611   REF  19  LAST  713   36,3013  1 6001 1           TCF     GOTOPOOH           WAY TO P00  (GOTOPOOH RELINTS)

 0612                        36,3014  0 0004 0  NULLCLOK INHINT
 0613                        36,3015  0 0006 1           EXTEND
 0614   REF   1              36,3016  23'141 1           DXCH    P40/RET
 0615   REF   2  LAST  735   36,3017  0 2652 1           TC      NOULLAGE       TURN OFF ULLAGE...
 0616   REF  12  LAST  737   36,3020  0 6050 1           TC      KILLTASK          DON'T LET IT COME ON, EITHER...
 0617   REF   4  LAST  731   36,3021   74350 1           CADR    ULLGTASK
 0618   REF  42  LAST  737   36,3022  0 5355 1           TC      PHASCHNG                 NOT EVEN IF THERE'S A RESTART.
 0619                        36,3023   00001 0           OCT     1
 0620   REF  18  LAST  737   36,3024  3 0005 1           CA      Z              KILL CLOKTASK
 0621   REF  16  LAST  740   36,3025  55'162 1           TS      DISPDEX
 0622   REF   2  LAST  741   36,3026  0 1141 1           TC      P40/RET


 06222  REF  43  LAST  741   36,3027  0 5355 1  ASTNRETN TC      PHASCHNG
 06224                       36,3030   04024 0           OCT     04024
 0623   REF 137  LAST  740   36,3031  3 4746 0           CAF     ZERO           STOP DISPLAYING BUT KEEP RUNNING.
 06231  REF  17  LAST  741   36,3032  55'162 1           TS      DISPDEX
 06232  REF   1              36,3033  3 5014 1           CAF     PRIO13
 0625   REF  28  LAST  732   36,3034  0 5076 0           TC      FINDVAC
 0626   REF   2  LAST  128   E5,1757                     EBANK=  STARIND
 0627   REF   1              36,3035   03022 1           2CADR   ASTNRET
 0627   REF   1              36,3036   64065 0
 0628   REF 111  LAST  741   36,3037  1 5146 0           TCF     ENDOFJOB


 0629   REF  50  LAST  738   36,3040  0 5506 1  *PROCEED TC      UPFLAG
 0630   REF   3  LAST  735   36,3041   00154 1           ADRES   ASTNFLAG

 0631   REF   1              36,3042  1 3101 0           TCF     IGNITE


 0632                        36,3043  0 0004 0  *ENTER   INHINT
 0633   REF  17  LAST  740   36,3044  51'455 1           INDEX   WHICH
 0634                        36,3045  0 0003 1           TC      3

 0635   REF   2  LAST  222   36,3046  3 4635 0  GOPOST   CAF     PRIO12         (3)  MUST BE LOWER PRIORITY THAN CLOKJOB
 0636   REF  29  LAST  741   36,3047  0 5076 0           TC      FINDVAC
 0637   REF  24  LAST  739   E7,1453                     EBANK=  TTOGO
 0638   REF   2  LAST  252   36,3050   03222 0           2CADR   POSTBURN
 0638                        36,3051   74067 0
 06382                       36,3052  0 0004 0           INHINT                 SET UP THE DAP FOR COASTING FLIGHT.
 06383  REF  27  LAST  737   36,3053  0 4665 0           TC      IBNKCALL
 06384  REF   2  LAST  241   36,3054   40205 1             CADR    ALLCOAST
 0639   REF   2  LAST  741   36,3055  0 3014 1             TC      NULLCLOK
 0640   REF  44  LAST  741   36,3056  0 5355 1             TC      PHASCHNG          4.13 RESTART FOR POSTBURN
 0641                        36,3057   00134 1             OCT     00134

 0642   REF 112  LAST  741   36,3060  1 5146 0             TCF     ENDOFJOB


 0643   REF   3  LAST  730   36,3061  3 5020 0  GOCUTOFF CAF     PRIO17            (3)
 0644   REF  30  LAST  741   36,3062  0 5076 0             TC      FINDVAC
 0645   REF   5  LAST  734   E7,1516                       EBANK=  TGO
 0646   REF   1              36,3063   03526 0             2CADR   CUTOFF
 0646   REF   1              36,3064   70067 1
 0649   REF  67  LAST  737   36,3065  0 5520 0             TC      DOWNFLAG
 0650   REF   3  LAST  737   36,3066   00175 1             ADRES   FLUNDISP

 06502                       36,3067  0 0004 0             INHINT                    SET UP THE DAP FOR COASTING FLIGHT.
 06504  REF  28  LAST  741   36,3070  0 4665 0             TC      IBNKCALL
 06506  REF   3  LAST  742   36,3071   40205 1             CADR    ALLCOAST
 0651   REF   3  LAST  742   36,3072  0 3014 1             TC      NULLCLOK
 0652   REF  45  LAST  742   36,3073  0 5355 1             TC      PHASCHNG
 0653                        36,3074   07024 0             OCT     07024
 0654                        36,3075   17000 1             OCT     17000
 0655   REF   6  LAST  742   E7,1516                       EBANK=  TGO
 0656   REF   2  LAST  742   36,3076   03526 0             2CADR   CUTOFF
 0656                        36,3077   70067 1
 0657   REF 113  LAST  742   36,3100  1 5146 0             TCF     ENDOFJOB


 0658   REF  12  LAST  733   36,3101  4 0103 1  IGNITE   CS      FLAGWRD7          (2)
 0659   REF   2  LAST  733   36,3102  7 4730 0             MASK    IGNFLBIT
 0660   REF 209  LAST  740   36,3103  10 C00 0             CCS     A
 0661   REF   1              36,3104  1 3115 0             TCF     IGNITE1
 0662   REF  37  LAST  738   36,3105  3 4744 1             CAF     BIT1
 0663                        36,3106  0 0004 0             INHINT
 0664   REF  17  LAST  739   36,3107  0 5175 1             TC      TWIDDLE
 0665   REF   3  LAST  733   36,3110   02433 1             ADRES   IGNITION

 0666   REF   1              36,3111  3 4351 1             CAF     OCT23             IMMEDIATE RESTART AT IGNITION.
 0667   REF 100  LAST  739   36,3112  54 C01 1             TS      L
 0668                        36,3113  4 0000 0             COM
 0669   REF   5  LAST  735   36,3114  52 760 1             DXCH    -PHASE4

 0670   REF   5  LAST  737   36,3115  4 4753 0  IGNITE1  CS      CNTDNDEX          RESTORE OLD DISPLAY.
 0671   REF  18  LAST  741   36,3116  55'162 1             TS      DISPDEX

 0672   REF 114  LAST  742   36,3117  1 5146 0             TCF     ENDOFJOB

R0673                                  ****************************************
```

```
 0674    REF  27  LAST  665    36,3120  0 5571 1  P40ALM    TC      ALARM             PROGRAM SELECTION NOT CONSISTENT WITH
 0675                          36,3121   01706 1            OCT     1706              VEHICLE CONFIGURATION

 0676    REF   4  LAST  665    36,3122  3 4777 1  REP40ALM  CAF     V05N09            (14)
 0677    REF 195  LAST  741    36,3123  0 4607 1            TC      BANKCALL
 0678    REF  20  LAST  712    36,3124   20471 1            CADR    GOFLASH

 0679    REF  20  LAST  741    36,3125  1 6001 1            TCF     GOTOPOOH          V34E  TERMINATE
 0680                          36,3126  1 3130 1            TCF      +2               PROCEED  CHECK FOR P42
 0681    REF   2  LAST  727    36,3127  1 3122 1            TCF     REP40ALM          V32E  REDISPLAY ALARM

 0682    REF  18  LAST  741    36,3130  51'455 1            INDEX   WHICH             FOR P42, ALLOW CREW TO PROCEED EVEN
 0683                          36,3131  0 0014 1            TC      14                THOUGH VEHICLE IS UNSTAGED.

R0684                                          ****************************************


 0685                          31,2144                      BANK    31
 0686    REF   1               35,2000                      SETLOC  P40S2
 0687                          35,3710                      8ANK

 0688    REF   2 LAST  736 TO  737:     25    25*           COUNT*  $$/P40

 0689    REF  10  LAST  738    35,3710  0 4636 0  P40AUTO   TC      MAKECADR          HELLO THERE.
 0690    REF   4  LAST  489    35,3711  55'163 0            TS      TEMPR60           FOR GENERALIZED RETURN TO OTHER BANKS.
 0691    REF 196  LAST  743    35,3712  0 4607 1  P40A/P    TC      BANKCALL          SUBROUTINE TO CHECK PGNCS CONTROL
 0692    REF   3  LAST  534    35,3713   54267 0            CADR    G+N,AUTO          AND AUTO STA8ILIZATION MODES
 0693    REF 210  LAST  742    35,3714  10 000 0            CCS     A                 +0  INDICATES IN PGNCS, IN AUTO
 0694    REF   1               35,3715  1 3733 1            TCF     TURNITON          + INDICATES NOT IN PGNCS AND/OR AUTO
 0695    REF   8  LAST  731    35,3716  3 4730 1            CAF     APSFLBIT          ARE WE ON THE DESCENT STAGE?
 0696    REF  16  LAST  731    35,3717  7 0106 1            MASK    FLGWRD10
 0697    REF 211  LAST  743    35,3720  10 000 0            CCS     A
 0698    REF   1               35,3721  1 3740 0            TCF     GO8ACK            RETURN
 06983   REF  32  LAST  736    35,3722  3 4741 1            CAF     BIT4
 06984   REF   4  LAST  326    35,3723  7 0374 0            MASK    CHANBKUP
 06985   REF 212  LAST  743    35,3724  10 000 0            CCS     A
 06986   REF   2  LAST  743    35,3725  1 3740 0            TCF     GO8ACK            IGN6RE CHAN 30 BIT 5.  ASSUME AUTO THROT

 0699    REF  33  LAST  721    35,3726  3 4740 0            CAF     BIT5              YES, CHECK FOR AUTOTHROTTLE MODE
 0700                          35,3727  0 0006 1            EXTEND
 0701    REF   4  LAST  491    35,3730  02 030 0            RAND    CHAN30
 0702                          35,3731  0 0006 1            EXTEND
 0703    REF   3  LAST  743    35,3732  1 3740 0            BZF     GOBACK            IN AUTOTHROTTLE MODE -- RETURN
 0704    REF   1               35,3733  3 3742 0  TURNITON  CAF     P40A/PMD          DISPLAY V50N25 R1=203  PLEASE PERFORM
 0705    REF 197  LAST  743    35,3734  0 4607 1            TC      8ANKCALL          CHECKLIST 203  TURN ON PGNCS ETC.
 0706    REF   3  LAST  528    35,3735   20635 0            CADR    GOPERF1
 0707    REF  21  LAST  743    35,3736  1 6001 1            TCF     GOTOPOOH          V34E  TERMINATE
 0708    REF   1               35,3737  1 3712 1            TCF     P40A/P            RECYCLE
 0709    REF   5  LAST  743    35,3740  3 1163 1  GOBACK    CA      TEMPR60
 0710    REF  13  LAST  739    35,3741  0 4631 1            TC      8ANKJUMP          GOODBYE.  COME AGAIN SOON.
 0711                           35,3742   00203 0  P40A/PMD OCT     00203

 0712                           36,3132                     BANK    36
 0713    REF   5  LAST   737    36,2000                     SETLOC  P40S
 0714                           36,3132                     BANK

 0715    REF   5 LAST  737 TO  743:   226   602*            COUNT*  $$/P40

R0716                                             ************************************
R0717                                             CONSTANTS FOR THE IGNITION ROUTINE
R0718                                             ************************************

 0719    REF   1                36,2107            SERVCADR =       P63TABLE  +7

 0720    REF   1                36,3132   02040 1  P40ADRES ADRES   P40TABLE

 0721    REF   1                36,3133   02050 0  P41ADRES ADRES   P41TABLE -5

 0722    REF   1                36,3134   02063 0  P42ADRES ADRES   P42TABLE

 0723    REF  25  LAST   737    E7,1515                     EBANK=  DVCNTR
 0724    REF   1                36,3135   02425 0  LUNLANAD 2CADR   LUNLAND
 0724    REF   1                36,3136   62067 1


 0727    REF  26  LAST   744    E7,1515                     EBANK=  DVCNTR
 0728    REF   1                36,3137   03375 0  ATMAGADR 2CADR   ATMAG
 0728    REF   1                36,3140   70067 1
 0729    REF  22  LAST   743       6001            ?        =       GOTOPOOH

 0730                           36,3141   00000 1  D29.9SEC 2DEC    2990
 0730                           36,3142   05656 1


 0731                           36,3143   04672 0  S24.9SEC DEC     2490


 0732                           36,3144   00752 1  4.9SEC   DEC     490

 0733    REF  34  LAST   743       4740            OCT20    =       BIT5

 07331                          36,3145   01475 0  V06N61   VN      0661
```

```
P0735             KILLTASK
R0736    MOD NO: NEW PROGRAM
R0737    MOD BY: COVELLI

R0738    FUNCTIONAL DESCRIPTION:

R0739       KILLTASK IS USED TO REMOVE A TASK FROM THE WAITLIST BY SUBSTITUTING ANULL TASK CALLED 'NULLTASK' (OF COURSE),
R0741    WHICH MERELY DOES A TC TASKOVER. IF THE SAME TASK IS SCHEDULED MORE THAN ONCE, ONLY THE ONE WHICH WILL OCCUR
R0743    FIRST IS REMOVED. IF THE TASK IS NOT SCHEDULED, KILLTASK TAKES NO ACTION AND RETURNS WITH NO ALARM. KILLTASK
R0745    LEAVES INTERRUPTS INHIBITED SO CALLER MUST RELINT

R0746    CALLING SEQUENCE:

A0748                                                 L         TC      KILLTASK        IN FIXED-FIXED
A0749                                                 L+1       CADR    ????????        CADR (NOT 2CADR) OF TASK TO BE REMOVED.
A0750                                                 L+2      (RELINT)                 RETURN

R0751    EXIT MODE:  AT L+2 OF CALLING SEQUENCE.

R0752    ERASABLE INITIALIZATION=  NONE.

R0753    OUTPUT:  2CADR OF NULLTASK IN LST2

R0754    DEBRIS:  ITEMP1 - ITEMP4, A,L,Q.

 0755    REF  19  LAST  232   E3,1410                      EBANK= LST2
 0756                            6050                      BLOCK  3                KILLTASK MUST BE IN FIXED-FIXED.
 0757    REF   3  LAST  578      6000                      SETLOC FFTAG6
 0758                            6050                      BANK
 0759    REF   1                                           COUNT* $$/KILL
 0760    REF   1                 6050  3 6057 0  KILLTASK  CA     KILLBB
 07605                           6051  0 0004 0            INHINT
 0761    REF 213  LAST  743      6052  22 000 1            LXCH   A
 0762    REF 183  LAST  739      6053  50 002 0            INDEX  Q
 0763                            6054  3 0000 1            CA     0                GET CADR.
 0764    REF  17  LAST  604      6055  22 006 1            LXCH   BBANK
 0765    REF   1                 6056  1 2200 0            TCF    KILLTSK2         CONTINUE IN SWITCHED FIXED

 0766    REF  20  LAST  745   E3,1410                      EBANK= LST2
 0767    REF   2  LAST  745      6057   56063 1  KILLBB    BBCON  KILLTSK2


 0768                         27,2200                      BANK   27

 0769    REF   3  LAST   46   27,2000                      SETLOC P40S1
 0770                         27,2200                      BANK
 0771    REF   1                                           COUNT* $$/KILL

 0772    REF  10  LAST  560   27,2200  22 062 0  KILLTSK2  LXCH   ITEMP2           SAVE CALLER'S BBANK
 0773   REF 184  LAST  745   27,2201  24 002 0            INCR    Q
 0774                        27,2202  0 0006 1            EXTEND
 0775   REF  26  LAST  618   27,2203  22 061 0            QXCH    ITEMP1           RETURN 2CADR IN ITEMP1,ITEMP2

 0776   REF  17  LAST  575   27,2204  54 063 0            TS      ITEMP3           CADR IS IN A
 0777   REF   5  LAST  470   27,2205  7 5003 0            MASK    LOW10
 0778   REF  21  LAST  446   27,2206  6 4732 0            AD      BIT11
 0779   REF   7  LAST  573   27,2207  54 064 1            TS      ITEMP4           GENADR OF TASK

 0780   REF   6  LAST  746   27,2210  4 5003 0            CS      LOW10
 0781   REF  18  LAST  746   27,2211  7 0063 0            MASK    ITEMP3
 0782   REF  19  LAST  746   27,2212  54 063 0            TS      ITEMP3           FBANK OF TASK

 0783                        27,2213  22 007 0            ZL
 0784   REF 101  LAST  742   27,2214  50 001 0  ADRSCAN   INDEX   L
 0785   REF  21  LAST  745   27,2215  4 1410 1            CS      LST2
 0786   REF   8  LAST  746   27,2216  6 0064 0            AD      ITEMP4           COMPARE GENADRS
 0787                        27,2217  0 0006 1            EXTEND
 0788   REF   1              27,2220  1 2232 1            BZF     TSTFBANK         IF THEY MATCH, COMPARE FBANKS
 0789   REF   1              27,2221  4 4740 1  LETITLIV  CS      LSTLIM
 0790   REF 102  LAST  746   27,2222  6 0001 0            AD      L
 0791                        27,2223  0 0006 1            EXTEND                   ARE WE DONE?
 0792   REF   1              27,2224  1 2230 0            BZF     DEAD             YES - DONE, SO RETURN
 0793   REF 103  LAST  746   27,2225  24 001 0            INCR    L
 0794   REF 104  LAST  746   27,2226  24 001 0            INCR    L
 0795   REF   1              27,2227  1 2214 0            TCF     ADRSCAN          CONTINUE LOOP.

 0796   REF  27  LAST  746   27,2230  52 062 1  DEAD      DXCH    ITEMP1
 0797                        27,2231  52 006 0            DTCB

 0798   REF   7  LAST  746   27,2232  4 5003 0  TSTFBANK  CS      LOW10
 0799   REF 105  LAST  746   27,2233  50 001 0            INDEX   L
 0800   REF  22  LAST  746   27,2234  7 1411 0            MASK    LST2 +1          COMPARE FBANKS ONLY.
 0801                        27,2235  0 0006 1            EXTEND
 0802   REF  20  LAST  746   27,2236  60 063 1            SU      ITEMP3
 0803                        27,2237  0 0006 1            EXTEND
 0804   REF   1              27,2240  1 2242 0            BZF     KILLDEAD         MATCH - KILL IT.
 0805   REF   1              27,2241  1 2221 0            TCF     LETITLIV         NO MATCH - CONTINUE.

 0806   REF   1              27,2242  3 4344 0  KILLDEAD  CA      TCTSKOVR
 0807   REF 106  LAST  746   27,2243  50 001 0            INDEX   L
 0808   REF  23  LAST  746   27,2244  55'410 1            TS      LST2             REMOVE TASK BY INSERTING TASKOVER
 0809   REF   2  LAST  746   27,2245  1 2230 0            TCF     DEAD

 0810   REF  35  LAST  744      4740            LSTLIM    EQUALS  BIT5             DEC 16
```

```
R0027   PROGRAM DESCRIPTION  P40BOTH     DECEMBER 22, 1966
R0028   MOD 03 BY PETER ADLER            MARCH 3, 1967
R0029   CALLED VIA JOB FROM V37E

R0030   FUNCTIONAL DESCRIPTION

R0031             1)  TO COMPUTE A PREFERRED IMU ORIENTATION AND A PREFERRED VEHICLE ATTITUDE FOR A LM DPS
R0033                 THRUSTING MANEUVER.

R0034             3)  TO DO THE VEHICLE MANEUVER TO THE THRUSTING ATTITUDE.

R0035             4)  TO CONTROL THE PGNCS DURING COUNTDOWN, IGNITION, THRUSTING, AND THRUST TERMINATION OF A
R0037                 PGNCS CONTROLLED DPS MANEUVER.

R0038             5)  IN POSTBURN--ZERO RENDEZVOUS COUNTER, MAINTAIN VG CALCULATIONS FOR POSSIBLE RCS MANEUVER,
R0040                             SET MAXIMUM DEADBAND IN DAP, RESET STEERLAW CSTEER TO ZERO.

R0042             NOTE:  P42, WHICH IS IN THIS LOG SECTION, DOES THE SAME FOR AN APS BURN, AND P41 DOES 1-3 FOR
R0044                    RCS PLUS DISPLAYS PARAMETERS FOR MANUAL CONTROL.

R0045   SUBROUTINES USED

R0046             R02       IMU STATUS CHECK
R0047             S40.1     COMPUTATION OF THRUST DIRECTION
R0048             S40.13    LENGTH OF BURN
R0049             S40.2,3   PREFERRED IMU ORIENATTION
R0050             S40.8     X PRODUCT STEERING
R0051             S40.9     LAMBERT VTOGAIN
R0052             R60LEM    ATTITUDE MANEUVER
R0053             LEMPREC   EXTRAPOLATE STATE VECTOR
R0054             PREREAD   AVERAGE G, SERVICER
R0055             ALLCOAST  DAP COASTING INITIALIZATION
R0056             CLOKTASK  ERGO CLOCKJOB--COUNT DOWN
R0057             PHASCHNG, INTPRET, FLAGUP, FLAGDOWN, WAITLIST, LONGCALL, GOFLASH, GOFLASHR, GOPERF1, ALARM,
R0059             PRIOLARM, GOTOPOOH, ENDOFJOB, BANKCALL, SETMAXDB, SETMINDB, CHECKMM, FLATOUT, OUTFLAT,
R0061             KILLTASK, SGNAGREE, TPAGREE, ETC.

R0062   RESTARTS VIA GROUP 4

R0063   DISPLAYS

R0064             V50N25  203 A/P TO PGNCS, AUTO THROTTLE MODE, AUTO ATTITUDE CONTROL
R0066             V06N40  TTI, VG, DELTAVM (DISPLAYED ONCE/SECOND BY CLOKTASK)
R0067             V50N99  PLEASE PERFORM ENGINE ON ENABLE
R0068             V06N40  TG (TIME TO GO TO CUTOFF), VG, DELTAVM--ONCE/SECOND
R0069             V16N40  FINAL VALUES OF TG, VG, DELTAVM
R0070             V16N85  COMP OF VG (BODY AXES) FOR POSS. RCS MANUAL MANEUVER
R0071             V05N09  POSSIBLE ALARMS
R0072             V50N07  PLEASE SELECT P00
```

```
R0073              VIA R30

R0074              V06N44  HAPO, PERI, TFF
R0075              V06N35  TIME TO PERIGEE, HMS

R0076      ALARM OR ABORT EXIT MODES

R0077              PROGRAM ALARM, FLASHING DISPLAY OF ALARM CODE 1706 IF P40 SELECTED WITH DESCENT UNIT STAGED.
R0079              V34E (TERMINATE) IS THE ONLY RESPONSE ACCEPTED. TC GOTOPOOH.

R0080              PROGRAM ALARM, FLASH CODE 1703:  TIG LESS THAN 45 SECS AWAY.  V34E=  GOTOPOOH OR V33E=  SLIP
R0082              TIG BY 45 SECS.

R0083      ERASABLE INITIALIZATION
R0084      DEBRIS
R0085      OUTPUT

R0086              SEE SUBROUTINES E.G.:  S40.1, S40.2,3, S40.13, S40.8, S40.9, TRIMGIMB
R0088              XDELVFLG = 1 FOR EXT DELV COMPUTATION
R0089                       = 0 FOR AIMPT (LAMBERT) COMP

 0090      REF   2 LAST   39 TO   40:     10     10*            COUNT* $$/P40
 0091      REF  19  LAST  743    E7,1455                         EBANK= WHICH

 0092                            36,3146                         BANK    36
 0093      REF   6  LAST  744    36,2000                         SETLOC P40S
 0094                            36,3146                         BANK

 0095      REF  46  LAST  742    36,3146  0 5355 1  P40LM        TC      PHASCHNG
 0096                            36,3147   04024 0               OCT     04024

 0097      REF   1               36,3150  3 3132 1               CAF     P40ADRES        INITIALIZATION FOR BURNBABY.
 0098      REF  20  LAST  748    36,3151  55'455 0               TS      WHICH

 0099      REF  17  LAST  743    36,3152  3 0106 0               CA      FLGWRD10
 0100      REF   9  LAST  743    36,3153  7 4730 0               MASK    APSFLBIT
 0101      REF 214  LAST  745    36,3154  10 000 0               CCS     A
 0102      REF   1               36,3155  1 3120 0               TCF     P40ALM
 0103      REF 198  LAST  743    36,3156  0 4607 1               TC      BANKCALL        GO DO IMU STATUS CHECK ROUTINE.
 0104      REF   4  LAST  518    36,3157   33757 1               CADR    R02BOTH

 0105      REF  22  LAST  738    36,3160  4 0111 1               CS      DAPBOOLS        INITIALIZE DVMON
 0106      REF   5  LAST  307    36,3161  7 4730 0               MASK    CSMDOCKD
 0107      REF 215  LAST  748    36,3162  10 000 0               CCS     A
 0108      REF   1               36,3163  3 2022 0               CAF     THRESH1
 0109      REF   1               36,3164  6 2023 1               AD      THRESH3
 0110      REF   2  LAST  108    36,3165  55'250 0               TS      DVTHRUSH
 0111      REF  10  LAST  737    36,3166  3 4742 1               CAF     FOUR
 0112      REF  27  LAST  744    36,3167  55'515 0               TS      DVCNTR
 0113   REF 100  LAST  730    36,3170  0 6060 1               TC      INTPRET        LOAD CONSTANTS FOR DPS BURN
 0114                         36,3171   43175 0               VLOAD   CLEAR          LOAD F, MDOT, TDECAY
 0115   REF   1               36,3172   34001 1                       FDPS
 0116   REF   1               36,3173   02663 0                       NOTHROTL
 0117   REF   2  LAST  149    36,3174   03735 0               STORE   F
 0118                         36,3175   77735 0               SLOAD
 0119   REF   1               36,3176   26002 1                       DPSVEX
 0120                         36,3177   70476 0  P40IN        DCOMP   SR1
 0121   REF   1               36,3200   37743 0               STCALL  VEX            LOAD EXHAUST VELOCITY FOR TGO COMP.
 0122   REF   1               36,3201   56246 1                       S40.1          COMPUTES UT AND VGTIG
 0123                         36,3202   77624 1               CALL
 0124   REF   1               36,3203   56413 1                       S40.2,3        COMPUTES PREFERRED IMU ORIENTATION
 0125                         36,3204   77776 1               EXIT

 0126                         36,3205  0 0004 0               INHINT
 0127   REF  29  LAST  742    36,3206  0 4665 0               TC      IBNKCALL
 0128   REF   1               36,3207   40143 0               CADR    PFLITEDB       ZERO ATTITUDE ERRORS, SET DB TO ONE DEG.

 0129   REF   1               36,3210  0 3212 0               TC      P40SXT4


R0130                                                     **********************
 0131   REF   1               36,3211  1 2130 0               TCF     BURNBABY
R0132                                                     **********************


 0133                         36,3212  0 0006 1  P40SXT4      EXTEND
 0134   REF   3  LAST  741    36,3213  23'141 1               QXCH    P40/RET
 0135                         36,3214  0 0003 1  P41MANU      RELINT

 0136   REF  68  LAST  742    36,3215  0 5520 0               TC      DOWNFLAG       CLEAR 3AXISFLG -- R60 WILL USE VECPOINT.
 0137   REF   6  LAST  535    36,3216   00124 0               ADRES   3AXISFLG

 0138   REF 199  LAST  748    36,3217  0 4607 1               TC      BANKCALL
 0139   REF   4  LAST  535    36,3220   54125 0               CADR    R60LEM         DO ATTITUDE MANEUVER ROUTINE
 0140   REF   4  LAST  749    36,3221  0 1141 1               TC      P40/RET


 0141   REF   9  LAST  736    E7,1462                         EBANK=  TRKMKCNT
 0142   REF  19  LAST  741    36,3222  3 0005 1  POSTBURN     CA      Z
 0143   REF  19  LAST  742    36,3223  55'162 1               TS      DISPDEX
 0144                         36,3224  0 0006 1               EXTEND
 0145   REF   1               36,3225  3 2060 0               DCA     ACADN85
 0146   REF   4  LAST  731    36,3226  53'252 1               DXCH    AVEGEXIT
 0147   REF   1               36,3227  3 3752 1               CAF     V16N40
 0148   REF 200  LAST  749    36,3230  0 4607 1               TC      BANKCALL
 0149   REF   1               36,3231   20647 0               CADR    GOFLASHR
 0150   REF   1               36,3232  0 3255 0               TC      TERM40
 0151   REF   2  LAST  736    36,3233  1 3240 0               TCF     TIGNOW
 0152   REF   3  LAST  741    36,3234  0 3222 0               TC      POSTBURN
```

```
L         P40-P47                                                                                USER'S PAGE NO.   4      E7 S3

 0153   REF  47  LAST  748    36,3235  0 5355 1  P40PHS1  TC      PHASCHNG
 0154                         36,3236   00014 1           OCT     00014
 0155   REF 115  LAST  742    36,3237  1 5146 0           TCF     ENDOFJOB

 0156                         36,3240  0 0004 0  TIGNOW   INHINT
 0157   REF  30  LAST  749    36,3241  0 4665 0           TC      IBNKCALL
 0158   REF   4  LAST  535    36,3242   40154 0           CADR    ZATTEROR
 0159   REF  31  LAST  750    36,3243  0 4665 0           TC      IBNKCALL
 0160   REF   3  LAST  535    36,3244   40141 1           CADR    SETMINDB
 0161                         36,3245  0 0003 1           RELINT
 0162   REF   2  LAST  731    36,3246  3 3753 0           CAF     V16N85B
 0163   REF 201  LAST  749    36,3247  0 4607 1           TC      BANKCALL
 0164   REF   1               36,3250   20455 1           CADR    REFLASHR
 0165   REF   2  LAST  749    36,3251  0 3255 0           TC      TERM40
 0166   REF   3  LAST  750    36,3252  1 3255 1           TCF     TERM40
 0167                         36,3253  0 3246 1           TC      -5

 0168   REF   1               36,3254  1 3235 1           TCF     P40PHS1

 0169                         36,3255  0 0006 1  TERM40   EXTEND
 0170   REF   1               36,3256  3 2110 0           DCA     SERVCADR
 0171   REF   5  LAST  749    36,3257  53'252 1           DXCH    AVEGEXIT
 0172   REF 138  LAST  741    36,3260  3 4746 0           CAF     ZERO
 0173   REF  10  LAST  749    36,3261  55'462 1           TS      TRKMKCNT             ZERO RENDZVS CNTERS
 0174   REF  20  LAST  749    36,3262  3 0005 1           CA      Z
 0175   REF  20  LAST  749    36,3263  55'162 1           TS      DISPDEX
 0176                         36,3264  0 0004 0           INHINT
 0177   REF  32  LAST  750    36,3265  0 4665 0           TC      IBNKCALL
 0178   REF   6  LAST  535    36,3266   40115 0           CADR    RESTORDB
 0179                         36,3267  0 0003 1           RELINT
 0180   REF  23  LAST  744    36,3270  0 6001 0           TC      GOTOPOOH

 0181   REF  21  LAST  748    E7,1455                     EBANK=  WHICH
 0182   REF   1                                           COUNT*  $$/P41
 0183   REF   1               36,3271  3 3133 0  P41LM    CAF     P41ADRES          INITIALIZATION FOR BURNBABY
 0184   REF  22  LAST  750    36,3272  55'455 0           TS      WHICH

 0185   REF 202  LAST  750    36,3273  0 4607 1           TC      BANKCALL
 0186   REF   5  LAST  748    36,3274   33757 1           CADR    R02BOTH

 0187   REF 139  LAST  750    36,3275  3 4746 0           CA      ZERO              ZERO DVTOTAL FOR NOUN 40 DISPLAY
 0188   REF   7  LAST  728    36,3276  55'507 0           TS      DVTOTAL
 0189   REF   8  LAST  750    36,3277  55'510 0           TS      DVTOTAL +1
 0190   REF   6  LAST  706    36,3300  3 5010 0           CAF     PRIO5
 0191   REF  21  LAST  750    36,3301  55'162 1           TS      DISPDEX           FOR SAFETY
 0192   REF  31  LAST  742    36,3302  0 5076 0           TC      FINDVAC
 0193   REF   4  LAST  254    E7,1700                     EBANK=  VGPREV
 0194   REF   1               36,3303   03366 1           2CADR   DYNMDISP
 0194   REF   1               36,3304   74067 0
 0195   REF   7  LAST  739    36,3305  0 5331 0           TC      2PHSCHNG
 0196                        36,3306  00116 1                OCT      00116         GROUP 6 RESTART AT FKP5RST, PRIO 17
 0197                        36,3307  04024 0                OCT      04024         GROUP 4 RESTART HERE, PRIO 13

 0198   REF 101  LAST  749   36,3310  0 6060 1               TC       INTPRET       BOTH LM
 0199                        36,3311  71214 0                BON      DLOAD         IF NJETSFLAG IS SET, LOAD 2 JET F
 0200   REF   1              36,3312  00700 0                         NJETSFLG
 0201   REF   1              36,3313  75317 0                         P41FJET1
 0202   REF   1              36,3314  34017 0                         FRCS4         IF NJETSFLAG IS CLEAR, LOAD 4 JET F

 0203   REF   3  LAST  749   36,3315  37735 1    P41FJET     STCALL   F
 0204   REF   1              36,3316  75322 0                         P41IN

 0205                        36,3317  77745 1    P41FJET1    DLOAD
 0206   REF   1              36,3320  34021 0                         FRCS2
 0207   REF   4  LAST  751   36,3321  03735 0                STORE    F

 0208                        36,3322  77624 1    P41IN       CALL
 0209   REF   2  LAST  749   36,3323  56246 1                         S40.1         BOTH
 0210                        36,3324  77624 1    P41NORM     CALL
 0211   REF   2  LAST  749   36,3325  56413 1                         S40.2,3       CALCULATE PREFERRED IMU ORIENTATION AND
 0212                        36,3326  77776 1                EXIT                   SET PFRATFLG.

 0213                        36,3327  0 0004 0               INHINT
 0214   REF  33  LAST  750   36,3330  0 4665 0               TC       IBNKCALL
 0215   REF   5  LAST  750   36,3331  40154 0                CADR     ZATTEROR      ZERO ATTITUDE ERRORS
 0216   REF  34  LAST  751   36,3332  0 4665 0               TC       IBNKCALL
 0217   REF   4  LAST  750   36,3333  40141 1                CADR     SETMINDB      SET 0.3 DEGREE DEADBAND
 0218   REF   2  LAST  749   36,3334  0 3212 0               TC       P40SXT4

 0219   REF 102  LAST  751   36,3335  0 6060 1               TC       INTPRET
 0220                        36,3336  45175 0                VLOAD    CALL          TRANSFORM VELOCITY-TO-BE-GAINED AT TIG
 0221   REF   5  LAST  208   36,3337  03701 1                         VGTIG         FROM REFERENCE COORDINATES TO LM BODY-
 0222   REF   1              36,3340  57271 1                         S41.1         AXIS COORDINATES FOR V16N85 DISPLAY.
 0223   REF   9  LAST  329   36,3341  03502 0                STORE    VGBODY        (SCALED AT 2 (+7) METERS/CENTISECOND)
 0224                        36,3342  77776 1                EXIT

 0225   REF   3  LAST  750   36,3343  3 3753 0               CAF      V16N85B
 0226   REF 203  LAST  750   36,3344  0 4607 1               TC       BANKCALL
 0227   REF   1              36,3345  20441 1                CADR     GODSPRET


 0228   REF   8  LAST  750   36,3346  0 5331 0               TC       2PHSCHNG
 0229                        36,3347  00076 0                OCT      00076         GROUP 6 RESTARTS AT REDO6.7
 0230                        36,3350  04024 0                OCT      04024         GROUP 4 RESTARTS HERE

R0231                                                     ***********************
 0232   REF   1              36,3351  1 2137 1                TCF     B*RNB*B*
A0233                                                     ***********************
```

```
 0234    REF  12  LAST  739    36,3352  3 4770 0  BLNKWAIT CAF     1SEC
 0235    REF 204  LAST  751    36,3353  0 4607 1           TC      BANKCALL
 0236    REF  14  LAST  721    36,3354   01736 1           CADR    DELAYJOB

 0237    REF  22  LAST  750    36,3355  3 1162 0  REDO6.7  CA      DISPDEX            ON A RESTART, DO NOT PUT UP DISPLAY IF
 0238    REF  49  LAST  740    36,3356  6 4743 0           AD      TWO                BLANKING (BETWEEN TIG-35 AND TIG-30)
R0239                                                          **********************


 0240                          36,3357  0 0006 1           EXTEND
 0241    REF   1               36,3360  1 3352 1           BZF     BLNKWAIT

 0242    REF   4  LAST  751    36,3361  3 3753 0           CAF     V16N85B
 0243    REF 205  LAST  752    36,3362  0 4607 1           TC      BANKCALL
 0244    REF   2  LAST  751    36,3363   20441 1           CADR    GODSPRET

 0245    REF   7  LAST  750    36,3364  3 5010 0  FKP5RST  CAF     PRIO5
 0246    REF  12  LAST  709    36,3365  0 5137 1           TC      PRIOCHNG

 0247    REF  23  LAST  752    36,3366  3 1162 0  DYNMDISP CA      DISPDEX            A NON-POSITIVE DISPDEX INDICATES PAST
 0248                          36,3367  0 0006 1           EXTEND                     TIG-35, SO SERVICER WILL BE DOING THE
 0249    REF 116  LAST  750    36,3370  6 5146 1           BZMF    ENDOFJOB           UPDATING OF NOUN 85. STOP DYNMDISP.
 0250                          36,3371  0 0006 1           EXTEND
 0251    REF  32  LAST  739    36,3372  4 1442 0           DCS     TIG
 0252    REF  25  LAST  741    36,3373  53'454 1           DXCH    TTOGO              UPDATE TFI DISPLAY (NOUN 40)
 0253                          36,3374  0 0006 1           EXTEND
 0254    REF  22  LAST  739    36,3375  3 0025 0           DCA     TIME2
 0255    REF  26  LAST  752    36,3376  21'454 1           DAS     TTOGO
 0256    REF 103  LAST  751    36,3377  0 6060 1           TC      INTPRET
 0257                          36,3400   45175 0           VLOAD   CALL
 0258    REF   5  LAST  750    36,3401   03701 1                   VGPREV
 0259    REF   2  LAST  751    36,3402   57271 1                   S41.1              CONVERT VG FROM REF TO BODY
 0260    REF  10  LAST  751    36,3403   03502 0           STORE   VGBODY
 0261                          36,3404   77776 1           EXIT
 0262    REF  13  LAST  752    36,3405  3 4770 0           CAF     1SEC
 0263    REF 206  LAST  752    36,3406  0 4607 1           TC      BANKCALL
 0264    REF  15  LAST  752    36,3407   01736 1           CADR    DELAYJOB
 0265    REF   2  LAST  750    36,3410  1 3366 0           TCF     DYNMDISP           RECYCLE ONCE A SECOND


 0266    REF   1                                           COUNT   $$/P41
 0267                          32,2570                     BANK    32
 0268    REF   1               32,2000                     SETLOC  P40S4
 0269                          32,2570                     BANK

 0270    REF 104  LAST  752    32,2570  0 6060 1  CALCN85  TC      INTPRET
 0271                          32,2571   77624 1           CALL
 0272    REF   1               32,2572   75612 0                   UPDATEVG
 0273                          32,2573   45175 0           VLOAD   CALL
 0274    REF   6  LAST  752    32,2574   03701 1                   VGPREV
 0275   REF   3  LAST  752   32,2575   57271 1                     S41.1
 0276   REF  11  LAST  752   32,2576   03502 0             STORE   VGBODY
 0277                        32,2577   77776 1             EXIT
 0278   REF  44  LAST  736   32,2600  0 4626 1             TC      POSTJUMP
 0279   REF   3  LAST  727   32,2601   65656 1             CADR    SERVEXIT

 0280                        36,3411                       BANK    36
 0281   REF   7  LAST  748   36,2000                       SETLOC  P40S
 0282                        36,3411                       BANK

 0283   REF   1                                            COUNT*  $$/P42
 0284   REF  23  LAST  750   E7,1455                       EBANK=  WHICH

 0285   REF  48  LAST  750   36,3411  0 5355 1  P42LM      TC      PHASCHNG
 0286                        36,3412   04024 0             OCT     04024

 0287   REF   1              36,3413  3 3134 1             CAF     P42ADRES          INITIALIZATION FOR BURNBABY.
 0288   REF  24  LAST  753   36,3414  55'455 0             TS      WHICH

 0289   REF  18  LAST  748   36,3415  4 0106 1             CS      FLGWRD10
 0290   REF  10  LAST  748   36,3416  7 4730 0             MASK    APSFLBIT
 0291   REF 216  LAST  748   36,3417  10 000 0             CCS     A
 0292   REF   2  LAST  748   36,3420  0 3120 1             TC      P40ALM
 0293   REF 207  LAST  752   36,3421  0 4607 1  P42STAGE   TC      BANKCALL
 0294   REF   6  LAST  750   36,3422   33757 1             CADR    R02BOTH
 0295   REF   1              36,3423  3 6000 1             CAF     THRESH2           INITIALIZE DVMON
 0296   REF   3  LAST  748   36,3424  55'250 0             TS      DVTHRUSH
 0297   REF  11  LAST  748   36,3425  3 4742 1             CAF     FOUR
 0298   REF  28  LAST  748   36,3426  55'515 0             TS      DVCNTR

 0299   REF 105  LAST  752   36,3427  0 6060 1             TC      INTPRET
 0300                        36,3430   77214 0             SET     VLOAD             LOAD FAPS, MDOTAPS, AND ATDECAY INTO
 0301   REF   5  LAST  700   36,3431   01072 0                     AVFLAG            F, MDOT, AND TDECAY BY VECTOR LOAD.
 0302   REF   1              36,3432   34007 1                     FAPS
 0303   REF   5  LAST  751   36,3433   03735 0             STORE   F
 0304                        36,3434   52135 1             SLOAD   GOTO
 0305   REF   1              36,3435   26001 1                     APSVEX
 0306   REF   1              36,3436   75177 1                     P40IN

 0307   REF  25  LAST  753   E7,1455                       EBANK=  WHICH

 0308   REF   1                                            COUNT*  $$/P47
 0309   REF 208  LAST  753   36,3437  0 4607 1  P47LM      TC      BANKCALL
 0310   REF   7  LAST  753   36,3440   33757 1             CADR    R02BOTH
 0311   REF 106  LAST  753   36,3441  0 6060 1             TC      INTPRET
 0312                        36,3442   77624 1             CALRB
 0313   REF   1              36,3443   42760 0                     MIDTOAV2

 0314   REF 274  LAST  739   36,3444  3 0155 0             CA      MPAC +1
 0315   REF  18  LAST  742   36,3445  0 5175 1             TC      TWIDDLE
 0316   REF   1                36,3446   03450 0             ADRES   STARTP47

 0317   REF 117  LAST  752     36,3447  1 5146 0             TCF     ENDOFJOB

 0318   REF  49  LAST  753     36,3450  0 5355 1  STARTP47   TC      PHASCHNG
 0319                          36,3451   05014 1             OCT     05014
 0320                          36,3452   77777 0             OCT     77777

 0321                          36,3453  0 0006 1             EXTEND
 0322   REF   1                36,3454  3 3756 0             DCA     ACADN83
 0323   REF   6  LAST  750     36,3455  53252 1              DXCH    AVEGEXIT
 0324   REF   5  LAST  732     36,3456  3 4727 1             CAF     PRIO20
 0325   REF  32  LAST  750     36,3457  0 5076 0             TC      FINDVAC
 0326   REF   4  LAST  329     E7,1622                       EBANK=  DELVIMU
 0327   REF   1                36,3460   03514 1             2CADR   P47BODY
 0327   REF   1                36,3461   74067 0
 0328   REF   2  LAST  252     36,3462  1 2344 1             TCF     REDO4.2            CHECKS PHASE 5 AND GOES TO PREREAD
A0329                                                                                   SEE TIG-30 IN BURNBABY.

 0330   REF 107  LAST  753     36,3463  0 6060 1  CALCN83    TC      INTPRET
 0331                          36,3464   53375 0             VLOAD   VAD
 0332   REF   1                36,3465   03502 0                     DELVCTL
 0333   REF   2  LAST  154     36,3466   03527 1                     DELVREF
 0334   REF  11  LAST  633     36,3467   03656 1             STORE   DELVSIN            TEMP STORAGE FOR RESTARTS
 0335                          36,3470   77624 1             CALL
 0336   REF   4  LAST  753     36,3471   57271 1                     S41.1
 0337   REF   5  LAST  754     36,3472   03623 0             STORE   DELVIMU
 0338                          36,3473   77776 1             EXIT
 0339   REF  50  LAST  754     36,3474  0 5355 1             TC      PHASCHNG
 0340                          36,3475   10035 0             OCT     10035              REREADAC AND HERE

 0341   REF 108  LAST  754     36,3476  0 6060 1             TC      INTPRET
 0342                          36,3477   77775 1             VLOAD
 0343   REF  12  LAST  754     36,3500   03656 1                     DELVSIN
 0344   REF   2  LAST  754     36,3501   03502 0             STORE   DELVCTL
 0345                          36,3502   77776 1             EXIT

 0346   REF  45  LAST  753     36,3503  0 4626 1             TC      POSTJUMP
 0347   REF   4  LAST  753     36,3504   65656 1             CADR    SERVEXIT

 0348   REF   1                36,3505  3 3754 1  P47BOD     CAF     V1683
 0349   REF 209  LAST  753     36,3506  0 4607 1             TC      BANKCALL
 0350   REF   2  LAST  749     36,3507   20647 0             CADR    GOFLASHR
 0351   REF  24  LAST  750     36,3510  0 6001 0             TC      GOTOPOOH
 0352   REF  25  LAST  754     36,3511  0 6001 0             TC      GOTOPOOH

 0353   REF   2  LAST  754     36,3512  1 3514 0             TCF     P47BODY

 0354   REF   2  LAST  750     36,3513  1 3235 1             TCF     P40PHS1
 0355   REF 109  LAST  754    36,3514  0 6060 1  P47BODY  TC      INTPRET
 0356                         36,3515   77775 1           VLOAD
 0357   REF   5  LAST  724    36,3516   06505 1                   HI6ZEROS
 0358   REF   6  LAST  754    36,3517   03623 0           STORE   DELVIMU
 0359   REF   3  LAST  754    36,3520   03502 0           STORE   DELVCTL
 0360                         36,3521   77776 1           EXIT
 0361   REF   1               36,3522  0 3505 1           TC      P47BOD

 0362   REF   6 LAST  744 TO  745:      12   614*         COUNT*  $$/P40
 0363   REF   7  LAST  742    36,3523  3 1517 0  IMPLBURN CA      TGO +1
 0364   REF   1               36,3524  0 3736 0           TC      GETDT
 0365   REF  19  LAST  753    36,3525  0 5175 1           TC      TWIDDLE
 0366   REF   2  LAST  252    36,3526   03543 0           ADRES   ENGOFTSK
 0367   REF  69  LAST  749    36,3527  0 5520 0           TC      DOWNFLAG           TURN OFF IGNFLAG
 0368   REF   3  LAST  735    36,3530   00153 0           ADRES   IGNFLAG
 0369   REF  70  LAST  755    36,3531  0 5520 0           TC      DOWNFLAG           TURN OFF ASTNFLG
 0370   REF   4  LAST  741    36,3532   00154 1           ADRES   ASTNFLAG
 0371   REF  71  LAST  755    36,3533  0 5520 0           TC      DOWNFLAG           TURN OFF IMPULSW
 0372   REF   1               36,3534   00044 1           ADRES   IMPULSW
 0373   REF  51  LAST  754    36,3535  0 5355 1           TC      PHASCHNG           RESTART PROTECT ENGOFTSK (ENGINOFF)
 0374                         36,3536   40114 1           OCT     40114

 0375   REF  13  LAST  739    36,3537  0 5223 1           TC      FIXDELAY           WAIT HALF A SECOND
 0376                         36,3540   00062 0           DEC     50

 0377   REF   3  LAST  741    36,3541  0 2652 1           TC      NOULLAGE           TURN OFF ULLAGE

 0378   REF  49  LAST  739    36,3542  0 5263 0           TC      TASKOVER

 0379   REF  35  LAST  751    36,3543  0 4665 0  ENGOFTSK TC      IBNKCALL           THIS CODING ALLOWS ENGINOFF ET AL TO BE
 0380   REF   1               36,3544   75545 1           CADR    ENGINOFF           USED BOTH BY WAITLIST AND BY TC IBNKCALL
 0381   REF  50  LAST  755    36,3545  0 5263 0           TC      TASKOVER

 0382   REF   3  LAST  741    36,3546  3 4635 0  ENGINOFF CAF     PRIO12             MUST BE LOWER PRIO THAN CLOCKJOB
 0383   REF  33  LAST  754    36,3547  0 5076 0           TC      FINDVAC
 0384   REF  11  LAST  750    E7,1462                     EBANK=  TRKMKCNT
 0385   REF   4  LAST  749    36,3550   03222 0           2CADR   POSTBURN
 0385                         36,3551   74067 0

 0386   REF  38  LAST  742    36,3552  3 4744 1  ENGINOF2 CAF     BIT1
 0387   REF  29  LAST  734    36,3553  0 5205 0           TC      WAITLIST
 0388   REF   8  LAST  727    E6,1422                     EBANK=  OMEGAQ
 0389   REF   1               36,3554   03607 0           2CADR   COASTSET
 0389   REF   1               36,3555   74066 1
 0390   REF  13  LAST  742    36,3556  4 0103 1  ENGINOF1 CS      FLAGWRD7           SET THE IDLE BIT.
 0391   REF   1               36,3557  7 4736 0           MASK    IDLEFBIT
 0392   REF  14  LAST  755    36,3560  26 103 1           ADS     FLAGWRD7

 0393   REF   4  LAST  755    36,3561  0 2652 1           TC      NOULLAGE
 0394                           36,3562  0 0006 1  ENGINOF4 EXTEND
 0395  REF  23  LAST  752       36,3563  3 0025 0           DCA      TIME2
 0396  REF   5  LAST  733       36,3564  53 342 1           DXCH     TEVENT

 0397  REF   4  LAST  733       36,3565  4 4736 0  ENGINOF3 CS       ENGONBIT           INSURE ENGONFLG IS CLEAR.
 0398  REF  23  LAST  734       36,3566  7 0101 0           MASK     FLAGWRD5
 0399  REF  24  LAST  756       36,3567  54 101 0           TS       FLAGWRD5
 0400  REF   7  LAST  733       36,3570  4 4346 0           CS       PRIO30             ENGINOF3 IS USED AS A PRE-ENGINE ARM
 0401                           36,3571  0 0006 1           EXTEND                      SUBROUTINE.
 0402  REF  24  LAST  733       36,3572  02 011 0           RAND     DSALMOUT
 0403  REF   6  LAST  754       36,3573  6 4727 1           AD       PRIO20             TURN OFF THE ENGINE - DPS OR APS
 0404                           36,3574  0 0006 1           EXTEND
 0405  REF  25  LAST  756       36,3575  01 011 0           WRITE    DSALMOUT

 0406  REF  23  LAST  748       36,3576  4 0111 1           CS       DAPBOOLS           TURN OFF TRIM GIMBAL
 0407  REF   1                  36,3577  7 4727 0           MASK     USEQRJTS
 0408  REF  24  LAST  756       36,3600  26 111 1           ADS      DAPBOOLS

 0409  REF   1                  36,3601  4 4730 0           CS       HIRTHROT           ZERO AUTO-THROTTLE WHENEVER THE ENGINE
 0410  REF   3  LAST  736       36,3602  54 055 0           TS       THRUST             IS TURNED OFF.
 0411  REF  33  LAST  743       36,3603  3 4741 1           CAF      BIT4               THE HARDWARE DOES SO ONLY WHEN THE
 0412                           36,3604  0 0006 1           EXTEND                      ENGINE IS DISARMED.
 0413  REF   9  LAST  736       36,3605  05 014 1           WOR      CHAN14

 0414  REF   2  LAST  577       36,3606  0 4700 1           TC       ISWRETRN
 0415  REF  36  LAST  755       36,3607  0 4665 0  COASTSET TC       IBNKCALL           DO DAP COASTING INITIALIZATION
 0416  REF   4  LAST  742       36,3610   40205 1           CADR     ALLCOAST
 0417  REF  51  LAST  755       36,3611  0 5263 0           TC       TASKOVER

 0418  REF   9  LAST  755       E6,1422                     EBANK=   OMEGAQ
 0419                           36,3612   45020 1  UPDATEVG STQ      CALL
 0420  REF   2  LAST  148       36,3613   03665 1                    QTEMP1
 0421  REF   1                  36,3614   56447 0                    S40.8              X-PRODUCT STEERING
 0422                           36,3615   43014 0  S40RET   BON      BON                WILL RETURN HERE FROM S40.8
 0423  REF   4  LAST  693       36,3616   01307 1                    XDELVFLG
 0424  REF   3  LAST  756       36,3617   03665 1                    QTEMP1
 0425  REF   3  LAST  690       36,3620   03705 0                    NORMSW
 0426  REF   1                  36,3621   75634 1                    180SETUP
 0427                           36,3622   45345 1           DLOAD    DSU
 0428  REF   5  LAST  709       36,3623   01234 0                    PIPTIME
 0429  REF   1                  36,3624   03763 0                    TIGSAVE
 0430                           36,3625   50025 0           DSU      BMN
 0431  REF   1                  36,3626   03432 1                    TNEWA
 0432  REF   1                  36,3627   75657 1                    GETRANS
 0433                           36,3630   43345 1           DLOAD    DAD
 0434  REF   2  LAST  756       36,3631   03763 0                    TIGSAVE
 0435  REF   2  LAST  756       36,3632   03432 1                    TNEWA
 0436  REF   1                  36,3633   03765 0           STORE    TIGSAVEP
 0437                           36,3634   77776 1  180SETUP EXIT
 0438  REF   1                  36,3635  10 754 0           CCS      PHASE2
 0439   REF   1                36,3636   1 3664 1               TCF      NO.9
 0440   REF   4  LAST  309     36,3637   3 4730 1               CAF      PRIO10
 0441                          36,3640   0 0004 0               INHINT
 0442   REF  34  LAST  755     36,3641   0 5076 0               TC       FINDVAC
 0443   REF   2  LAST  149     E7,1706                          EBANK=   VG
 0444   REF   1                36,3642    02711 1               2CADR    S40.9                LAMBERT VTOGAIN
 0444   REF   1                36,3643    56067 0
 0445   REF   9  LAST  751     36,3644   0 5331 0               TC       2PHSCHNG
 0446                          36,3645    00172 0               OCT      00172                2.17SPOT FOR S40.9
 0447                          36,3646    10035 0               OCT      10035                HERE AND RERFADAC AFTER RESTART

 0448   REF 110  LAST  755     36,3647   0 6060 1   ENDSTEER    TC       INTPRET
 0449                          36,3650    77745 1               DLOAD
 0450   REF   2  LAST  756     36,3651    03765 0                        TIGSAVEP
 0451   REF   3  LAST  756     36,3652    27763 0               STOVL    TIGSAVE
 0452   REF   7  LAST  720     36,3653    01220 0                        RN
 0453   REF   8  LAST  695     36,3654    26314 0               STOVL    RINIT
 0454   REF   7  LAST  720     36,3655    01226 0                        VN
 0455   REF   7  LAST  695     36,3656    02322 0               STORE    VINIT
 0456                          36,3657    45345 1   GETRANS     DLOAD    DSU
 0457   REF   7  LAST  678     36,3660    03631 0                        TPASS4
 0458   REF   6  LAST  756     36,3661    01234 0                        PIPTIME
 0459   REF   7  LAST  692     36,3662    37452 0               STCALL   DELLT4
 0460   REF   4  LAST  756     36,3663    03665 1                        QTEMP1

 0461   REF 111  LAST  757     36,3664   0 6060 1   NO.9        TC       INTPRET
 0462                          36,3665    77650 1               GOTO
 0463   REF   5  LAST  757     36,3666    03665 1                        QTEMP1
 0464   REF 112  LAST  757     36,3667   0 6060 1   STEERING    TC       INTPRET

 0465                          36,3670    77624 1               CALL
 0466   REF   2  LAST  752     36,3671    75612 0                        UPDATEVG
 0467                          36,3672    77776 1               EXIT

 0468   REF  29  LAST  753     E7,1515                          EBANK=   DVCNTR
 0469                          36,3673   0 0004 0   NSTEER      INHINT
 0470   REF   7  LAST  735     36,3674   3 5007 0               CA       EBANK7
 0471   REF  30  LAST  735     36,3675   54 003 0               TS       EBANK
 0472   REF  13  LAST  735     36,3676   4 0076 1               CS       FLAGWRD2             CHECK IMPULSE SWITCH.  IT IS SET EITHER
 0473   REF   2  LAST  735     36,3677   7 4734 1               MASK     IMPULBIT             BY S40.13 IF TBURN<6 SECS OR BY S40.8 IF
 0474   REF 217  LAST  753     36,3700   10 000 0               CCS      A                    STEERING IS ALMOST DONE.

 0475                          36,3701   1 3706 1               TCF       +5                  IMPULSW = 0     EXIT
 0476   REF  15  LAST  755     36,3702   4 0103 1               CS       FLAGWRD7             IMPULSW = 1     WHY?  CHECK IDLEFLAG
 0477   REF   2  LAST  755     36,3703   7 4736 0               MASK     IDLEFBIT                (IDLEFLAG = 0 --> DVMON ON)
 0478   REF 218  LAST  757     36,3704   10 000 0               CCS      A
 0479                          36,3705   1 3710 0               TCF       +3                  DVMON ON-->THRUSTING-->IMPULSW VIA S40.8
 0480   REF  46  LAST  754     36,3706   0 4626 1               TC       POSTJUMP             DVMON OFF-->IMPULSW ON VIA S40.13-->EXIT
 0481   REF   5  LAST  754     36,3707    65656 1               CADR     SERVEXIT
 0482   REF  37  LAST  756   36,3710   0 4665 0              TC      IBNKCALL
 0483   REF   3  LAST  375   36,3711    40166 1              CADR    STOPRATE

 0484   REF  72  LAST  755   36,3712   0 5520 0              TC      DOWNFLAG         TURN OFF IMPULSW
 0485   REF   2  LAST  755   36,3713    00044 1              ADRES   IMPULSW

 0486   REF  51  LAST  741   36,3714   0 5506 1              TC      UPFLAG
 0487   REF   4  LAST  737   36,3715    CC161 1              ADRES   IDLEFLAG         TURN OFF DVMON

 0488                        36,3716   0 0004 0              INHINT
 0489                        36,3717   0 0006 1              EXTEND
 0490   REF  33  LAST  752   36,3720   3 1442 1              DCA     TIG
 0491   REF 275  LAST  753   36,3721   52 155 1              DXCH    MPAC
 0492                        36,3722   C 0006 1              EXTEND
 0493   REF  24  LAST  756   36,3723   4 0025 1              DCS     TIME2
 0494   REF 276  LAST  758   36,3724   20 155 1              DAS     MPAC
 0495   REF   8  LAST  738   36,3725   C 7300 0              TC      TPAGREE
 0496   REF 277  LAST  758   36,3726   30 155 0              CAE     MPAC +1
 0497   REF   2  LAST  755   36,3727   0 3736 0              TC      GETDT
 0498   REF  20  LAST  755   36,3730   0 5175 1              TC      TWIDDLE
 0499   REF   3  LAST  755   36,3731    03543 0              ADRES   ENGOFTSK
 0500   REF  10  LAST  757   36,3732   0 5331 0              TC      2PHSCHNG
 0501                        36,3733    40114 1              OCT     40114            ENGOFTSK (ENGINOFF)
 0502                        36,3734    00035 1              OCT     00035            SERVICER--REREADAC

 0503   REF 118  LAST  754   36,3735   1 5146 0              TCF     ENDOFJOB

 0504   REF 219  LAST  757   36,3736   10 000 0  GETDT       CCS     A
 0505                        36,3737   1 3742 1              TCF     +3
 0506                        36,3740   1 3742 1              TCF     +2
 0507   REF 140  LAST  750   36,3741   3 4746 0              CAF     ZERO
 0508   REF  75  LAST  717   36,3742   6 4744 1              AD      ONE
 0509   REF 107  LAST  746   36,3743   56 001 0              XCH     L
 0510   REF 141  LAST  758   36,3744   3 4746 0              CAF     ZERO
 0511   REF   8  LAST  755   36,3745   53'517 1              DXCH    TGO
 0512   REF   9  LAST  758   36,3746   3 1517 0              CA      TGO +1
 0513   REF 185  LAST  746   36,3747   0 C002 0              TC      Q

R0514   **************************************************************************

 0515                        36,3750    00000 1  5SECDP      OCT     00000            DON'T MOVE FROM JUST BEFORE 5SEC
 0516                        36,3751    0C764 1  5SEC        DEC     500
 0517                        36,3752    04050 0  V16N40      VN      1640
 0518                        36,3753    04125 0  V16N85B     VN      1685
 0519                        36,3754    04123 0  V1683       VN      1683
 0520   REF  14  LAST  752      4770             SEC01       =       1SEC
 0521   REF   2  LAST  744   36,2057             ACADN85     =       P41TABLE +2

 0522   REF   7  LAST  755   E7,1622                         EBANK=  DELVIMU
 0523   REF   1                 36,3755   03463 0  ACADN83   2CADR   CALCN83
 0523   REF   1                 36,3756   74067 0
R0524   ******************************************************
```

```
P0525   PROGRAM DESCRIPTION S40.1        DATE15NOV66
R0526   MOD NO2         LOG SECTION  P40-P47
R0527   MOD BY ZELDIN AND ADAPTED BY TALAYCO
R0528   FUNCTIONAL DESCRIPTION
R0529            COMPUTE INITIAL THRUST DIRECTION(UT) AND INITIAL VALUE OF VG
R0530            VECTOR(VGTIG).
R0531   CALLING SEQUENCE
R0532          L CALL
R0533        L+1        S40.1
R0534   NORMAL EXIT MODE
R0535            AT L+2 OF CALLING SEQUENCE
R0536   SUBROUTINES CALLED
R0537            LEMPREC
R0538            INITVEL
R0539   ERASABLE INITIALIZATION REQUIRED
R0540                   WEIGHT/G  ANTICIPATED VEHICLE MASS        DP  B16KGM
R0541            XDELVFLG      1=DELTA-V MANEUVER,0=AIMPT STEER
R0542             F         THRUST FOR ENGINE USED
R0543         IF DELTA-V MANEUVER
R0544            DELVSIN   SPECIFIED DELTA-V REQUIRED IN
R0545                      INERTIAL COORDS. OF ACTIVE VEHICLE
R0546                      AT TIME OF IGNITION                 VECTOR B7M/CS
R0547            DELVSAB   MAG. OF DELVSIN                     DP      B7M/CS
R0548            RTIG      POSITION AT TIME OF IGNITION       VECTOR B29M
R0549            VTIG      VELOCITY AT TIME OF IGNITION       VECTOR B7M/CS
R0550         IF AIMPT STEER
R0551            TIG       TIME OF IGNITION                    DP      B28CS
R0552            RTARG     POSITION TARGET TIME               VECTOR B29M
R0553            TPASS4    TARGET INTERCEPT TIME              DP     B28 CS
R0554   OUTPUT
R0555         UT           DESIRED THRUST DIRECTION            VECT. B2M/(CS.CS)
R0556         VGTIG        INITIAL VALUE OF VELOCITY
R0557                      TO BE GAINED (INERT. COORD.)        VECTOR B7M/CS
R0558         DELVLVC      VGTIG IN LOC. VERT. COORDS.                B7M/CS
R0559            UNIT/R/   POSITION AT TIG FOR ASTEER         VECTOR B1
R0560         RTIG         CALC IN S40.1B(AIMPT) FOR S40.2,3  VECTOR B29M
R0561                      POSITION AT TIME OF IGNITION
R0562   DEBRIS     QTEMP1
R0563         MPAC,QPRET
R0564         PUSHLIST
 0565                        14,2455                          BANK   14
 0566   RFF   4  LAST  745   27,2000                          SETLOC P40S1
 0567                        27,2246                          BANK

 0568   REF   1                                               COUNT* $$/S40.1
 0569                        27,2246   71220 1  S40.1         STQ    DLOAD
 0570   REF   3  LAST  623   27,2247   03632 0                       QTEMP
 0571   REF  34  LAST  758   27,2250   03442 0                       TIG
 0572   REF   4  LAST  757   27,2251   03763 0                STORE  TIGSAVE
 0573                        27,2252   77614 1  DELVTEST      BOFF
```

```
0574   REF   5  LAST  756   27,2253   01347 0                      XDELVFLG
0575   REF   1              27,2254   56336 1                      S40.1B
0576                        27,2255   77201 1  CALCTHET SETPD      VLOAD
0577                        27,2256   00C01 0                      0
0578   REF   5  LAST  648   27,2257   03650 1                      VTIG
0579   REF   8  LAST  757   27,2260   02322 0           STORE      VINIT
0580                        27,2261   53435 0           VXV        UNIT
0581   REF   6  LAST  648   27,2262   03642 1                      RTIG
0582   REF   3  LAST  150   27,2263   27673 0           STOVL      UT                UP IN UT
0583   REF   7  LAST  761   27,2264   03642 1                      RTIG
0584   REF   9  LAST  757   27,2265   02314 0           STORE      RINIT
0585                        27,2266   65236 0           VSQ        PDDL
0586                        27,2267   00045 0                      36D
0587                        27,2270   56205 0           DMP        DDV
0588   REF   1              27,2271   16412 1                      THETACON
0589                        27,2272   41205 0           DMP        DMP
0590   REF   4  LAST  651   27,2273   03664 0                      DELVSAB
0591   REF   1              27,2274   01244 1                      WEIGHT/G
0592                        27,2275   77671 1           DDV
0593   REF   6  LAST  753   27,2276   03735 0                      F
0594                        27,2277   24017 1           STOVL      14D
0595   REF  13  LAST  754   27,2300   03656 1                      DELVSIN

0596                        27,2301   74241 0           DOT        VXSC
0597   REF   4  LAST  761   27,2302   C3673 0                      UT
0598   REF   5  LAST  761   27,2303   03673 0                      UT
0599                        27,2304   41552 0           VSL2       PUSH              (DELTAV.UP)UP SCALED AT 2(+7) P.D.L. 0
0600                        27,2305   65245 1           BVSU       PDDL              DELTA VP SCALED AT 2(+7) P.D.L. 6
0601   REF  14  LAST  761   27,2306   03656 1                      DELVSIN
0602                        27,2307   00017 1                      14D
0603                        27,2310   63356 1           SIN        PDVL
0604                        27,2311   00007 0                      6D
0605                        27,2312   53435 0           VXV        UNIT
0606   REF   6  LAST  761   27,2313   03673 0                      UT
0607                        27,2314   45561 1           VXSC       STADR
0608   REF   6  LAST  751   27,2315   50C76 0           STOVL      VGTIG             UNIT(VPXUP)SIN(THETAT/2) IN VGTIG.
0609                        27,2316   65256 0           UNIT       PDDL              UNIT(DELTA VP) IN P.D.L. 6
0610                        27,2317   C0017 1                      14D
0611                        27,2320   74346 0           COS        VXSC
0612                        27,2321   74255 0           VAD        VXSC
0613   REF   7  LAST  761   27,2322   03701 1                      VGTIG
0614                        27,2323   00045 0                      36D
0615                        27,2324   53352 0           VSL2       VAD
0616                        27,2325   77626 0           STADR
0617   REF   8  LAST  761   27,2326   74076 0           STORE      VGTIG             VG IGNITION SCALED AT 2(+7)M/CS

0618                        27,2327   77656 1           UNIT
0619   REF   7  LAST  761   27,2330   27673 0           STOVL      UT                THRUST DIRECTION SCALED AT 2(+1)
0620   REF   9  LAST  761   27,2331   03701 1                      VGTIG
0621                        27,2332   45006 0           PUSH       CALL
```

```
 0622   REF   1                27,2333   42022 1                    GET.LVC        VGTIG IN LV COOR AT 2(+7)M/CS IN DELVLVC
 0623                          27,2334   77650 1             GOTO
 0624   REF   4  LAST  760     27,2335   03632 0                    QTEMP
 0625                          27,2336   77745 1  S40.18     DLOAD
 0626   REF  35  LAST  760     27,2337   03442 0                    TIG
 0627   REF  42  LAST  729     27,2340   00041 1             STORE  TDEC1
 0628                          27,2341   77621 1             BDSU
 0629   REF   8  LAST  757     27,2342   03631 0                    TPASS4
 0630   REF   8  LAST  757     27,2343   37452 0             STCALL DELLT4         INTERCEPT TIME - TIG.
 0631   REF   7  LAST  710     27,2344   27115 1                    LEMPREC
 0632                          27,2345   40375 1             VLOAD  SETPD          LOAD STATE VECTOR AT TIG FOR INITVEL.
 0633   REF  24  LAST  717     27,2346   00001 0                    RATT
 0634                          27,2347   00001 0                    0
 0635   REF   8  LAST  761     27,2350   03642 1             STORE  RTIG
 0636   REF  10  LAST  761     27,2351   02314 0             STORE  RINIT
 0637                          27,2352   77656 1             UNIT
 0638   REF   2  LAST  154     27,2353   27537 0             STOVL  UNIT/R/
 0639   REF  20  LAST  717     27,2354   00007 0                    VATT
 0640   REF   6  LAST  761     27,2355   03650 1             STORE  VTIG
 0641   REF   9  LAST  761     27,2356   02322 0             STORE  VINIT
 0642                          27,2357   65345 0             DLOAD  PDDL           NUMIT = 0
 0643   REF  12  LAST  680     27,2360   06505 1                    ZEROVECS
 0644   REF   1                27,2361   16406 1                    EPS1
 0645                          27,2362   43214 1             BOFF   DAD
 0646   REF   4  LAST  756     27,2363   03745 1                    NORMSW
 0647   REF   1                27,2364   56366 1                    SMALLEPS
 0648   REF   1                27,2365   16410 0                    EPS2           EPSILON4 = 10 DEGREES OR 45 DEGREES.
 0649                          27,2366   66006 1  SMALLEPS   PUSH   SXA,1
 0650   REF  12  LAST  701     27,2367   02776 0                    RTX1
 0651                          27,2370   45134 0             SXA,2  CALL
 0652   REF  11  LAST  702     27,2371   02777 1                    RTX2
 0653   REF   2  LAST  677     27,2372   22000 1                    INITVEL
 0654                          27,2373   41575 0             VLOAD  PUSH
 0655   REF  11  LAST  693     27,2374   02357 1                    DELVEET3       VGTIG = VR - VN.
 0656   REF  10  LAST  761     27,2375   03701 1             STORE  VGTIG
 0657                          27,2376   77656 1             UNIT                  UT = UNIT (VGTIG)
 0658   REF   8  LAST  761     27,2377   17673 0             STODL  UT
 0659                          27,2400   00045 0                    36D
 0660   REF   3  LAST  326     27,2401   37664 1             STCALL VGDISP         CONVERT VGTIG (IN PUSHLIST ) TO LOCAL
 0661   REF   2  LAST  762     27,2402   42022 1                    GET.LVC        VERTICAL COORDINATES.
 0662                          27,2403   77650 1             GOTO
 0663   REF   5  LAST  762     27,2404   03632 0                    QTEMP

 0664                          27,2405   00707 1  EPS1       2DEC*  2.777777778 E-2*  10 DEGREES AT 1 REVOLUTION.
 0664                          27,2406   03434 1
 0665                          27,2407   03070 0  EPS2       2DEC*  9.722222222 E-2*  35 DEGREES AT 1 REVOLUTION.
 0665                          27,2410   34344 0
 0666                          27,2411   00024 1  THETACON 2DEC     .31830989 B-8
 0666                          27,2412   13714 1
```

```
P0667   SUBROUTINE NAME: S40.2,3          MOD. NO. 3 DATE: APRIL 4, 1967

R0668   MODIFICATION BY: JONATHAN D. ADDELSTON (ADAMS ASSOCIATES)

R0669   MOD. NO. 4:  JULY 18, 1967:  PETER ADLER (MIT/IL)

R0670   MOD. NO. 5:  OCTOBER 18, 1967:  PETER ADLER (MIT/IL)

R0671   ORIGINALLY BY: SAYDEAN ZELDIN (MIT INSTRUMENTATION LAB) AND RICHARD TALAYCO (SYSTEM DEVELOPMENT CORP)

R0673   S40.2,3 COMPUTES "POINTVSM" WHICH IS THE HALF-UNIT DESIRED THRUST VECTOR IN STABLE-MEMBER COORDINATES FROM "UT"
R0675   WHICH IS THE SAME VECTOR IN REFERENCE COORDINATES.  IT DETERMINES THE CORRECT VALUES FOR "SCAXIS" USING THE +X
R0677   AXIS FOR DPS, APS, AND RCS BURNS.  THE "WINGS-LEVEL HEADS-UP" LM ORIENTATION IS THEN COMPUTED IN REFERENCE
R0679   COORDINATES.  THESE VECTORS ALSO DEFINE THE "PREFERRED IMU ORIENTATION".  UPON COMPLETION OF THIS CALCULATION,
R0681   THE "PREFERRED ATTITUDE COMPUTED" FLAG IS SET (PFRATFLG).

R0682   CALLING SEQUENCE:

A0683                                             L         CALL                         INTERPRETIVE CALL.
A0684                                             L +1              S40.2,3
A0685                                             L +2     (RETURN)                      GIMBAL ANGLE VECTOR IN MPAC.

R0686   SUBROUTINES CALLED:  NONE.

R0687   NORMAL RETURN:  L +2 (SEE CALLING SEQUENCE ABOVE).

R0688   ALARM/ABORT MODES:  NONE.

R0689   INPUT:

R0690             1. REFSMMAT                MATRIX FROM REFERENCE TO STABLE-MEMBER COORDINATES SCALED AT 2.
R0692             2. UT                      HALF-UNIT DESIRED THRUST DIRECTION.
R0693             3. RTIG                    POSITION AT TIG IN REFERENCE COORDINATES.

R0695   OUTPUT:

R0696             1. : XSCREF :              WINGS-LEVEL HEADS-UP LM ORIENTATION
R0697                : YSCREF :              IN REFERENCE COORDINATES
R0698                : ZSCREF :              (PREFERRED IMU ORIENTATION).
R0699             2. POINTVSM                DESIRED THRUST DIRECTION IN STABLE-MEMBER COORDINATES.
R0701             3. SCAXIS                  HALF-UNIT OF AXIS TO ALIGN IN STABLE-MEMBER COORDINATES.
R0703             4. PFRATFLG                INTERPRETIVE FLAG.  ON:  PREFERRED ORIENTATION COMPUTED; OFF:  NOT COMPUTED.

R0705   DEBRIS:  NONE.
```

```
0706    REF   1                                             COUNT*  $$/S40.2
0707                         27,2413   77775 1   S40.2,3    VLOAD                 UT: DESIRED THRUST DIRECTION (HALF-UNIT)
0708    REF   9  LAST  762   27,2414   03673 0                      UT            (PUT INTO TOP OF PUSH-DOWN-LIST.)
0709                         27,2415   76521 0              MXV     VSL1          TRANSFORM THRUST DIRECTION TO STABLE-
0710    REF  24  LAST  729   27,2416   01732 0                      REFSMMAT      MEMBER FROM REFERENCE COORDS (RESCALE).
0711    REF   7  LAST  534   27,2417   27773 1              STOVL   POINTVSM      SAVE FOR "VECPOINT" ROUTINE (LEMMANU).
0712    REF   6  LAST  600   27,2420   06503 1                      UNITX         SCAXIS SET TO +X, FOR P40 AND P42 AND
0713    REF  22  LAST  534   27,2421   27765 0              STOVL   SCAXIS        FOR P41 IF RCS NOT -X,+Y,-Y,+Z,-Z.

0714    REF  10  LAST  764   27,2422   03673 0                      UT            ASSUME +X BURN ALWAYS, EVEN FOR RCS.
0715    REF   1              27,2423   03607 0   PLUSX      STORE   XSCREF        XSCREF = UT (DESIRED THRUST DIRECTION.)
0716                         27,2424   53435 0              VXV     UNIT          RTIG = POSITION AT TIME-OF-IGNITION.
0717    REF   9  LAST  762   27,2425   03642 1                      RTIG          YSCREF = UNIT(UT X RTIG)
0718                         27,2426   46125 0              PDDL    BHIZ
0719                         27,2427   00045 0                      36D           TEST MAGNITUDE OF UT X RTIG
0720    REF   1              27,2430   56441 0                      FIXY          IF SMALL, USE UT X VTIG AS YSC
0721                         27,2431   45575 1   STORY      VLOAD   STADR
0722    REF   1              27,2432   74162 1              STORE   YSCREF
0723                         27,2433   76435 1              VXV     VSL1          COMPUTE (YSCREF X XSCREF),BUT FOR A
0724    REF   2  LAST  764   27,2434   03607 0                      XSCREF        RIGHT HANDED SYSTEM, NEED (X CROSS Y).
0725                         27,2435   77676 0              VCOMP                 ZSCREF = - (YSCREF X XSCREF)
0726    REF   1              27,2436   03623 0              STORE   ZSCREF                = + (XSCREF X YSCREF)

0727                         27,2437   43414 1              SET     RVQ
0728    REF   1              27,2440   01073 1                      PERATFLG
0729                         27,2441   47375 0   FIXY       VLOAD   VXV           IN THIS CASE,
0730    REF   3  LAST  764   27,2442   03607 0                      XSCREF        YSCREF = UNIT(XSCREF X VTIG)
0731    REF   7  LAST  762   27,2443   03650 1                      VTIG
0732                         27,2444   41456 0              UNIT    PUSH
0733                         27,2445   77650 1              GOTO
0734    REF   1              27,2446   56431 1                      STORY
```

```
P0735   SUBROUTINE S40.8

R0736   MODIFIED APRIL 3, 1968  BY  PETER ADLER   MIT/IL

R0737   DESCRIPTION

R0738        S40.8 UPDATES THE VELOCITY-TO-BE-GAINED VECTOR, VG, COMPUTES THE TIME FOR ISSUING THE ENGINE OFF COMMAND,
R0740   TGO, AND CALLS THE ROUTINE "FINDCDUW", WHICH GENERATES THE STEERING COMMANDS FOR THE AUTOPILOT.  FOR "ASTEER"
R0742   TYPE MANEUVERS, SUBROUTINE "RASTEER1" IS CALLED EACH PASS TO GENERATE A NEW VELOCITY-TO-BE-GAINED.

R0744   CALLING SEQUENCE

R0745   L-1       CALL
R0746   L                S40.8
R0747   L+1                        INTERPRETIVE RETURN

R0748   ALARM

R0749        IF VG . DELVREF IS NEGATIVE (VG AND DELVREF OVER 90 DEGREES APART), BYPASS TGO COMPUTATIONS, BUT DO FINDCDU
R0751   (STEERING)  SET ALARM 1407 AND RETURN TO CALLER NORMALLY.

R0752   INPUT AND INITIALIZATION

R0753   VGPREV           REFERENCE        2(7) M/CS
R0754   DELVREF          REFERENCE        2(7) M/CS
R0755   TDECAY           TAIL-OFF TIME    2(28)  CS
R0756   XDELVFLG         1 = EXTERNAL DELTA-V;   0 = LAMBERT (AIMPOINT)
R0757   STEERSW          1 = DO STEERING AND TGO COMPUTATIONS; 0 = VG UPDATE ONLY
R0758

R0759   NOTE:  VGTIG EQUALS VGPREV

R0760   OUTPUT

R0761   STEERSW          SEE INPUT
R0762   IMPULSW          1 = ENGINE OFF IN TGO CENTISECONDS;  0 = CONTINUE BURN
R0763   TGO              TIME TO CUT-OFF 2(28)   CS
R0764   SEE FINDCDUW FOR STEERING OUTPUTS.

R0765   SUBROUTINE CALLED

R0766        FINDCDUW

R0767        RASTEER1
R0768   DEBRIS

R0769        MPACS, PUSHLIST

 0770   REF    1                                       COUNT* $$/S40.8
```

```
0771                          27,2447   77614 1  S40.8     BOF                         GENERATE VR IF NOT EXTERNAL DELTA-V BURN
0772   REF   6  LAST  761     27,2450   01347 0                      XDELVFLG
0773   REF   1                27,2451   56733 0                      RASTEER1
0774                          27,2452   52375 1            VLOAD     VSU
0775   REF   7  LAST  752     27,2453   03701 1                      VGPREV
0776   REF   3  LAST  754     27,2454   03527 1                      DELVREF
0777   REF   3  LAST  757     27,2455   03707 1  VGAIN*    STORE     VG                VELOCITY TO BE GAINED SCALED AT (7)M/CS
0778                          27,2456   76521 0            MXV       VSL1
0779   REF  25  LAST  764     27,2457   01732 0                      REFSMMAT
0780   REF   3  LAST  212     27,2460   03252 1            STORE     UNFC/2
0781                          27,2461   51575 1  BDTOK     VLOAD     ABVAL
0782   REF   4  LAST  766     27,2462   03707 1                      VG
0783   REF   4  LAST  762     27,2463   03664 0            STORE     VGDISP
0784                          27,2464   77776 1            EXIT
0785   REF  52  LAST  755     27,2465  0 5355 1            TC        PHASCHNG
0786                          27,2466   10035 0            OCT       10035
0787   REF 113  LAST  757     27,2467  0 6060 1            TC        INTPRET
0788                          27,2470   77201 1  TGOCALC   SETPD     VLOAD
0789                          27,2471   00001 0                      0
0790   REF   5  LAST  766     27,2472   03707 1                      VG
0791   REF   8  LAST  766     27,2473   27701 1            STOVL     VGPREV
0792   REF   4  LAST  766     27,2474   03527 1                      DELVREF
0793                          27,2475   57414 1            BOFF      VCOMP
0794   REF   1                27,2476   01344 0                      STEERSW
0795   REF   1                27,2477   75615 1                      S40RET            LOCATION FOLLOWING CALL TO S40.8
0796                          27,2500   77656 1            UNIT
0797                          27,2501   41441 0            DOT       PUSH
0798   REF   6  LAST  766     27,2502   03707 1                      VG
0799                          27,2503   56244 0            BPL       DDV
0800   REF   1                27,2504   51634 1                      ALARMIT           DELV IS MORE THAN 90 DEGREES FROM VG.
0801   REF   2  LAST  749     27,2505   03743 1                      VEX
0802                          27,2506   41215 1            DAD       DMP
0803   REF  12  LAST  672     27,2507   06503 1                      DPHALF
0804                          27,2510   56261 1            SR        DDV
0805                          27,2511   20613 1                      10D
0806                          27,2512   00045 0                      36D
0807                          27,2513   43205 1            DMP       DAD
0808   REF   1                27,2514   16533 0                      -FOURDT
0809   REF   1                27,2515   03741 0                      TDECAY
0810   REF  10  LAST  758     27,2516   03517 1            STORE     TGO
0811                          27,2517   77615 0            DAD
0812   REF   7  LAST  757     27,2520   01234 0                      PIPTIME
0813   REF  36  LAST  762     27,2521   17442 0            STODL     TIG
0814   REF  11  LAST  766     27,2522   03517 1                      TGO
0815                          27,2523   51025 1            DSU       BPL
0816   REF   1                27,2524   16535 0                      FOURSECS          400 CS
0817   REF   1                27,2525   51640 1                      GOFIND            CALL TO FINDCDUW -2
0818                          27,2526   43014 0            SET       CLRGO
0819   REF   3  LAST  758     27,2527   01066 0                      IMPULSW
0820   REF   2  LAST  766     27,2530   01224 1                      STEERSW
```

```
 0821   REF   2  LAST  766   27,2531   75615 1                     S40RET           LOCATION FOLLOWING CALL TO S40.8
 0822                        24,3634                       BANK     24
 0823   REF   1              24,2000                       SETLOC S40BNK
 0824                        24,3634                       BANK

 0825                        24,3634   77776 1  ALARMIT    EXIT
 0826   REF  28  LAST  743   24,3635  0 5571 1             TC       ALARM
 0827                        24,3636   01407 0             OCT      01407           SKIP TGO COMPUTATION BUT CALL FINDCDUW.
 0828   REF 114  LAST  766   24,3637  0 6060 1             TC       INTPRET
 0829                        24,3640   77624 1  GOFIND     CALL
 0830   REF   1              24,3641   61072 0                      FINDCDUW -2
 0831                        24,3642   77650 1             GOTO
 0832   REF   3  LAST  767   24,3643   75615 1                      S40RET          LOCATION FOLLOWING CALL TO S40.8

 0833                        27,2532                       BANK     27
 0834   REF   5  LAST  760   27,2000                       SETLOC P40S1
 0835                        27,2532                       BANK

 0836                        27,2532   77715 1  -FOURDT    2DEC     -800 B-18       -4 (200 CS.)  B (-18)
 0836                        27,2533   77777 0
 0837                        27,2534   00000 1  FOURSECS 2DEC       400             400 CS SCALED AT 2(+28)CS
 0837                        27,2535   00620 0
 0838   REF   3  LAST  766   E7,1742            2VEXHUST =          VEX
```

```
P0839   NAME      S40.13 - TIMEBURN
R0840   FUNCTION          (1) DETERMINE WHETHER A GIVEN COMBINATION OF VELOCITY TO
R0841                     BE GAINED AND ENGINE CHOICE RESULT IN A BURN TIME
R0842                     SUFFICIENT TO ALLOW STEERING AT THE VEHICLE DURING THE
R0843                     BURN
R0844                     (2) THE MAGNITUDE OF THE RESULTING BURN TIME -- IF IT
R0845                     IS SHORT --  AND THE ASSOCIATED TIME OF THE ENGINE OFF
R0846                     SIGNAL
R0847   CALLING SEQUENCE  VIA FINDVAC AS A NEW JOB
R0848   INPUT             VGTIG VELOCITY TO BE GAINED VECTOR (METERS/CS) AT +7
R0849                     WEIGHT/G MASS OF VEHICLE IN KGM AT +16
R0850                     F  ENGINE THRUST  (USED ONLY FOR APS CALCULATIONS)  IN  KG-M/CS/CS AT +7
R0852                     FRCS4  4 JET RCS THRUST IN KG-M/CS/CS AT +7
R0853                     MDOT RATE OF DECREASE OF VEHICLE MASS DURING ENGINE
R0854                     BURN IN KG/CS AT +3
R0855                     APSFLAG:
R0856                      =0   DPS
R0857                      =1   APS
R0858   OUTPUT            IMPULSW  ZERO FOR STEERING
R0859                              ONE FOR ATTITUDE HOLD
R0860                     NOTHROTL  ZERO FOR THROTTLING
R0861                               ONE  TO INHIBIT THROTTLING
R0862                     TGO  TIME TO BURN IN CS
R0863


 0864   REF  12  LAST  766   E7,1516                            EBANK= TGO
 0865   REF   1                                                 COUNT* $$/40.13
 0866   REF 115  LAST  767   27,2536  0 6060 1  S40.13    TC      INTPRET
 0867                        27,2537   43001 1            SETPD   CLEAR
 0868                        27,2540   00001 0                    OOD
 0869   REF   4  LAST  766   27,2541   01266 1                    IMPULSW          ASSUME STEERING UNTIL FOUND OTHERWISE
 0870                        27,2542   51575 1            VLOAD   ABVAL
 0871   REF  11  LAST  762   27,2543   03701 1                    VGTIG            VELOCITY TO BE GAINED AT +7
 0872                        27,2544   41325 0            PDDL    DMP             OOD = MAG OF VGTIG AT +7
 0873   REF   1              27,2545   16710 0                    6.5SECS         CORRECT VG FOR 6.5 SECONDS OF ULLAGE
 0874   REF   2  LAST  751   27,2546   34017 0                    FRCS4            ASSUME 4 JET ULLAGE
 0875                        27,2547   72471 0            DDV     SL1              SCALE
 0876   REF   2  LAST  761   27,2550   01244 1                    WEIGHT/G
 0877                        27,2551   41421 0            BDSU    PUSH
 0878                        27,2552   43014 0            BOFF    SET
 0879   REF   1              27,2553   05342 1                    APSFLAG
 0880   REF   1              27,2554   56624 1                    S40.13D          FOR DPS ENGINE
 0881   REF   2  LAST  749   27,2555   02463 1                    NOTHROTL
 0882                        27,2556   56345 0            DLOAD   DDV              OOD = MAG OF VGTIG CORRECTED
 0883   REF   1              27,2557   16001 1                    K1VAL            KG-M/CS AT +23
 0884   REF   3  LAST  768   27,2560   01244 1                    WEIGHT/G
 0885                        27,2561   50021 1            BDSU    BMN
 0886                        27,2562   00001 0                    OOD
 0887   REF   1              27,2563   56606 1                    S40.131          TGO LESS THAN 100 CS
```

```
L         P40-P47                                                                               USER'S PAGE NO.  23       E7 S3

 0888                               27,2564    41325 0          PDDL    DMP                02D = TEMP1 AT +7
 0889    REF    2  LAST   149       27,2565    03737 1                  MDOT

 0890    REF    1                   27,2566    16700 1                  3.5SEC             350 CS AT +14
 0891                               27,2567    65221 0          BDSU    PDDL
 0892    REF    4  LAST   768       27,2570    01244 1                  WEIGHT/G
 0893    REF    7  LAST   761       27,2571    03735 0                  F
 0894                               27,2572    60405 0          DMP     SR2                SCALE
 0895    REF    1                   27,2573    16702 0                  5SECS
 0896                               27,2574    41471 0          DDV     PUSH               04D = TEMP2
 0897                               27,2575    51021 0          BDSU    BPL
 0898                               27,2576    00003 1                  02D
 0899    REF    2  LAST   768       27,2577    56624 1                  S40.13D
 0900                               27,2600    55345 0          DLOAD   BDDV
 0901                               27,2601    43205 1          DMP     DAD
 0902    REF    2  LAST   769       27,2602    16702 0                  5SECS
 0903    REF    1                   27,2603    16676 1                  1SEC2D             100 CS AT +14
 0904                               27,2604    77650 1          GOTO
 0905    REF    1                   27,2605    56614 1                  S40.132
 0906                               27,2606    41345 0 S40.131  DLOAD   DMP
 0907    REF    5  LAST   769       27,2607    01244 1                  WEIGHT/G
 0908                               27,2610    41542 1          SR1     PUSH
 0909                               27,2611    56215 1          DAD     DDV
 0910    REF    1                   27,2612    16003 0                  K2VAL              KG-M/CS AT +24
 0911    REF    1                   27,2613    16005 0                  K3VAL              KG-M/CS/CS AT +10 (SAME VALUE AS APS)
 0912                               27,2614    77414 0 S40.132  SET     EXIT
 0913    REF    5  LAST   768       27,2615    01066 0                  IMPULSW
 0914    REF    9  LAST   758       27,2616    0 7300 0 S40.132* TC     TPAGREE
 0915    REF  278  LAST   758       27,2617    3 0154 1         CA      MPAC
 0916    REF  108  LAST   758       27,2620    56 001 0         XCH     L
 0917    REF  142  LAST   758       27,2621    3 4746 0         CA      ZERO
 0918    REF   13  LAST   768       27,2622    53'517 1         DXCH    TGO
 0919    REF    1                   27,2623    1 2650 1         TCF     S40.134

 0920                               27,2624    41345 0 S40.130  DLOAD   DMP                FOR DPS ENGINE
 0921                               27,2625    00001 0                  00D
 0922    REF    6  LAST   769       27,2626    01244 1                  WEIGHT/G
 0923                               27,2627    43006 0          PUSH    BON
 0924    REF    2  LAST   768       27,2630    05302 0                  APSFLAG
 0925    REF    1                   27,2631    56671 1                  APSTGO
 0926                               27,2632    43071 0          DDV     CLEAR
 0927    REF    1                   27,2633    16007 1                  S40.136
 0928    REF    3  LAST   768       27,2634    02663 0                  NOTHROTL
 0929                               27,2635    41400 0          BOV     PUSH
 0930    REF    1                   27,2636    56653 1                  S40.130V
 0931                               27,2637    51025 1 S40.137  DSU     BPL
 0932    REF    1                   27,2640    16704 0                  6SEC               600.0 CS AT +14
 0933    REF    1                   27,2641    56661 0                  S40.138
 0934                               27,2642    43015 1          DAD     SET
 0935    REF    2  LAST   769       27,2643    16704 0                  6SEC
 0936   REF   4  LAST  769   27,2644   02463 1                     NOTHROTL
 0937                        27,2645   77650 1              GOTO
 0938   REF   2  LAST  769   27,2646   56614 1                     S40.132
 0939                        27,2647   77776 1  S40.133     EXIT
 0940   REF  53  LAST  766   27,2650  0 5355 1  S40.134     TC     PHASCHNG
 0941                        27,2651   00003 1              OCT    00003
 0942   REF 119  LAST  758   27,2652  0 5146 1              TC     ENDOFJOB
 0943                        27,2653   40545 1  S40.130V    DLOAD  SR4            RECOMPUTE TGO IN TIME2 UNITS
 0944                        27,2654   77671 1              DDV
 0945   REF   1              27,2655   16011 0                     S40.136_       S40.136 SHIFTED LEFT 10
 0946   REF  14  LAST  769   27,2656   03517 1              STORE  TGO
 0947                        27,2657   77776 1              EXIT
 0948   REF   2  LAST  769   27,2660  1 2650 1              TCF    S40.134        REJOIN COMMON CODING FOR RESTART PROTECT

 0949                        27,2661   51025 1  S40.138     DSU    BPL
 0950   REF   1              27,2662   16706 1                     89SECS
 0951   REF   1              27,2663   56666 1                     STORETGO
 0952                        27,2664   77614 1              SET
 0953   REF   5  LAST  770   27,2665   02463 1                     NOTHROTL
 0954                        27,2666   77745 1  STORETGO    DLOAD                 LOAD TGO AT 2(14)
 0955                        27,2667   77776 1              EXIT
 0956   REF   1              27,2670  1 2616 0              TCF    S40.132*

 0957                        27,2671   62471 1  APSTGO      DDV    SL2
 0958   REF   2  LAST  753   27,2672   34007 1                     FAPS
 0959                        27,2673   77650 1              GOTO
 0960   REF   2  LAST  770   27,2674   56667 0                     STORETGO +1
 0961                        27,2675   00144 0  1SEC2D      2DEC   100.0 B-14     100.0 CS AT +14
 0961                        27,2676   00000 1
 0962                        27,2677   01274 1  3.5SEC      2DEC   350.0 B-13     350 CS AT +13
 0962                        27,2700   00000 1
 0963                        27,2701   00764 1  5SECS       2DEC   500.0 B-14     500.0 CS AT +14
 0963                        27,2702   00000 1
 0964                        27,2703   01130 1  6SEC        2DEC   600.0 B-14     600.0 CS AT +14
 0964                        27,2704   00000 1
 0965                        27,2705   21304 0  89SECS      2DEC   8900.0 B-14
 0965                        27,2706   00000 1
 0966                        27,2707   00121 0  6.5SECS     2DEC   650. B-17      ASSUME 6.5 SECONDS OF ULLAGE
 0966                        27,2710   10000 0
```

```
P0967    S40.9 AND RASTEER1

R0968    S40.9

R0969    FUNCTION         TO UPDATE "A" (THE SEMI-MAJOR AXIS OF THE ELLIPTICAL TRAJECTORY) BY CALLING "HAVEGUES" (INITVEL)
R0971                     EVERY "TNEWA" SECONDS.

R0972    CALLING SEQ      VIA FINDVAC (FROM "STEERING", EVERY "TNEWA" SECONDS)

R0973    INPUT AND        SEE INITVEL FOR A COMPLETE DESCRIPTION
R0974      OUTPUT
R0975                     RINIT      - ACTIVE VEHICLE RADIUS VECTOR       METERS +29
R0976                     VINIT      - ACTIVE VEHICLE VELOCITY VECTOR      M/CS + 7
R0977                                - BOTH RINIT AND VINIT ARE VALID AT LAST PIPTIME (FROM SERVICER)
R0979                     DELLT4     - DESIRED TIME OF FLIGHT FROM RINIT TO RTARG IN CS  +28
R0981                                - THE PREVIOUS THREE QUANTITIES ARE SET EVERY GUIDANCE CYCLE AT "ENDSTEER"
R0983                     RTX1       - -2 EARTH  -10D MOON   SET IN S40.1
R0984                     RTX2       -  0 EARTH     2  MOON   SET IN S40.1

R0985                     THE ONLY OUTPUTS FROM INITVEL THAT ARE OF INTEREST HERE ARE:

R0987                     MUASTEER   - MU (GRAVITATIONAL CONSTANT) AT +42 EARTH,   +36 MOON
R0989                     MU/A       - RATIO  OF MU TO SEMI-MAJOR AXIS AT +14 EARTH,   +10  MOON


R0991    RASTEER1

R0992    FUNCTION         GENERATES REQUIRED VELOCITY AND VELOCITY-TO-BE-GAINED VECTORS FOR USE DURING AIMPOINT MANEUVERS.
R0994    ALSO ADJUSTS FOR GRAVITATIONAL EFFECTS DUE TO OBLATENESS.

R0995    CALLING SEQ      CALLED EVERY GUIDANCE PASS (DURING AIMPOINT MANEUVERS) FROM S40.8 AS AN INTERPRETIVE SUBROUTINE.

R0997    INPUT
R0998      FROM S40.1     RTX2       - -2 FOR EARTH, -10D FOR MOON
R0999      FROM SERVICER UNIT/R/     - POSITION VECTOR HALF-UNIT
R1000                     RN         - POSITION VECTOR  METERS AT +29
R1001                     VN1        - VELOCITY VECTOR M/CS AT +7 EARTH OR +5 MOON
R1002                     UNITGOBL   - OBLATENESS TERM OF GRAVITY VECTOR
R1003                     PIPTIME    - TIME OF RN AND VN1  CS  AT +28
R1004      FROM INITVEL   RTARG      - TARGET VECTOR  METERS  AT +29
R1005                     RTMAG      - MAGNITUDE OF RTARG    AT +29
R1006                     MUASTEER   - MU  (SEE ABOVE, S40.9)
R1007                     MU/A       - RATIO  OF MU TO SEMI-MAJOR AXIS (SEE S40.9)
R1008                     GEOMSGN    - 1 IF TRANSFER ANGLE < 180, -1 IF > 180
R1009      FROM TARGETTING
R1010                     NORMSW     - 1 IF TRANSFER ANGLE CLOSE TO 180, 0 IF NOT
R1011                     TPASS4     - DESIRED INTERCEPT TIME    CS  AT +28
R1012      FROM OTHERS    GOBLTIME   - NOMINAL (NOT ACTUAL) IGNITION TIME  CS AT+28
```

```
R1013   OUTPUT          DELVEET3  - VELOCITY-TO-BE-GAINED   M/CS  AT +7


  1014  REF   9  LAST  766   E7,1700                          EBANK= VGPREV
  1015  REF   2 LAST   46 TO  46:       2      2*               COUNT* $$/S40.9
  1016  REF 116  LAST  768   27,2711  0 6060 1  S40.9      TC      INTPRET
  1017                       27,2712   77601 0             SETPD
  1018                       27,2713   00001 0                     00D
  1019                       27,2714   71214 0             SET     DLOAD
  1020  REF   6  LAST  753   27,2715   01072 0                     AVFLAG              SET AVFLAG FOR LEM ACTIVE
  1021  REF   6  LAST  755   27,2716   06505 1                     HI6ZEROS
  1022                       27,2717   77725 1             PDDL
  1023  REF   2  LAST  762   27,2720   16406 1                     EPS1
  1024                       27,2721   43214 1             BOFF    DAD                 EPSILON4 = 10 OR 45 DEGREES.
  1025  REF   5  LAST  762   27,2722   03745 1                     NORMSW
  1026  REF   1                27,2723   56725 1                     EPSSMALL
  1027  REF   2  LAST  762   27,2724   16410 0                     EPS2
  1028                       27,2725   45006 0  EPSSMALL  PUSH    CALL
  1029  REF   1                27,2726   22002 0                     HAVEGUES
  1030                       27,2727   77776 1  ENDS40.9  EXIT
  1031  REF  54  LAST  770   27,2730  0 5355 1             TC      PHASCHNG
  1032                       27,2731   00002 0             OCT     2
  1033  REF 120  LAST  770   27,2732  1 5146 0             TCF     ENDOFJOB


  1034                       27,2733   51575 1  RASTEER1  VLOAD   ABVAL
  1035  REF   8  LAST  757   27,2734   01220 0                     RN
  1036                       27,2735   53744 0             LXC,2   SL*
  1037  REF  12  LAST  762   27,2736   02777 1                     RTX2
  1038                       27,2737   57576 1                     0,2
  1039  REF   2  LAST  149   27,2740   27715 1             STOVL   RMAG
  1040  REF   7  LAST  693   27,2741   03444 0                     RTARG
  1041                       27,2742   47051 0             VSU     RTB
  1042  REF   9  LAST  772   27,2743   01220 0                     RN
  1043  REF   3  LAST  708   27,2744   21722 0                     NORMUNX1
  1044  REF   1                27,2745   17656 1             STODL   IC                  UNIT(C)  C IS CHORD VECTOR
  1045                       27,2746   00045 0                     36D                 C(36D) = ABVAL(C)
  1046                       27,2747   53674 1             XAD,2   SL*
  1047  REF  15  LAST  691   27,2750   00046 0                     X1
  1048                       27,2751   57576 1                     0,2
  1049                       27,2752   00037 0             STORE   30D
  1050                       27,2753   41301 0             NORM    DMP
  1051  REF  13  LAST  717   27,2754   00050 1                     X2
  1052  REF   3  LAST  772   27,2755   03715 1                     RMAG
  1053                       27,2756   57101 0             NORM    XAD,2
  1054  REF  16  LAST  772   27,2757   00047 1                     X1
  1055  REF  17  LAST  772   27,2760   00046 0                     X1
  1056                       27,2761   77734 1             SXA,2
  1057  REF   1                27,2762   03766 0                     MUSCALE
  1058  REF   2  LAST  149   27,2763   17725 1             STODL   R1C                          2(+58 -X)
```

```
 1059                              27,2764   00037 0                30D
 1060                              27,2765   65342 1         SR1    PDDL
 1061   REF   4  LAST   772        27,2766   03715 1                RMAG
 1062                              27,2767   65342 1         SR1    PDDL
 1063   REF   4  LAST   689        27,2770   03723 1                RTMAG
 1064                              27,2771   43342 0         SR1    DAD
 1065                              27,2772   45415 0         DAD    STADR
 1066   REF   1                    27,2773   74044 1         STORE  SS              SS = (R1 + R2 +C )/2
 1067                              27,2774   41225 1         DSU    DMP
 1068                              27,2775   00037 0                30D
 1069   REF   3  LAST   693        27,2776   03721 0                MU/A
 1070                              27,2777   77621 1         BDSU
 1071   REF   3  LAST   693        27,3000   03717 0                MUASTEER        (MU - MU(S-C)/2A)
 1072                              27,3001   45325 1         PDDL   DSU
 1073   REF   2  LAST   773        27,3002   03733 0                SS
 1074   REF   5  LAST   773        27,3003   03715 1                RMAG            (S - R)
 1075                              27,3004   70501 1         NORM   SR1
 1076   REF  18  LAST   772        27,3005   00047 1                X1
 1077                              27,3006   41271 0         DDV    DMP             (2(S-R)/RC) (MU - MU(S-C)/2A)
 1078   REF   3  LAST   772        27,3007   03725 1                R1C
 1079                              27,3010   53664 0         XSU,2  SL*
 1080   REF  19  LAST   773        27,3011   00046 0                X1
 1081                              27,3012   57575 1                1,2
 1082                              27,3013   77754 1         LXA,2
 1083   REF   2  LAST   772        27,3014   03766 0                MUSCALE
 1084                              27,3015   75366 0         SQRT   SIGN            SQRT((2(S-R)/RC)(MU - MU(S-C)/2A))
 1085   REF   3  LAST   691        27,3016   02673 1                GEOMSGN         (GEOMSGN = SGNA IN GSOP)
 1086                              27,3017   00041 1         STORE  32D             + OR - A
 1087                              27,3020   41345 0         DLOAD  DMP             A=SGNA(SQRT((2(S-R)/RC)(MU-MU(S-C)/2A)))
 1088   REF   3  LAST   773        27,3021   03733 0                SS
 1089   REF   4  LAST   773        27,3022   03721 0                MU/A
 1090                              27,3023   77621 1         BDSU
 1091   REF   4  LAST   773        27,3024   03717 0                MUASTEER        MU - (MU S / 2A)
 1092                              27,3025   45325 1         PDDL   DSU
 1093   REF   4  LAST   773        27,3026   03733 0                SS
 1094   REF   5  LAST   773        27,3027   03723 1                RTMAG
 1095                              27,3030   70501 1         NORM   SR1
 1096   REF  20  LAST   773        27,3031   00047 1                X1
 1097                              27,3032   41271 0         DDV    DMP             (2(S-R2)/RC)  (MU - MU S / 2A)  R2=RTARG
 1098   REF   4  LAST   773        27,3033   03725 1                R1C
 1099                              27,3034   53664 0         XSU,2  SL*
 1100   REF  21  LAST   773        27,3035   00046 0                X1
 1101                              27,3036   57575 1                1,2
 1102                              27,3037   65366 1         SQRT   PDDL            -B (NO SIGN)
 1103   REF   5  LAST   773        27,3040   03733 0                SS
 1104                              27,3041   56225 1         DSU    DDV
 1105                              27,3042   00037 0                30D
 1106   REF   6  LAST   773        27,3043   03733 0                SS
 1107                              27,3044   41566 1         SQRT   PUSH
 1108                              27,3045   67542 0         SR1    ASIN            ARCSIN(SORT((S-C)/S))
```

```
1109                           27,3046   65205 0            DMP      PDDL
1110    REF  1                 27,3047   17220 1                     2PI+3
1111                           27,3050   56325 0            PDDL     DDV
1112                           27,3051   00037 0                     30D
1113    REF  7  LAST  773      27,3052   03733 0                     SS
1114                           27,3053   77600 1            BOV
1115                           27,3054   57055 0                     +1
1116                           27,3055   41366 1            SQRT     DMP            SQRT(C/S) SQRT((S-C)/S)=(1/S)(SQRT(C
1117                           27,3056   44242 0            SR3      BDSU                                           (S-C)))
1118                           27,3057   65365 1            SIGN     PDDL           SGNA(ARCSIN((S-C)/S)-(1/S)SQRT(C(S-C)))
1119    REF  4  LAST  773      27,3060   02673 1                     GEOMSGN
1120    REF  2  LAST  774      27,3061   17220 1                     2PI+3
1121                           27,3062   45302 1            SR2      DSU            (PI/2) - SGNA(ABOVE MESS)
1122                           27,3063   65205 0            DMP      PDDL
1123    REF  8  LAST  774      27,3064   03733 0                     SS
1124    REF  9  LAST  774      27,3065   03733 0                     SS
1125                           27,3066   75442 1            SR3      SQRT
1126                           27,3067   77605 1            DMP                     S SQRT(S) = SQRT(S CUBED)
1127                           27,3070   52525 1            PDDL     SL3
1128    REF  5  LAST  773      27,3071   03717 0                     MUASTEER
1129                           27,3072   55366 1            SQRT     BDDV           T MINIMUM ENERGY  (TM)
1130                           27,3073   43225 0            DSU      DAD
1131    REF  9  LAST  762      27,3074   03631 0                     TPASS4
1132    REF  8  LAST  766      27,3075   01234 0                     PIPTIME
1133                           27,3076   14037 0            STODL    30D            (TM - T2)  FOR SIGN OF B
1134                           27,3077   77765 0            SIGN
1135                           27,3100   00037 0                     30D            B WITH SIGN
1136                           27,3101   00037 0            STORE    30D
1137                           27,3102   77214 0            BON      VLOAD
1138    REF  6  LAST  772      27,3103   03705 0                     NORMSW
1139    REF  1                 27,3104   57125 0                     180MESS
1140    REF  2  LAST  772      27,3105   03656 1                     IC
1141                           27,3106   53451 1            VSU      UNIT
1142    REF  3  LAST  762      27,3107   03537 0                     UNIT/R/        UNCM
1143                           27,3110   63361 0            VXSC     PDVL           B  UNCM
1144                           27,3111   00037 0                     30D
1145    REF  3  LAST  774      27,3112   03656 1                     IC
1146                           27,3113   53455 0            VAD      UNIT
1147    REF  4  LAST  774      27,3114   03537 0                     UNIT/R/        UNCP
1148                           27,3115   53361 0  GETVRVG1  VXSC     VAD            A  UNCP
1149                           27,3116   00041 1                     32D
1150                           27,3117   53744 0  GETVRVG2  LXC,2    VSR*
1151    REF 13  LAST  772      27,3120   02777 1                     RTX2
1152                           27,3121   57177 1                     0 -1,2
1153    REF  7  LAST  693      27,3122   02330 0            STORE    VIPRIMF
1154                           27,3123   77650 1            GOTO
1155    REF  1                 27,3124   57170 0                     ASTREND -2
1156                           27,3125   50375 0  180MESS   VLOAD    DOT
1157    REF  4  LAST  774      27,3126   03656 1                     IC
1158    REF  5  LAST  774      27,3127   03537 0                     UNIT/R/
```

```
 1159                          27,3130   77240 1            8MN      VLOAD
 1160   REF    1               27,3131   57150 1                     NEGPROD
 1161   REF    5  LAST  774    27,3132   03656 1                     IC
 1162                          27,3133   63362 0            VSR1     PDVL
 1163   REF    6  LAST  774    27,3134   03537 0                     UNIT/R/
 1164                          27,3135   53362 0            VSR1     VAD
 1165                          27,3136   77656 1            UNIT
 1166                          27,3137   57406 1            PUSH     VCOMP               FOR A
 1167                          27,3140   75235 1            VXV      SIGN
 1168   REF    4  LAST  690    27,3141   02674 0                     UN
 1169   REF    5  LAST  774    27,3142   02673 1                     GEOMSGN
 1170                          27,3143   74256 0            UNIT     VXSC
 1171                          27,3144   00037 0                     30D
 1172                          27,3145   77715 1            PDVL                         UNIT(IC-IR)      +-B
 1173                          27,3146   77650 1            GOTO
 1174   REF    1               27,3147   57115 0                     GETVRVG1
 1175                          27,3150   74575 0  NEGPROD   VLOAD    VSR1
 1176   REF    7  LAST  775    27,3151   03537 0                     UNIT/R/
 1177                          27,3152   74515 0            PDVL     VSR1
 1178   REF    6  LAST  775    27,3153   03656 1                     IC
 1179                          27,3154   53451 1            VSU      UNIT
 1180                          27,3155   77606 1            PUSH
 1181                          27,3156   75235 1            VXV      SIGN
 1182   REF    5  LAST  775    27,3157   02674 0                     UN                  FOR B
 1183   REF    6  LAST  775    27,3160   02673 1                     GEOMSGN
 1184                          27,3161   74256 0            UNIT     VXSC
 1185                          27,3162   00041 1                     32D
 1186                          27,3163   77715 1            PDVL
 1187                          27,3164   53361 0            VXSC     VAD
 1188                          27,3165   00037 0                     30D
 1189                          27,3166   77650 1            GOTO
 1190   REF    1               27,3167   57117 1                     GETVRVG2
 1191                          27,3170   77651 0            VSU
 1192   REF    3  LAST  730    27,3171   03553 1                     VN1
 1193   REF   12  LAST  762    27,3172   02357 1  ASTREND   STORE    DELVEET3
 1194                          27,3173   53135 0  FIRSTTME  SLOAD    8ZE
 1195   REF   14  LAST  774    27,3174   03000 1                     RTX2
 1196   REF    1               27,3175   57201 0                     GETGO8L
 1197                          27,3176   52175 0            VLOAD    GOTO                NO OBLATENESS COMP IF IN MOON SPHERE
 1198   REF   13  LAST  775    27,3177   02357 1                     DELVEET3
 1199   REF    1               27,3200   57214 1                     NOGOBL
 1200                          27,3201   53575 0  GETGO8L   VLOAD    UNIT                CALCULATE OBLATENESS TERM.
 1201   REF   10  LAST  772    27,3202   01220 0                     RN
 1202                          27,3203   45345 1            DLOAD    DSU
 1203   REF    9  LAST  774    27,3204   01234 0                     PIPTIME                          2
 1204   REF    3  LAST  728    27,3205   03512 1                     GOBLTIME            G     = -(MU/R  )(UNITGO8L)(T - TIG)
 1205                          27,3206   56205 0            DMP      DDV                  O8L
 1206   REF    1               27,3207   16023 1                     EARTHMU
 1207                          27,3210   00043 0                     34D                 34D = /RN/ (2) FROM UNIT OPERATION.
 1208                          27,3211   53361 0            VXSC     VAD
 1209    REF    1                 27,3212    03521 1                     UNITGOBL
 1210    REF   14   LAST   775    27,3213    02357 1                     DELVEET3          OUTPUT FROM INITVEL  VG = VR - VN
 1211    REF   15   LAST   776    27,3214    02357 1  NOGOBL    STORE   DELVEET3        VG = VR + GOBL - VN
 1212                             27,3215    77650 1            GOTO
 1213    REF    1                 27,3216    56455 0                     VGAIN*


 1214                             27,3217    31103 1  2PI+3     2DEC    3.141592653 B-2
 1214                             27,3220    36652 0
```

```
P1215   TRIMGIMB       (FORMERLY S40.6)
R1216   MOD 0     24 FEB 67      PETER ADLER
R1217   FUNCTION:
R1218            TRIMS DPS ENGINE TO MINIMIZE THRUST/CG OFFSET. ENGINE IS GIMBALLED TO FULL + PITCH AND + ROLL (TO LOCK)
R1220            FOR REFERENCE AND IS THEN BROUGHT BACK TO TRIM POSITION BY RUNNING FOR THE PROPER TIMES (TO BE
R1222            SPECIFIED BY GAEC) IN - PITCH AND - ROLL.
R1223   CALLING SEQUENCE:
R1224            VIA WAITLIST FROM R03
R1225   INPUT:
R1226            PITTIME      TIME TO RUN FROM FULL + PITCH TO TRIM  (CS)
R1227            ROLLTIME     TIME TO RUN FROM FULL + ROLL  TO TRIM  (CS)
R1228   SUBROUTINES USED:
R1229            WAITLIST, FIXDELAY, VARDELAY, FLAGUP, FLAGDOWN, NOVAC

 1230   REF   1                                           COUNT* $$/S40.6
 1231   REF   3  LAST  326   E6,1401                      EBANK= ROLLTIME        OCTAL MASKS:  PRIO5=05000 EBANK5=02400

 1232   REF  73  LAST  758   27,3221  0 5520 0  TRIMGIMB TC     DOWNFLAG        GMBDRVSW FLAG IS SET WHEN EITHER ROLL OR
 1233   REF   1              27,3222   00137 1           ADRES  GMBDRVSW        PITCH IS COMPLETED, WHICHEVER IS FIRST.

 1234   REF   8  LAST  752   27,3223  4 5010 1           CS     PRIO5           TURN OFF - PITCH, - ROLL, IF ON.
 1235                        27,3224  0 0006 1           EXTEND
 1236   REF  40  LAST  609   27,3225  03 012 1           WAND   CHAN12
 1237   REF   3  LAST  400   27,3226  3 5005 1           CAF    EBANK5          TURN ON + PITCH, + ROLL.
 1238                        27,3227  0 0006 1           EXTEND
 1239   REF  41  LAST  777   27,3230  05 012 1           WOR    CHAN12
 1240   REF  14  LAST  755   27,3231  0 5223 1           TC     FIXDELAY        WAIT ONE MINUTE TO MAKE SURE ENGINE IS
 1241                        27,3232   13560 0           DEC    6000            AT FULL + PITCH AND FULL + ROLL
 1242   REF   4  LAST  777   27,3233  4 5005 0           CS     EBANK5          TURN OFF + PITCH, + ROLL.
 1243                        27,3234  0 0006 1           EXTEND
 1244   REF  42  LAST  777   27,3235  03 012 1           WAND   CHAN12
 1245   REF   9  LAST  777   27,3236  3 5010 0           CAF    PRIO5           TURN ON - PITCH, - ROLL.
 1246                        27,3237  0 0006 1           EXTEND
 1247   REF  43  LAST  777   27,3240  05 012 1           WOR    CHAN12
 1248   REF   2  LAST  326   27,3241  31'402 0           CAE    PITTIME         GET TIME TO SHUT OFF - PITCH AND SET UP
 1249   REF  21  LAST  758   27,3242  0 5175 1           TC     TWIDDLE         TWIDDLE-TASK TO TURN IT OFF THEN
 1250   REF   1              27,3243   03262 1           ADRES  PITCHOFF

 1251   REF   4  LAST  777   27,3244  31'401 0           CAE    ROLLTIME        GET TIME TO SHUT OFF - ROLL AND GO AWAY
 1252   REF   4  LAST  580   27,3245  0 5226 1           TC     VARDELAY        UNTIL THEN
 1253   REF  25  LAST  709   27,3246  4 4731 1           CS     BIT12
 1254                        27,3247  0 0006 1           EXTEND
 1255   REF  44  LAST  777   27,3250  03 012 1           WAND   CHAN12          SHUT OFF ROLL
 1256   REF   3  LAST  710   27,3251  3 0102 1  ROLLOVER CA     FLAGWRD6        IF HERE INLINE (ROLL DONE) IS PITCH DONE
 1257   REF   1              27,3252  7 4733 0           MASK   GMBDRBIT        IF HERE FROM PITCHOFF, IS ROLL DONE?
 1258                        27,3253  0 0006 1           EXTEND
 1259   REF   2  LAST  777   27,3254  1 3266 1           BZF    PITCHOFF +4     NO.  SET FLAG, ROLL OR PITCH DONE.
 1260   REF   5  LAST  757   27,3255  3 4730 1           CAF    PRIO10          RETURN TO R03
 1261   REF  20  LAST  739   27,3256  0 5063 1           TC     NOVAC
 1262   REF   4  LAST  613   E7,1471                     EBANK= WHOCARES
 1263   REF    1              27,3257   02330 0            2CADR  TRIMDONE
 1263   REF    1              27,3260   02067 1
 1264   REF   52  LAST  756   27,3261  0 5263 0            TC     TASKOVER
 1265   REF   27  LAST  567   27,3262  4 4733 0  PITCHOFF  CS     BIT10
 1266                         27,3263  0 0006 1            EXTEND
 1267   REF   45  LAST  777   27,3264  03 012 1            WAND   CHAN12        SHUT OFF PITCH
 1268   REF    1              27,3265  1 3251 0            TCF    ROLLOVER      SEE IF ROLL HAS FINISHED ALSO.
 1269   REF   52  LAST  758   27,3266  0 5506 1            TC     UPFLAG        ROLL DONE; OR PITCH DONE; BUT NOT BOTH.
 1270   REF    2  LAST  777   27,3267   00137 1            ADRES  GMBDRVSW
 1271   REF   53  LAST  778   27,3270  0 5263 0            TC     TASKOVER
```

```
P1272   SUBROUTINE NAME: S41.1          MOD. NO. 0  DATE: FEBRUARY 28, 1967

R1273                                MOD. NO. 1  DATE: JANUARY 23, 1968: BY PETER ADLER (MIT/IL)

R1275   AUTHOR: JONATHAN D. ADDELSTON (ADAMS ASSOCIATES)

R1276   S41.1 PERFORMS THE COORDINATE SYSTEM TRANFORMATION FROM THE REFERENCE FRAME TO THE BODY OF THE LM.
R1278   SPECIFICALLY, IT IS USED TO TRANSFORM A VELOCITY (SCALED AT 2(+7) METERS/CENTISECOND) FROM REFERENCE TO LM AXIS
R1280   COORDINATES.  FIRST THE VECTOR IS TRANSFORMED TO THE STABLE MEMBER COORDINATES BY THE MATRIX REFSMMAT.  THIS
R1282   LEAVES THE VECTOR IN MPAC, SCALED AT 2(+8) METERS/CENTISECOND.  THEN
R1283   THE SUBROUTINE CDUTRIG IS CALLED TO SET UP THE DOUBLE-PRECISION CDU VECTOR ALONG WITH ITS SINES AND COSINES.
R1285   THE VECTOR IS THEN TRANSFORMED FROM STABLE MEMBER COORDINATES TO SPACECRAFT (OR LM) COORDINATES BY THE
R1287   SUBROUTINE *SMNB*.  FINALLY( THE VECTOR IS RESCALED TO 2(+7) METERS/CENTISECOND, AND CONTROL IS RETURNED TO THE
R1289   CALLER WITH C(MPAC) = VELOCITY(LM).


R1290   CALLING SEQUENCE:

A1291                                              L         VLOAD  CALL
A1292                                              L +1             VELOCITY(REF)   SCALED AT 2(+7)M/CS IN REFERENCE COORDS.
A1293                                              L +2             S41.1
A1294                                              L +3      STORE  VELOCITY(LM)    SCALED AT 2(+7)M/CS IN LM BODY AXIS SYS.

R1295   SUBROUTINES CALLED:

R1296           1.  CDUTRIG,
R1297                  WHICH CALLS CDULOGIC.
R1298           2.  *SMNB*

R1299   NORMAL RETURN: L +3 (SEE CALLING SEQUENCE, ABOVE.)

R1300   ALARM/ABORT MODES: NONE.

R1301   RESTART PROTECTION: NONE.
```

```
P1302   INPUT:

R1303            1.  REFSMMAT.
R1304            2.  CDUX, CDUY, CDUZ.
R1305            3.  VELOCITY (REF) IN MPAC.

R1306   OUTPUT:

R1307            1.  CDUSPOT:  DOUBLE PRECISION CDU VECTOR, ORDERED Y,Z,X.
R1308            2.  SINCDU:   HALF SINES OF CDUSPOT COMPONENTS.
R1309            3.  COSCDU:   HALF COSINES OF CDUSPOT COMPONENTS.
R1310            4.  MPAC:     VELOCITY(LM) (SCALED AT 2(+7) METERS/CENTISECOND)

R1311   DEBRIS: NONE.

R1312   CHECKOUT STATUS: CODED.

 1313   REF   1                                         COUNT* $$/S41.1
 1314                       27,3271   76521 0  S41.1    MXV    VSL1            CONVERT VECTOR IN MPAC FROM REF AT 2(+7)
 1315   REF  26  LAST  766  27,3272   01732 0                  REFSMMAT        TO SM AND RESCALE DUE TO HALFUNIT MATRIX
 1316                       27,3273   77650 1               GOTO                   CONVERT TO BODY AT 2(+7) USING PRESENT
 1317   REF   2  LAST  534  27,3274   47640 0                  CDU*SMNB        CDU ANGLES.  CDU*SMNB WILL RETURN
A1318                                                                          VIA RVQ TO THE CALLER OF S41.1
```

```
 0001                        32,2602                       BANK    32
 0002   REF   2  LAST   41   32,2000                       SETLOC F2DPS*32
 0003                        32,2602                       BANK

 0004   REF   1              E7,1621                       EBANK= E2DPS

R0005                                           ****************************************
R0006                                           P63: THE LUNAR LANDING, BRAKING PHASE
R0007                                           ****************************************

 0008   REF   1                                            COUNT* $$/P63

 0009   REF  55  LAST  772   32,2602  0 5355 1  P63LM      TC      PHASCHNG
 0010                        32,2603   04024 0             OCT     04024

 0011   REF 210  LAST  754   32,2604  0 4607 1             TC      BANKCALL          DO IMU STATUS CHECK ROUTINE R02
 0012   REF   8  LAST  753   32,2605   33757 1             CADR    R02BOTH

 0013   REF   1              32,2606  3 3063 1             CAF     P63ADRES          INITIALIZE WHICH FOR BURNBABY
 0014   REF  26  LAST  753   32,2607  55'455 0             TS      WHICH

 00141  REF   1              32,2610  3 2000 0             CAF     DPSTHRSH          INITIALIZE DVMON
 00142  REF   4  LAST  753   32,2611  55'250 0             TS      DVTHRUSH
 00143  REF  12  LAST  753   32,2612  3 4742 1             CAF     FOUR
 00144  REF  30  LAST  757   32,2613  55'515 0             TS      DVCNTR

 0015   REF  76  LAST  758   32,2614  4 4744 0             CS      ONE               INITIALIZE WCHPHASE AND FLPASS0
 0016   REF   2  LAST  734   32,2615  55'346 0             TS      WCHPHASE

 0017   REF 143  LAST  769   32,2616  3 4746 0             CA      ZERO
 00175  REF   4  LAST  734   32,2617  55'623 0             TS      FLPASS0

 0018   REF  55  LAST  608   32,2620  4 4727 0             CS      BIT14
 0019                        32,2621  0 0006 1             EXTEND
 0020   REF  46  LAST  778   32,2622  03 012 1             WAND    CHAN12            REMOVE TRACK-ENABLE DISCRETE.

 0023   REF 117  LAST  772   32,2623  0 6060 1  FLAGORGY   TC      INTPRET           DIONYSIAN FLAG WAVING
 00231                       32,2624   77614 1             CLEAR
 00232  REF   2  LAST  284   32,2625   00664 0                     NOTERFLG          PERMIT TERRAIN MODEL
 0024                        32,2626   43014 0             CLEAR   CLEAR
 0025   REF   6  LAST  770   32,2627   02663 0                     NOTHROTL
 0026   REF   1              32,2630   03271 0                     REDFLAG
 0030                        32,2631   43014 0             CLEAR   SET
 0031   REF   1              32,2632   05660 1                     LRBYPASS
 0032   REF   4  LAST  729   32,2633   03067 0                     MUNFLAG
 0033                        32,2634   43014 0             CLEAR   CLEAR
 0034   REF   2  LAST  518   32,2635   00266 0                     P25FLAG           TERMINATE P25 IF IT IS RUNNING.
 0035   REF   4  LAST  583   32,2636   00270 1                     RNDVZFLG          TERMINATE P20 IF IT IS RUNNING

A0036                                                                                ****************************************
```

```
 0037                              32,2637   77201 1  IGNALG    SETPD  VLOAD            FIRST SET UP INPUTS FOR RP-TO-R:-
 0038                              32,2640   00001 0                   0                  AT 0D LANDING SITE IN MOON FIXED FRAME
 0039    REF    7  LAST  720       32,2641   02021 0                   RLS                AT 6D ESTIMATED TIME OF LANDING
 0040                              32,2642   41525 0            PDDL   PUSH               MPAC NON-ZERO TO INDICATE LUNAR CASE
 0041    REF    2  LAST  212       32,2643   02027 0                   TLAND
 0042    REF    2  LAST  156       32,2644   37625 1            STCALL TPIP             ALSO SET TPIP FOR FIRST GUIDANCE PASS
 0043    REF    1                  32,2645   55716 1                   RP-TO-R
 0044                              32,2646   64312 0            VSL4   MXV
 0045    REF   27  LAST  780       32,2647   01732 0                   REFSMMAT
 0046    REF    3  LAST  212       32,2650   37635 0            STCALL LAND
 0047    REF    1                  32,2651   71346 0                   GUIDINIT         GUIDINIT INITIALIZES WM AND /LAND/
 0048                              32,2652   45345 1            DLOAD  DSU
 0049    REF    3  LAST  782       32,2653   02027 0                   TLAND
 0050    REF    1                  32,2654   25070 1                   GUIDDURN
 0051    REF   43  LAST  762       32,2655   34041 0            STCALL TDEC1            INTEGRATE STATE FORWARD TO THAT TIME
 0052    REF    8  LAST  762       32,2656   27115 1                   LEMPREC
 0053                              32,2657   77331 0            SSP    VLOAD
 00531   REF    1                  32,2660   03647 1                   NIGNLOOP
 00532                             32,2661   00050 1                   40D
 0057    REF    7  LAST  764       32,2662   06503 1                   UNITX
 0058    REF    3  LAST  127       32,2663   26572 0            STOVL  CG
 0059    REF    4  LAST  600       32,2664   06501 0                   UNITY
 0060    REF    4  LAST  782       32,2665   26600 0            STOVL  CG  +6
 0061    REF    7  LAST  708       32,2666   06477 0                   UNITZ
 0062    REF    5  LAST  782       32,2667   16606 0            STODL  CG  +14
 00621   REF    1                  32,2670   25066 0                   99999CON
 00622   REF    4  LAST  327       32,2671   27665 1            STOVL  DELTAH           INITIALIZE DELTAH FOR V16N68 DISPLAY
 00623   REF   13  LAST  762       32,2672   06505 1                   ZEROVECS
 00624   REF    4  LAST  766       32,2673   17252 1            STODL  UNFC/2           INITIALIZE TRIM VELOCITY CORRECTION TERM
 0063    REF    7  LAST  772       32,2674   06505 1                   HI6ZEROS
 0065    REF    3  LAST  212       32,2675   17643 0            STODL  TTF/8
 00652   REF    1                  32,2676   25074 0                   HLROFFF
 00653   REF    1                  32,2677   03452 1            STORE  HLROFF           LR CUTOFF ALTITUDE.
 0066                              32,2700   77745 1  IGNALOOP  DLOAD
 0067    REF   14  LAST  729       32,2701   00015 0                   TAT
 0068    REF    5  LAST  729       32,2702   27561 0            STOVL  PIPTIME1
 0073    REF   10  LAST  729       32,2703   00017 1                   RATT1
 0074                              32,2704   64312 0            VSL4   MXV
 0075    REF   28  LAST  782       32,2705   01732 0                   REFSMMAT
 0076    REF    4  LAST  244       32,2706   37521 0            STCALL R
 0077    REF    2  LAST  729       32,2707   67037 1                   MUNGRAV
 0078    REF    5  LAST  109       32,2710   35236 0            STCALL GDT/2
 0079    REF    1                  32,2711   62417 1                   ?GUIDSUB         WHICH DELIVERS N PASSES OF GUIDANCE

R0080    DDUMCALC IS PROGRAMMED AS FOLLOWS:-

R0081                                                 2                                            -
R0083                  (RIGNZ - RGU )/16 + 16(RGU  )KIGNY/B8 + (RGU - RIGNX)KIGNX/B4 + (ABVAL(VGU) - VIGN)KIGNV/B4
R0085                              2             1                  0
R0086           DDUM = --------------------------------------------------------------------------------------------
```

```
R0088                                                         10
R0089                                                        2    (VGU  - 16 VGU  KIGNX/B4)
R0090                                                                 2          0

R0091    THE NUMERATOR IS SCALED IN METERS AT 2(28).   THE DENOMINATOR IS A VELOCITY IN UNITS OF 2(10)M/CS.
R0093    THE QUOTIENT IS THUS A TIME IN UNITS OF 2(18) CENTISECONDS.   THE FINAL SHIFT RESCALES TO UNITS OF 2(28) CS.
R0095    THERE IS NO DAMPING FACTOR.   THE CONSTANTS KIGNX/B4, KIGNY/B8 AND KIGNV/B4 ARE ALL NEGATIVE IN SIGN.

 0097    REF   2  LAST  782    32,2712   55'646 0  DDUMCALC TS      NIGNLOOP
 00971   REF 118  LAST  781    32,2713   0 6060 1           TC      INTPRET
 00972                         32,2714    57345 1           DLOAD   DMPR              FORM DENOMINATOR FIRST
 0098    REF   3  LAST  212    32,2715    03627 1                   VGU
 0099    REF   2  LAST  126    32,2716    02465 1                   KIGNX/B4
 0100                          32,2717    44232 1           SL4R    BDSU
 0101    REF   4  LAST  783    32,2720    03633 1                   VGU  +4
 0102                          32,2721    45325 1           PDDL    DSU
 0103    REF   2  LAST  125    32,2722    02463 1                   RIGNZ
 0104    REF   3  LAST  212    32,2723    02630 0                   RGU  +4
 0105                          32,2724    65222 0           SR4R    PDDL
 0106    REF   4  LAST  783    32,2725    02626 1                   RGU  +2
 0107                          32,2726    57316 1           DSQ     DMPR
 0108    REF   2  LAST  126    32,2727    02467 0                   KIGNY/B8
 0109                          32,2730    65232 1           SL4R    PDDL
 0110    REF   5  LAST  783    32,2731    02624 0                   RGU
 0111                          32,2732    57225 0           DSU     DMPR
 0112    REF   2  LAST  125    32,2733    02461 0                   RIGNX
 0113    REF   3  LAST  783    32,2734    02465 1                   KIGNX/B4
 0114                          32,2735    51515 1           PDVL    ABVAL
 0115    REF   5  LAST  783    32,2736    03627 1                   VGU
 0116                          32,2737    57225 0           DSU     DMPR
 0117    REF   2  LAST  125    32,2740    02457 0                   VIGN
 0118    REF   2  LAST  126    32,2741    02471 1                   KIGNV/B4
 0119                          32,2742    43215 0           DAD     DAD
 0120                          32,2743    56215 1           DAD     DDV
 0121                          32,2744    77661 0           SPR
 0122                          32,2745    21613 0                   10D

 0123                          32,2746    43206 1           PUSH    DAD
 0124    REF   6  LAST  782    32,2747    03561 0                   PIPTIME1
 0125    REF  44  LAST  782    32,2750    14041 1           STODL   TDEC1             STORE NEW GUESS FOR NEXT INTEGRATION
 0126                          32,2751    45246 0           ABS     DSU
 0127    REF   1               32,2752    25072 0                   DDUMCRIT
 0128                          32,2753    45040 1           BMN     CALL
 0129    REF   1               32,2754    64773 0                   DDUMGOOD
 0130    REF  26  LAST  713    32,2755    27447 0                   INTSTALL
 0131                          32,2756    43014 0           SET     SET
 0132    REF  15  LAST  713    32,2757    01473 0                   INTYPFLG
 0133    REF  13  LAST  713    32,2760    00063 1                   MOONFLAG
 0134                          32,2761    77745 1           DLOAD
 0136    REF   7  LAST  783    32,2762    03561 0                   PIPTIME1
 0137    REF  15  LAST  713    32,2763   25517 0            STOVL  TET            HOPEFULLY ?GUIDSUB DID NOT
 0138    REF  11  LAST  782    32,2764   00017 1                   RATT1            CLOBBER RATT1 AND VATT1
 0139    REF  12  LAST  713    32,2765   25535 0            STOVL  RCV
 0140    REF  13  LAST  729    32,2766   00025 0                   VATT1
 0141    REF  10  LAST  712    32,2767   35543 0            STCALL VCV
 0142    REF   7  LAST  713    32,2770   27145 1                   INTEGRVS
 0143                          32,2771   77650 1            GOTO
 0144    REF   1               32,2772   64700 1                   IGNALOOP

 0145                          32,2773   53575 0  DDUMGOOD  VLOAD  UNIT           INITIALIZE KALCMAMU
 0146    REF   5  LAST  782    32,2774   03252 1                   UNFC/2
 0147    REF   8  LAST  764    32,2775   27773 1            STOVL  POINTVSM
 0148    REF   8  LAST  782    32,2776   06503 1                   UNITX
 0149    REF  23  LAST  764    32,2777   27765 0            STOVL  SCAXIS         NEXT COMPUTE DISTANCE LANDING SITE IS
 0151    REF   2  LAST  154    32,3000   03527 1                   V                OUT OF LM'S ORBITAL PLANE AT IGNITION:
 0152                          32,3001   53435 0            VXV    UNIT             SIGN IS + IF LANDING SITE IS TO THE
 0153    REF   5  LAST  782    32,3002   03521 1                   R                RIGHT, NORTH; - IF TO THE LEFT, SOUTH.
 0154                          32,3003   72441 0            DOT    SL1
 0155    REF   4  LAST  782    32,3004   03635 1                   LAND
 0156    REF   3  LAST  327    32,3005   16614 0            STODL  OUTOFPLN       NEXT COMPUTE TIG
 0157    REF   4  LAST  734    32,3006   03423 1                   ZOOMTIME
 0158                          32,3007   44261 1            SR     BDSU
 0159                          32,3010   20617 0                   14D
 0160    REF  45  LAST  783    32,3011   00041 1                   TDFC1
 0161    REF  37  LAST  766    32,3012   03442 0            STORE  TIG
 0162                          32,3013   77776 1            EXIT
A0163                                                                             ****************************************

 0164    REF  56  LAST  781    32,3014  0 5355 1  IGNALGRT  TC     PHASCHNG       PREVENT REPEATING IGNALG
 0165                          32,3015   04024 0            OCT    04024

 0166    REF   1               32,3016  4 4353 1  ASTNCLOK  CS     ASTNDEX
 0167    REF 211  LAST  781    32,3017  C 4607 1            TC     BANKCALL
 0168    REF   2  LAST  729    32,3020   74663 1            CADR   STCLOK2
 0169    REF 121  LAST  772    32,3021  1 5146 0            TCF    ENDOFJOB       RETURN IN NEW JOB AND IN EBANK FIVE

 01756   REF   8  LAST  757    32,3022  3 5007 0  ASTNRET   CAF    EBANK7
 01757   REF  31  LAST  757    32,3023  54 003 0            TS     EBANK

 0176                          32,3024  C CC04 0            INHINT
 0177    REF  38  LAST  758    32,3025  0 4665 0            TC     IBNKCALL
 0178    REF   2  LAST  749    32,3026   40143 0            CADR   PFLITEDB
 0179                          32,3027  C 0003 1            RELINT

 0180    REF 212  LAST  734    32,3030  0 4607 1            TC     BANKCALL
 0181    REF   5  LAST  749    32,3031   54125 0            CADR   R60LEM

 0182    REF  57  LAST  784    32,3032  0 5355 1            TC     PHASCHNG       PREVENT RECALLING R60
 0183                          32,3033   04024 0            OCT    04024
 0184    REF  38  LAST  684    32,3034   3 4737 0  P63SPOT3 CA      BIT6            IS THE LR ANTENNA IN POSITION 1 YET
 0185                          32,3035   0 0006 1           EXTEND
 0186    REF  20  LAST  612    32,3036   02 033 0           RAND    CHAN33
 0187                          32,3037   0 0006 1           EXTEND
 0188    REF   1               32,3040   1 3046 1           BZF     P63SPOT4        BRANCH IF ANTENNA ALREADY IN POSITION 1

 0189    REF   1               32,3041   3 3064 0           CAF     CODE500         ASTRONAUT: PLEASE CRANK THE
 0190    REF 213  LAST  784    32,3042   0 4607 1           TC      BANKCALL                   SILLY THING AROUND
 0191    REF   4  LAST  743    32,3043    20635 0           CADR    GOPERF1
 0192    REF  26  LAST  754    32,3044   1 6001 1           TCF     GOTOPOOH        TERMINATE
 0193    REF   1               32,3045   1 3034 1           TCF     P63SPOT3        PROCEED    SEE IF HE'S LYING

 0194    REF  50  LAST  752    32,3046   3 4743 0  P63SPOT4 CAF     TWO             ENTER      INITIALIZE LANDING RADAR
 01941   REF   7  LAST  575    32,3047   55'674 1           TS      STILBADH
 01942   REF   6  LAST  576    32,3050   55'675 0           TS      STILBADV
 0195    REF 144  LAST  781    32,3051   3 4746 0           CAF     ZERO
 01951   REF   2  LAST  157    32,3052   55'670 0           TS      LRLCTR
 01952   REF   2  LAST  157    32,3053   55'672 1           TS      LRMCTR
 01953   REF   2  LAST  157    32,3054   55'671 1           TS      LRRCTR
 01954   REF   2  LAST  157    32,3055   55'673 0           TS      LRSCTR
 01955   REF   5  LAST  576    32,3056   55'462 1           TS      VSELECT

 01958   REF  13  LAST  781    32,3057   3 4742 1           CA      FOUR            INITIALIZE COUNTER TO ISSUE 511
 01959   REF   2  LAST  156    32,3060   55'622 1           TS      511CTR          ALARM AFTER 10 SECONDS

 0196    REF  47  LAST  757    32,3061   0 4625 1           TC      POSTJUMP        OFF TO SEE THE WIZARD...
 0197    REF   2  LAST  749    32,3062    74130 0           CADR    BURNBABY


R0198                                              -------------------------------------------

R0199                                                    CONSTANTS FOR P63LM AND IGNALG


 0200    REF   2  LAST  744    32,3063    02100 1  P63ADRES GENADR  P63TABLE


 0202    REF   2  LAST  473       4353             ASTNDEX  =       MDI             OCT 25;  INDEX FOR CLOKTASK


 0203                          32,3064    00500 1  CODE500  OCT     00500


 02035                         32,3065    00035 1  99999CON 2DEC    30479.7 B-24
 02035                         32,3066    30373 0


 0204                          32,3067    00004 0  GUIDDURN 2DEC    +       66440             GUIDDURN    +6.64400314E+ 2
 0204                          32,3070    01610 1
 0205                          32,3071    00000 1  DDUMCRIT 2DEC    +8 B-28         CRITERION FOR IGNALG CONVERGENCE
 0205                          32,3072    00010 0
 02055                          32,3073   00364 0  HIROFFF  DEC     15.24 B-10      LOADED DP, BUT LOW ORDER DOESN'T MATTER
R0206                                           ----------------------------------------
```

```
P0207                                         **************************************
R0208                                         P68: LANDING CONFIRMATION
R0209                                         **************************************

 0210                          34,3271                          BANK    34
 0211   REF   1                34,2000                          SETLOC  F2DPS*34
 0212                          34,3271                          BANK

 0213   REF   1                                                 COUNT*  $$/P6567

 0214   REF  58  LAST  784     34,3271  0 5355 1  LANDJUNK TC      PHASCHNG
 0215                          34,3272   04024 0                OCT     04024

 02151                         34,3273  0 0004 0                INHINT
 0216   REF 214  LAST  785     34,3274  0 4607 1                TC      BANKCALL         ZERO ATTITUDE ERROR
 0217   REF   6  LAST  751     34,3275   40154 0                CADR    ZATTEROR

 0221   REF 119  LAST  783     34,3276  0 6060 1                TC      INTPRET          TO INTERPRETIVE AS TIME IS NOT CRITICAL
 02211                         34,3277   77614 1                SET                      PREVENT RCS JET FIRINGS IF MODE CONT IS
 02212  REF   4  LAST  736     34,3300   06460 0                        PULSEFLG         IN ATT HOLD
 0222                          34,3301   43014 0                SET     CLEAR
 0223   REF  15  LAST  659     34,3302   04067 1                        SURFFLAG
 0224   REF   1                34,3303   04666 0                        LETABORT
 0225                          34,3304   77214 0                SET     VLOAD
 0226   REF   3  LAST  769     34,3305   05062 0                        APSFLAG
 0230   REF  11  LAST  775     34,3306   01220 0                        RN
 0231   REF   3  LAST  660     34,3307   16032 1                STODL   ALPHAV
 0232   REF  10  LAST  775     34,3310   01234 0                        PIPTIME
 0233                          34,3311   45014 0                SET     CALL
 0234   REF   3  LAST  660     34,3312   01463 1                        LUNAFLAG
 0235   REF   2  LAST  660     34,3313   26406 1                        LAT-LONG
 0236                          34,3314   77201 1                SETPD   VLOAD            COMPUTE RLS AND STORE IT AWAY
 0237                          34,3315   00001 0                        0
 0238   REF  12  LAST  787     34,3316   01220 0                        RN
 0239                          34,3317   65352 0                VSL2    PDDL
 0240   REF  11  LAST  787     34,3320   01234 0                        PIPTIME
 0241                          34,3321   45006 0                PUSH    CALL
 0242   REF   1                34,3322   51644 0                        R-TO-RP
 0243   REF   8  LAST  782     34,3323   02021 0                STORE   RLS
 0244                          34,3324   77776 1                EXIT
 0245   REF   1                34,3325  3 3345 0                CAE     V06N43*          ASTRONAUT: NOW LOOK WHERE YOU ENDED UP
 0246   REF 215  LAST  787     34,3326  0 4607 1                TC      BANKCALL
 0247   REF  21  LAST  743     34,3327   20471 1                CADR    GOFLASH
 0248   REF  27  LAST  785     34,3330  1 6001 1                TCF     GOTOPOOH         TERMINATE
 0249                          34,3331  1 3333 0                TCF     +2               PROCEED
 0250                          34,3332  1 3325 1                TCF     -5               RECYCLE


 0251   REF 120  LAST  787     34,3333  0 6060 1                TC      INTPRET
 0252                          34,3334   64375 1                VLOAD   MXV              INITIALIZE GSAV AND (USING REFMF)
 0253    REF   13  LAST  787    34,3335    01220 0                   RN                YNBSAV, ZNBSAV AND ATTFLAG FOR P57
 0254    REF   29  LAST  782    34,3336    01732 0                   REFSMMAT
 0255                           34,3337    45056 0             UNIT  CALL
 0256    REF    3  LAST  780    34,3340    47640 0                   CDU*SMNB
 0257    REF    5  LAST  214    34,3341    36222 0             STCALL GSAV
 0258    REF    1               34,3342    33470 1                   REFMF
 0263                           34,3343    77776 1             EXIT

 0264    REF   28  LAST  787    34,3344  1 6001 1              TCF   GOTOPOOH        ASTRONAUT: PLEASE SELECT P57


 0265                           34,3345    01453 1  V06N43*    VN    0643
 0001                         31,2144                      BANK    31

 0002    REF   2  LAST   41   31,2000                      SETLOC  FTHROT

 0003                         31,2144                      BANK

 0004    REF   2  LAST  156   E7,1612                      EBANK=  PIF

 0005    REF   2 LAST   41 TO   41:      5      5*         COUNT*  $$/THROT
R0006    * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *

R0008        HERE FC, DESIRED THRUST, AND FP, PRESENT THRUST, UNWEIGHTED, ARE COMPUTED.


 0010    REF   4  LAST  222   31,2144  3 1245 0  THROTTLE CA      ABDELV          COMPUTE PRESENT ACCELERATION IN UNITS OF
 0011                         31,2145  0 0006 1           EXTEND                    2(-4) M/CS/CS, SAVING SERVICER TROUBLE
 0012    REF   1              31,2146  7 2363 1           MP      /AF/CNST
 0013                         31,2147  0 0006 1     +3    EXTEND
 0014    REF   2  LAST  156   31,2150  23'607 1           QXCH    RTNHOLD
 0015    REF   1              31,2151  0 2344 0  AFDUMP   TC      MASSMULT
 0016    REF   1              31,2152  53'470 1           DXCH    FP              FP = PRESENT THRUST
 0017                         31,2153  0 0006 1           EXTEND
 0018    REF   2  LAST  146   31,2154  3 1464 0           DCA     /AFC/
 0019    REF   2  LAST  789   31,2155  0 2344 0           TC      MASSMULT
 00195                        31,2156  0 0004 0           INHINT                  PREVENT A DOWNRUPT
 0020    REF   3  LAST  213   31,2157  55'615 0           TS      FC              FC = THRUST DESIRED BY GUIDANCE
 0021    REF   2  LAST  146   31,2160  53'466 0           DXCH    FCODD           FCODD = WHAT IT IS GOING TO GET


 002101                       31,2161  0 0006 1           EXTEND
 002102  REF  12  LAST  787   31,2162  3 1234 0           DCA     PIPTIME
 002103  REF   2  LAST  213   31,2163  53'753 0           DXCH    GTCTIME         DOWNLINK TIME AGREEMENT
 002104                       31,2164  0 0003 1           RELINT

R00211  COMPUTE DESIRED THRUST FOR DISPLAY AS A PERCENTAGE OF 10,500 POUNDS

 002111  REF   1              31,2165  3 2365 0           CAF     4FMAXNOM        MOVE 4FMAXNOM TO ERASABLE FOR DV BELOW
 002112  REF 186  LAST  758   31,2166  54 002 1           TS      Q
 00212   REF   4  LAST  789   31,2167  3 1615 1           CA      FC
 00213   REF   1              31,2170  7 2364 0           MASK    OCT17777        FOR SAFETY
 00214                        31,2171  0 0006 1           EXTEND
 00215   REF 187  LAST  789   31,2172  10 002 1           DV      Q
 00216                        31,2173  0 0006 1           EXTEND
 00217   REF   2  LAST  175   31,2174  7 4774 0           MP      4SECS
 00218   REF   2  LAST  329   31,2175  55'750 0           TS      THRDISP         FOR DISPLAY IN  N92

R0022        IF IT HAS BEEN LESS THAN 3 SECONDS SINCE THE LAST THROTTLING, AUGMENT FP USING THE FWEIGHT CALCULATED THEN.


 0024    REF   2  LAST  156   31,2176  4 1617 1           CS      TTHROT          THIS CODING ASSUMES A FLATOUT WITHIN
 0025   REF  14  LAST  739   31,2177  6 0025 0            AD      TIME1          80 SECONDS BEFORE FIRST THROTTLE CALL
 0026   REF  16  LAST  589   31,2200  7 4724 0            MASK    POSMAX
 0027                        31,2201  4 0000 0            COM
 0028   REF   1              31,2202  6 4773 0            AD      3SECS
 0029                        31,2203  0 0006 1            EXTEND
 0030   REF   1              31,2204  6 2210 0            BZMF    WHERETO       BRANCH IF (TIME1-TTHROT +1) > 3 SECONDS
 0031                        31,2205  0 0006 1            EXTEND
 0032   REF   2  LAST  156   31,2206  3 1611 0            DCA     FWEIGHT
 0033   REF   2  LAST  789   31,2207  21'470 1            DAS     FP

R0034       THIS LOGIC DETERMINES THE THROTTLING IN THE REGION 10% - 94%.   THE MANUAL THROTTLE, NOMINALLY SET AT
R0036   MINIMUM BY ASTRONAUT OR MISSION CONTROL PROGRAMS, PROVIDES THE LOWER BOUND.   A STOP IN THE THROTTLE HARDWARE
R0038   PROVIDES THE UPPER.

 0039   REF   5  LAST  777   31,2210  3 5005 1  WHERETO   CA      FBANK5        INITIALIZE L*WCR*T AND H*GHCR*T FROM
 0040   REF  32  LAST  784   31,2211  54 003 0            TS      FBANK           PAD LOADED ERASABLES IN W-MATRIX
 0041   REF   2  LAST  126   E5,1472                      EBANK=  LOWCRIT
 0042                        31,2212  0 0006 1            EXTEND
 0043   REF   3  LAST  790   31,2213  3 1473 0            DCA     LOWCRIT
 0044   REF   1              31,2214  52 131 0            DXCH    L*WCR*T
 0045   REF   9  LAST  784   31,2215  3 5007 0            CA      EBANK7
 0046   REF  33  LAST  790   31,2216  54 003 0            TS      EBANK
 0047   REF   3  LAST  789   E7,1612                      EBANK=  PIF
 0048   REF 145  LAST  785   31,2217  4 4746 1            CS      ZERO          INITIALIZE PIFPSET
 0049   REF   2  LAST  156   31,2220  55'606 1            TS      PIFPSET
 0050   REF   1              31,2221  4 0131 0            CS      H*GHCR*T
 0051   REF   2  LAST  156   31,2222  6 1620 1            AD      FCOLD
 0052                        31,2223  0 0006 1            EXTEND
 0053   REF   1              31,2224  6 2236 1            BZMF    LOWFCOLD      BRANCH IF FCOLD < OR = HIGHCRIT
 0054   REF   2  LAST  790   31,2225  4 0130 1            CS      L*WCR*T
 0055   REF   3  LAST  789   31,2226  6 1465 1            AD      FCODD
 0056                        31,2227  0 0006 1            EXTEND
 0057   REF   1              31,2230  6 2233 1            BZMF    FCOMPSET      BRANCH IF FC < OR = LOWCRIT
 0058   REF   3  LAST  790   31,2231  3 1467 0            CA      FP            SEE NOTE 1
 0059   REF   1              31,2232  1 2243 1            TCF     FLATOUT1

 0060   REF   1              31,2233  4 2002 0  FCOMPSET  CS      FMAXODD       SEE NOTE 2
 0061   REF   4  LAST  790   31,2234  6 1467 0            AD      FP
 0062   REF   1              31,2235  1 2245 1            TCF     FLATOUT2

 0063   REF   2  LAST  790   31,2236  4 0131 0  LOWFCOLD  CS      H*GHCR*T
 0064   REF   4  LAST  790   31,2237  6 1465 1            AD      FCODD
 0065                        31,2240  0 0006 1            EXTEND
 0066   REF   1              31,2241  6 2246 0            BZMF    DOPIF         BRANCH IF FC < OR = HIGHCRIT

 0067   REF   1              31,2242  3 2003 0            CA      FMAXPOS       NO:   THROTTLE-UP
 0068   REF   5  LAST  790   31,2243  57'465 1  FLATOUT1  XCH     FCODD
 0069   REF   1              31,2244  3 4730 1            CA      FEXTRA
 0070   REF   3  LAST  790   31,2245  55'606 1  FLATOUT2 TS      PIFPSET

A0071                                           NOTE 1   FC IS SET EQUAL TO FP SO PIF WILL BE ZERO.   THIS IS DESIRABLE
A0072                                                    AS THERE IS ACTUALLY NO THROTTLE CHANGE.

A0073                                           NOTE 2   HERE, SINCE WE ARE ABOUT TO RETURN TO THE THROTTLEABLE REGION
A0074                                                    (BELOW 55%) THE QUANTITY -(FMAXODD - FP) IS COMPUTED AND PUT
A0075                                                    INTO PIFPSET TO COMPENSATE FOR THE DIFFERENCE BETWEEN THE
A0076                                                    NUMBER OF BITS CORRESPONDING TO FULL THROTTLE (FMAXODD) AND THE
A0077                                                    NUMBER CORRESPONDING TO ACTUAL THRUST (FP).   THUS THE TOTAL
A0078                                                    THROTTLE COMMAND PIF = FC - FP -(FMAXODD - FP) = FC - FMAXODD.

 0081   REF   1              31,2246  0 3751 1  DOPIF    TC      FASTCHNG
 0082                        31,2247  0 0006 1           EXTEND
 0083   REF   6  LAST  790   31,2250  3 1466 1           DCA     FCODD
 0084   REF   3  LAST  790   31,2251  55'620 0           TS      FCOLD
 0085   REF   4  LAST  790   31,2252  53'613 0           DXCH    PIF
 0086                        31,2253  0 0006 1           EXTEND
 0087   REF   5  LAST  790   31,2254  4 1470 1           DCS     FP
 0088   REF   5  LAST  791   31,2255  21'613 0           DAS     PIF             PIF = FC - FP, NEVER EQUALS +0


 0089   REF   6  LAST  791   31,2256  3 1612 0  DOIT     CA      PIF
 0090   REF   4  LAST  791   31,2257  6 1606 0           AD      PIFPSET         ADD IN PIFPSET, WITHOUT CHANGING PIF
 0091   REF   3  LAST  212   31,2260  55'614 1           TS      PSEUDO55
 0092   REF   4  LAST  756   31,2261  54 055 0           TS      THRUST
 0093   REF  34  LAST  756   31,2262  3 4741 1           CAF     BIT4
 0094                        31,2263  0 0006 1           EXTEND
 0095   REF  10  LAST  756   31,2264  05 014 1           WOR     CHAN14
 0096   REF  15  LAST  790   31,2265  3 0025 0           CA      TIME1
 0097   REF   3  LAST  789   31,2266  55'617 1           TS      TTHROT

R0098       SINCE /AF/ IS NOT AN INSTANTANEOUS ACCELERATION, BUT RATHER AN "AVERAGE" OF THE ACCELERATION LEVELS DURING
R0100   THE PRECEEDING PIPA INTERVAL, AND SINCE FP IS COMPUTED DIRECTLY FROM /AF/, FP IN ORDER TO CORRESPOND TO THE
R0102   ACTUAL THRUST LEVEL AT THE END OF THE INTERVAL MUST BE WEIGHTED BY

R0103                                     PIF(PPROCESS + TL)     PIF /PIF/
R0104                           FWEIGHT = ------------------ + -------------
R0105                                           PGUID           2 PGUID FRATE

R0106   WHERE PPROCESS IS THE TIME BETWEEN PIPA READING AND THE START OF THROTTLING, PGUID IS THE GUIDANCE PERIOD, AND
R0108   FRATE IS THE THROTTLING RATE (32 UNITS PER CENTISECOND).  PGUID IS EITHER 1 OR 2 SECONDS. THE "TL" IN THE
R0110   FIRST TERM REPRESENTS THE ENGINE'S RESPONSE LAG.   HERE FWEIGHT IS COMPUTED FOR USE NEXT PASS.

 0112   REF   2  LAST  158   31,2267  3 1762 0           CA      THISTPIP +1     INITIALIZE FWEIGHT COMP AS IF FOR P66
 0113   REF  49  LAST  472   31,2270  54 130 1           TS      BUF

 0114   REF  12  LAST  711   31,2271  4 1010 0           CS      MODREG          ARE WE IN FACT IN P66?
 0115   REF   1              31,2272  6 2454 0           AD      DEC66
 0116                        31,2273  0 0006 1           EXTEND
 0117   REF   1             31,2274  1 2301 0            BZF    FWCOMP              YES

 0118   REF  13  LAST  789  31,2275  3 1234 0            CA     PIPTIME   +1        NO:   INITIALIZE FOR TWO SECOND PERIOD
 0119   REF  50  LAST  791  31,2276  54 130 1            TS     BUF
 0120   REF   3  LAST  789  31,2277  3 4774 1            CAF    4SECS
 0121   REF   2  LAST  792  31,2300  1 2302 0            TCF    FWCOMP    +1

 0122   REF   2  LAST  580  31,2301  3 4771 1  FWCOMP    CAF    2SECS
 0126   REF 188  LAST  789  31,2302  54 002 1      +1    TS     Q
 01261                      31,2303  0 0006 1            EXTEND
 01262  REF  39  LAST  785  31,2304  7 4737 1            MP     BIT6
 01263  REF  51  LAST  792  31,2305  22 131 1            LXCH   BUF  +1
 0127   REF  52  LAST  792  31,2306  4 0130 1            CS     BUF                 TIME OF LAST PIPA READING.
 0128   REF  16  LAST  791  31,2307  6 0025 0            AD     TIME1
 0129   REF   1             31,2310  6 2004 1            AD     THROTLAG            COMPENSATE FOR ENGINE RESPONSE LAG
 0130   REF   4  LAST  475  31,2311  7 4350 1            MASK   LOW8                MAKE SURE SMALL AND POSITIVE
 0131                       31,2312  22 007 0            ZL
 0132                       31,2313  0 0006 1            EXTEND
 0133   REF 189  LAST  792  31,2314  10 002 1            DV     Q
 0134                       31,2315  0 0006 1            EXTEND
 0135   REF   7  LAST  791  31,2316  7 1612 1            MP     PIF
 0136                       31,2317  20 001 1            DDOUBL
 0137   REF   3  LAST  790  31,2320  53'611 1            DXCH   FWEIGHT
 0138   REF   8  LAST  792  31,2321  11'612 1            CCS    PIF
 0139   REF  77  LAST  781  31,2322  6 4744 1            AD     ONE
 0140                       31,2323  1 2325 0            TCF    +2
 0141   REF  78  LAST  792  31,2324  6 4744 1            AD     ONE
 0142                       31,2325  0 0006 1            EXTEND
 0143   REF   9  LAST  792  31,2326  7 1612 1            MP     PIF
 0144                       31,2327  0 0006 1            EXTEND
 0145   REF  53  LAST  792  31,2330  10 131 0            DV     BUF  +1
 0146                       31,2331  22 007 0            ZL
 0147   REF   4  LAST  792  31,2332  21'611 1            DAS    FWEIGHT


 0148   REF   3  LAST  789  31,2333  0 1607 1  THDUMP    TC     RTNHOLD


R0149       FLATOUT THROTTLES UP THE DESCENT ENGINE, AND IS CALLED AS A BASIC SUBROUTINE.

 0151   REF  27  LAST  736  31,2334  3 4730 1  FLATOUT   CAF    BIT13               4096 PULSES
 0152   REF   5  LAST  791  31,2335  55'606 1  WHATOUT   TS     PIFPSET             USE PIFPSET SO FWEIGHT WILL BE ZERO
 0153   REF 146  LAST  790  31,2336  4 4746 1            CS     ZERO
 0154   REF   4  LAST  791  31,2337  55'620 0            TS     FCOLD
 0155   REF  10  LAST  792  31,2340  55'612 1            TS     PIF
 0156                       31,2341  0 0006 1            EXTEND
 0157   REF   4  LAST  792  31,2342  23'607 1            QXCH   RTNHOLD
 0158   REF   1             31,2343  1 2256 0            TCF    DOIT
```

```
R0159       MASSMULT SCALES ACCELERATION, ARRIVING IN A AND L IN UNITS OF 2(-4) M/CS/CS, TO FORCE IN PULSE UNITS.

 0161                              31,2344  0 0006 1  MASSMULT EXTEND
 0162   REF  54   LAST  792        31,2345  22 130 0           QXCH    BUF
 0163   REF 279   LAST  769        31,2346  52 155 1           DXCH    MPAC
 0164   REF  16   LAST  449        31,2347  0 7124 1           TC      DMP
 0165   REF   5   LAST  307        31,2350   01243 0           ADRES   MASS
 0166   REF  17   LAST  793        31,2351  0 7124 1           TC      DMP                 LEAVES PROPERLY SCALED FORCE IM MPAC
 0167   REF   1                    31,2352   02005 0           ADRES   SCALEFAC
 0168   REF  10   LAST  769        31,2353  0 7300 0           TC      TPAGREE
 0169   REF 280   LAST  793        31,2354  3 0154 1           CA      MPAC
 0170                              31,2355  0 0006 1           EXTEND
 0171                              31,2356  1 2361 0           BZF     +3
 0172   REF  17   LAST  790        31,2357  3 4724 1           CAF     POSMAX
 0173   REF  55   LAST  793        31,2360  0 0130 0           TC      BUF
 0174   REF 281   LAST  793        31,2361  52 156 1           DXCH    MPAC +1
 0175   REF  56   LAST  793        31,2362  0 C130 0           TC      BUF

R0176                 CONSTANTS:-

 0177   REF  28   LAST  792           4730              FEXTRA   =       BIT13                       FEXT         +5.13309020E+ 4

 0180                              31,2363   04143 0  /AF/CNST DEC     .13107

 01802                             31,2364   17777 0  OCT17777 OCT     17777
 01804                             31,2365   35074 1  4FMAXNOM DEC     14908               EQUIVALENT TO 10,500 LBS.
R0181   * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
```

```
P0001

 0002     REF    2  LAST   781    F7,1621                          EBANK= E2DPS

 0003     REF    2 LAST    40 TO    41:      2      2*             COUNT* $$/F2DPS

R0004     ===============================================================================================
R0006     LUNAR LANDING FLIGHT SEQUENCE TABLES
R0007     ===============================================================================================

R0009     FLIGHT SEQUENCE TABLES ARE ARRANGED BY FUNCTION.   THEY ARE REFERENCED USING AS AN INDEX THE REGISTER WCHPHASE:

A0011                                                              WCHPHASE   =  -1  --->  IGNALG
A0012                                                              WCHPHASE   =   0  --->  BRAKQUAD
A0013                                                              WCHPHASE   =   1  --->  APPRQUAD
A0014                                                              WCHPHASE   =   2  --->  VERTICAL

R0015     ===============================================================================================

R0017     ROUTINES FOR STARTING NEW GUIDANCE PHASES:

 0018     REF    1                31,2366  1 2562 0            TCF      TTFINCR         IGNALG
 0019     REF    2  LAST   794    31,2367  1 2562 0  NEWPHASE  TCF      TTFINCR         BRAKQUAD
 0020     REF    1                31,2370  1 2550 1            TCF      STARTP64        APPRQUAD
 0021     REF    1                31,2371  1 2452 1            TCF      STARTP66        VERTICAL
R0022

R0023     PRE-GUIDANCE COMPUTATIONS:

 0024     REF    1                31,2372  1 2742 0            TCF      CALCRGVG        IGNALG
 0025     REF    1                31,2373  1 2752 1  PREGUIDE  TCF      RGVGCALC        BRAKQUAD
 0026     REF    1                31,2374  1 2643 0            TCF      REDESIG         APPRQUAD
R0027

R0028     GUIDANCE EQUATIONS:

 0029     REF    1                31,2375  1 3015 1            TCF      TTF/8CL         IGNALG
 0030     REF    2  LAST   794    31,2376  1 3015 1  WHATGUID  TCF      TTF/8CL         BRAKQUAD   **** HOBSON'S CHOICE? ****
 0031     REF    3  LAST   794    31,2377  1 3015 1            TCF      TTF/8CL         APPRQUAD
R0032

R0033     POST GUIDANCE EQUATION COMPUTATIONS:

 0034     REF    1                31,2400  1 3222 1            TCF      CGCALC          IGNALG
 0035     REF    1                31,2401  1 3207 0  AFTRGUID  TCF      EXTLOGIC        BRAKQUAD
 0036     REF    2  LAST   794    31,2402  1 3207 0            TCF      EXTLOGIC        APPRQUAD
R0037
```

```
P0038    WINDOW VECTOR COMPUTATIONS:

 0039    REF   1                 31,2403  1 3266 1            TCF     EXGSUB          IGNALG
 0040    REF   1                 31,2404  1 3307 1  WHATEXIT  TCF     EXBRAK          BRAKQUAD
 0041    REF   1                 31,2405  1 3315 1            TCF     EXNORM          APPRQUAD
R0042

R0043    DISPLAY ROUTINES:

 0044    REF   1                 31,2406  1 3426 0  WHATDISP  TCF     P63DISPS        BRAKQUAD
 0045    REF   1                 31,2407  1 3444 1            TCF     P64DISPS        APPRQUAD
 0046    REF   1                 31,2410  1 3502 1            TCF     VERTDISP        VERTICAL
R0047

R0048    ALARM ROUTINE FOR TTF COMPUTATION:

 0049    REF   1                 31,2411  1 3731 0            TCF     1406POO         IGNALG
 0050    REF   1                 31,2412  1 3733 1  WHATALM   TCF     1406ALM         BRAKQUAD
 0051    REF   2  LAST   795     31,2413  1 3733 1            TCF     1406ALM         APPRQUAD
R0052

R0053    INDICES FOR REFERENCING TARGET PARAMETERS:

 0054                            31,2414   00000 1            OCT     0               IGNALG
 0055                            31,2415   00000 1  TARGTDEX  OCT     0               BRAKQUAD
 0056                            31,2416   00002 0            OCT     2               APPRQUAD
R0057
```

```
P0058   ===================================================================================================
R0060   ENTRY POINTS:   ?GUIDSUB FOR THE IGNITION ALGORITHM, LUNLAND FOR SERVOUT
R0061   ===================================================================================================

R0063   IGNITION ALGORITHM ENTRY:  DELIVERS N PASSES OF QUADRATIC GUIDANCE

 0064                           31,2417    77776 1  ?GUIDSUB EXIT
 0065   REF  51  LAST  785      31,2420   3 4743 0           CAF     TWO               N = 3
 0066   REF   1                 31,2421   55'647 1           TS      NGUIDSUB
 0067   REF   1                 31,2422   1 2530 1           TCF     GUILDRET

 0068   REF   2  LAST  796      31,2423   55'647 1  GUIDSUB  TS      NGUIDSUB          ON SUCEEDING PASSES SKIP TTFINCR
 0069   REF   2  LAST  794      31,2424   1 2742 0           TCF     CALCRGVG

R0070   NORMAL ENTRY:  CONTROL COMES HERE FROM SERVOUT

 0071   REF  59  LAST  787      31,2425   0 5355 1  LUNLAND  TC      PHASCHNG
 0072                           31,2426    00035 1           OCT     00035             GROUP 5: RETAIN ONLY PIPA TASK
 0073   REF  25  LAST  756      31,2427   3 0101 1           CA      FLAGWRD5          HAS THROTTLE-UP COME YET?
 0074   REF   1                 31,2430   7 4735 0           MASK    ZOOMBIT
 0075                           31,2431   0 0006 1           EXTEND
 0076   REF   1                 31,2432   1 3420 0           BZF     DISPEXIT +3       NO:   DO DISPLAYS ONLY

 0077   REF  60  LAST  796      31,2433   0 5355 1           TC      PHASCHNG          YES:  DO GUIDANCE
 0078                           31,2434    05023 0           OCT     05023
 0079                           31,2435    20000 0           OCT     20000
```

```
R0080   ==================================================================================================================
R0082   GUILDENSTERN (AUTO-MODES MONITOR - R13)
R0083   SELECT P66 WHEN THE ROD SWITCH HAS BEEN MANIPULATED IN THE ATTITUDE HOLD MODE
R0085   ==================================================================================================================

 0087   REF   1                                            COUNT* $$/R13

 0088   REF  13  LAST  791   31,2436  4 1010 0  GUILDEN   CS     MODREG          ARE WE ALREADY IN P66?
 0089   REF   2  LAST  791   31,2437  6 2454 0     STERN  AD     DEC66
 0090                        31,2440  0 0006 1            EXTEND
 0091   REF   1              31,2441  1 2523 0            BZE    RE-IN66?        Y: GO SEE IF WE SHOULD RE-INITIALIZE P66

 0092   REF  29  LAST  793   31,2442  3 4730 1            CAF    BIT13           N: ATTITUDE HOLD?
 0093                        31,2443  0 0006 1            EXTEND
 0094   REF   3  LAST  491   31,2444  02 031 1            RAND   CHAN31
 0095   REF 220  LAST  758   31,2445  10 000 0            CCS    A
 0096   REF   2  LAST  796   31,2446  1 2530 1            TCF    GUILDRET        N: CONTINUE P63 OR P64

 0097   REF   2  LAST  270   31,2447  3 1746 0            CA     RODCOUNT        Y: ANY ROD COMMANDS?
 0098                        31,2450  0 0006 1            EXTEND
 0099   REF   3  LAST  797   31,2451  1 2530 1            BZF    GUILDRET        N: CONTINUE P63 OR P64

R0100   INITIALIZE P66

 0101   REF   2  LAST  791   31,2452  0 3751 1  STARTP66  TC     FASTCHNG        Y: START P66
 0102   REF   2  LAST  385   31,2453  0 5313 0            TC     NEWMODEX
 0103                        31,2454   00102 1  DEC66     DEC    66

 0104                        31,2455  0 0006 1            EXTEND
 0105   REF   8  LAST  329   31,2456  3 1474 1            DCA    HDOTDISP        SET DESIRED ALTITUDE RATE TO THE
 0106   REF   1              31,2457  53'645 0            DXCH   VDGVERT            CURRENTLY DISPLAYED ALTITUDE RATE

 0107   REF  53  LAST  778   31,2460  0 5506 1            TC     UPFLAG          SET FLAG TO CONTINUE P66 HORIZONTAL
 0108   REF   1              31,2461   00016 0            ADRES  P66PROFL           UNTIL 'PROCEED' AFTER TOUCHDOWN

 0109   REF   1              31,2462  4 1354 0            CS     TOOFEW          INITIALIZE CNTTHROT TO -TOOFEW
 0110   REF   1              31,2463  55'623 0            TS     CNTTHROT

R0111   P66 RE-INITIALIZATION WHEN RODFLAG RESET - P66 INITIALIZATION CONTINUED

 0112   REF 121  LAST  787   31,2464  0 6060 1  RE-IN66   TC     INTPRET
 0113                        31,2465   47375 0            VLOAD  VXV             COMPUTE HORIZONTAL VELOCITY COMMAND
 0114   REF   2  LAST  124   31,2466   02316 1                   WM              MOON'S ANGULAR RATE IN 2(-17)RAD/CS
 0115   REF   6  LAST  784   31,2467   03521 1                   R               LM POSITION IN 2(24)M
 0116   REF   1              31,2470   03434 1            STORE  VHZC
 0117                        31,2471   57551 1            TLOAD  DCOMP
 0118   REF   2  LAST  108   31,2472   01254 0                   TEMX
 0119   REF   2  LAST  158   31,2473   27764 1            STOVL  OLDPIPAX        NOTE: VECTOR INIT OF SP OLDPIPA'S OVER-
 0120   REF  14  LAST  782   31,2474   06505 1                   ZEROVECS           LAPS ADJACENT DELVROD.  THUS INIT
 0121   REF   3  LAST  159   31,2475   17767 1            STODL  DELVROD            DELVROD AFTER OLDPIPA'S
 0122   REF   2  LAST  126   31,2476   02535 0                  RODSCALE
 0123   REF   2  LAST  158   31,2477   17757 1           STODL  RODSCAL1

 0124   REF  14  LAST  792   31,2500   01234 0                  PIPTIME         SHOW THAT LAST P66 WAS, IN EFFECT,
 0125   REF   2  LAST  158   31,2501   03760 0           STORE  LASTTPIP           PERFORMED AT PIPTIME

 0126                        31,2502   77776 1           EXIT

 0127   REF 216  LAST  787   31,2503  0 4607 1           TC     BANKCALL        REFER CURRENT PIPAX READING TO THE CM:
 0128   REF   1              31,2504   65425 1           FCADR  DEIMUBOB           ALAS, OMEGAQ AT PIPTIME NOT AVAILABLE

 0129   REF 147  LAST  792   31,2505  3 4746 0           CAF    ZERO
 0130   REF   5  LAST  792   31,2506  55'620 0           TS     FCOLD
 0131   REF   5  LAST  792   31,2507  55'610 0           TS     FWEIGHT
 0132   REF   6  LAST  798   31,2510  55'611 1           TS     FWEIGHT +1

 0133   REF  52  LAST  796   31,2511  3 4743 0           CAF    TWO             WCHPHOLD=2 --> VERTICAL  PHASE
 0134   REF   3  LAST  734   31,2512  55'621 1           TS     WCHPHOLD

 0135   REF   3  LAST  781   31,2513  55'346 0           TS     WCHPHASE        ***DOES ANYONE SEE ANY NEED FOR THIS?***

 0136   REF  74  LAST  777   31,2514  0 5520 0           TC     DOWNFLAG        PERMIT X-AXIS OVERRIDE
 0137   REF   3  LAST  240   31,2515   00311 1           ADRES  XOVINFLG        SHOULD DO INTERPRETIVELY TO SAVE A WORD

 0138   REF  54  LAST  797   31,2516  0 5506 1           TC     UPFLAG          TERMINATE TERRAIN MODEL
 0139   REF   3  LAST  781   31,2517   00023 0           ADRES  NOTERFLG        SHOULD DO INTERPRETIVELY TO SAVE A WORD

 0140   REF  55  LAST  798   31,2520  0 5506 1           TC     UPFLAG          P66 INITIALIZATION COMPLETE
 0141   REF   1              31,2521   00022 1           ADRES  RODFLAG

 0142   REF   1              31,2522  1 3517 0           TCF    P66

 0143   REF  28  LAST  535   31,2523  3 0075 0  RE-IN66? CA     FLAGWRD1        RE-INITIALIZE P66?
 0144   REF   2  LAST  228   31,2524  7 4731 1           MASK   RODFLBIT
 0145                        31,2525  0 0006 1           EXTEND
 0146   REF   1              31,2526  1 2464 1           BZF    RE-IN66         Y

 0147   REF   2  LAST  798   31,2527  1 3517 0           TCF    P66             N
```

```
P0148   =================================================================================
R0150   INITIALIZATION FOR THIS PASS
R0151   =================================================================================

 0153   REF   3 LAST   794 TO  797:    40     42*          COUNT* $$/F2DPS

 0154   REF 148  LAST  798   31,2530  3 4746 0  GUILDRET CAF     ZERO
 0155   REF   3  LAST  797   31,2531  55'746 1           TS      RODCOUNT

 0156                        31,2532  0 0006 1           EXTEND
 0157   REF   3  LAST  782   31,2533  3 1625 1           DCA     TPIP
 0158   REF   1              31,2534  53'574 1           DXCH    TPIPOLD

 0159   REF   3  LAST  797   31,2535  0 3751 1           TC      FASTCHNG

 0160                        31,2536  0 0006 1           EXTEND
 0161   REF   8  LAST  783   31,2537  3 1561 1           DCA     PIPTIME1
 0162   REF   4  LAST  799   31,2540  53'625 0           DXCH    TPIP

 0163                        31,2541  0 0006 1           EXTEND
 0164   REF   4  LAST  782   31,2542  3 1643 1           DCA     TTF/8
 0165   REF   2  LAST  156   31,2543  53'553 1           DXCH    TTF/8TMP

 0166   REF   5  LAST  781   31,2544  11'623 0           CCS     FLPASS0
 0167   REF   3  LAST  794   31,2545  1 2562 0           TCF     TTFINCR

 0168   REF   4  LAST  798   31,2546  51'346 1  BRSPOT1  INDEX   WCHPHASE
 0169   REF   1              31,2547  1 2367 0           TCF     NEWPHASE

R0170   *********************************************************************************
R0172   ROUTINES TO START NEW PHASES
R0173   *********************************************************************************

 0175   REF   3  LAST  797   31,2550  0 5313 0  STARTP64 TC      NEWMODEX
 0176                        31,2551   00100 0           DEC     64
 0177   REF   1              31,2552  3 1425 0           CA      DELTTFAP       AUGMENT TTF/8
 0178   REF   3  LAST  799   31,2553  27'552 0           ADS     TTF/8TMP
 0184   REF   1              31,2554  3 3761 1           CAF     P64DB
 0185   REF   3  LAST  223   31,2555  55'343 0           TS      DB
 0186   REF  75  LAST  798   31,2556  0 5520 0           TC      DOWNFLAG       INITIALIZE REDESIGNATION FLAG
 0187   REF   2  LAST  781   31,2557   00143 1           ADRES   REDFLAG

 0188   REF   1              31,2560  3 1315 1           CA      LRWH1          PUT P64 LR WEIGHTING FUNCTION INTO
 0189   REF   1              31,2561  55'421 0           TS      LRWH           LRWH SO LR UPDATES ARE DONE PROPERLY
A0190                                                 (CONTINUE TO TTFINCR)

R0191   *********************************************************************************
R0193   INCREMENT TTF/8, UPDATE LAND FOR LUNAR ROTATION, DO OTHER USEFUL THINGS
R0194   *********************************************************************************
```

```
R0196              TTFINCR COMPUTATIONS ARE AS FOLLOWS:-

R0197                        TTF/8 UPDATED FOR TIME SINCE LAST PASS:

R0198                                    TTF/8 = TTF/8 + (TPIP - TPIPOLD)/8

R0199                        LANDING SITE VECTOR UPDATED FOR LUNAR ROTATION:

R0200                                    -                  -      -                      -
R0202                                    LAND = /LAND/ UNIT(LAND - LAND(TPIP - TPIPOLD) * WM)

R0204                        SLANT RANGE TO LANDING SITE, FOR DISPLAY:

R0205                                                     -      -
R0206                                    RANGEDSP = ABVAL(LAND - R)

 0207   REF 122  LAST  797   31,2562   0 6060 1  TTFINCR  TC     INTPRET
 0208                        31,2563    45345 1           DLOAD  DSU
 0209   REF   5  LAST  799   31,2564    03625 0                  TPIP
 0210   REF   2  LAST  799   31,2565    03574 1                  TPIPOLD
 0211                        31,2566    41461 1           SLR    PUSH            SHIFT SCALES DELTA TIME TO 2(17) CSECS
 0212                        31,2567    21214 0                  11D
 0213                        31,2570    47361 0           VXSC   VXV
 0214   REF   5  LAST  784   31,2571    03635 1                  LAND
 0215   REF   3  LAST  797   31,2572    02316 1                  WM
 0216                        31,2573    47045 0           BVSU   RTB
 0217   REF   6  LAST  800   31,2574    03635 1                  LAND
 0218   REF   2  LAST  351   31,2575    21724 0                  NORMUNIT
 0219                        31,2576    76561 1           VXSC   VSL1
 0220   REF   2  LAST  124   31,2577    02324 0                  /LAND/
 0221   REF   2  LAST  156   31,2600    17545 0           STODL  LANDTEMP
 0222                        31,2601    77776 1           EXIT

 0223   REF 282  LAST  793   31,2602   52 155 1           DXCH   MPAC
 0224   REF   4  LAST  799   31,2603   21'553 1           DAS    TTF/8TMP        NOW HAVE INCREMENTED TTF/8 IN TTF/8TMP

 0225   REF   4  LAST  799   31,2604   0 3751 1           TC     EASTCHNG

 0226                        31,2605   0 0006 1           EXTEND
 0227   REF   5  LAST  800   31,2606   3 1553 0           DCA    TTF/8TMP
 0228   REF   5  LAST  799   31,2607   53'643 0           DXCH   TTF/8

 0229   REF   1              31,2610   0 3702 1           TC     TDISPSET

 0230   REF   2  LAST  348   31,2611   3 7737 0           CAF    PRIO31          TEMPORARILY OVER-PRIO CHARIN
 0231   REF  13  LAST  752   31,2612   0 5137 1           TC     PRIOCHNG

 0232   REF 123  LAST  800   31,2613   0 6060 1           TC     INTPRET
 0233                        31,2614    53375 0           VLOAD  VAD             ADD IN CORRECTION FROM NOUN 69
 0234   REF   3  LAST  800   31,2615    03545 0                  LANDTEMP
 0235   REF   5  LAST  127   31,2616   02632 1                     DLAND
 0236   REF   7  LAST  800   31,2617   03635 1            STORE    LAND
 0237                        31,2620   77646 0            ABVAL                       RECOMPUTE /LAND/
 0238   REF   3  LAST  800   31,2621   02324 0            STORE    /LAND/
 0239                        31,2622   77776 1            EXIT

 0240   REF   5  LAST  800   31,2623   0 3751 1           TC       FASTCHNG           SINCE REDESIG MAY CHANGE LANDTEMP

 0241   REF   6  LAST  790   31,2624   3 5005 1           CAF      EBANK5
 0242   REF   6  LAST  801   E5,1631                      EBANK=   DLAND
 0243   REF  34  LAST  790   31,2625   54 003 0           TS       EBANK
 0244   REF 149  LAST  799   31,2626   3 4746 0           CAF      ZERO               ZERO N 69 REGISTERS
 0245   REF   7  LAST  801   31,2627   55'631 0           TS       DLAND
 0246   REF   8  LAST  801   31,2630   55'632 0           TS       DLAND    +1
 0247   REF   9  LAST  801   31,2631   55'633 1           TS       DLAND    +2
 0248   REF  10  LAST  801   31,2632   55'634 0           TS       DLAND    +3
 0249   REF  11  LAST  801   31,2633   55'635 1           TS       DLAND    +4
 0250   REF  12  LAST  801   31,2634   55'636 1           TS       DLAND    +5
 0251   REF  10  LAST  790   31,2635   3 5007 0           CAF      EBANK7
 0252   REF   1              E7,1666                      EBANK=   TREDES
 0253   REF  35  LAST  801   31,2636   54 003 0           TS       EBANK

 0254   REF   7  LAST  756   31,2637   3 4727 1           CAF      PRIO20
 0255   REF  14  LAST  800   31,2640   0 5137 1           TC       PRIOCHNG

 0256   REF   5  LAST  799   31,2641   51'346 1  BRSPOT2  INDEX    WCHPHASE
 0257   REF   1              31,2642   1 2373 0           TCF      PREGUIDE

R0258   ****************************************************************************************************
R0260   LANDING SITE PERTURBATION EQUATIONS
R0261   ****************************************************************************************************

 0263   REF   4  LAST  777   31,2643   3 0102 1  REDESIG  CA       FLAGWRD6           IS REDFLAG SET?
 0264   REF   1              31,2644   7 4737 1           MASK     REDFLBIT
 0265                        31,2645   0 0006 1           EXTEND
 0266   REF   2  LAST  794   31,2646   1 2752 1           BZF      RGVGCALC           NO:    SKIP REDESIGNATION LOGIC

 0267   REF   2  LAST  801   31,2647   3 1666 0           CA       TREDES             YES:   HAS TREDES REACHED ZERO?
 0268                        31,2650   0 0006 1           EXTEND
 0269   REF   3  LAST  801   31,2651   1 2752 1           BZF      RGVGCALC           YES:   SKIP REDESIGNATION LOGIC

 0270                        31,2652   0 0004 0           INHINT
 0271   REF   2  LAST  156   31,2653   3 1645 1           CA       ELINCR1
 0272   REF   2  LAST  156   31,2654   55'554 0           TS       ELINCR
 0273   REF   3  LAST  157   31,2655   3 1644 0           CA       AZINCR1
 0274   REF   2  LAST  156   31,2656   55'556 1           TS       AZINCR
 0275   REF   6  LAST  801   31,2657   0 3751 1           TC       FASTCHNG

 0276   REF 150  LAST  801   31,2660   3 4746 0           CA       ZERO
 0277   REF   3  LAST  801   31,2661   55'645 0           TS       ELINCR1
 0278   REF   4  LAST  801   31,2662  55'644 1          TS     AZINCR1
 0279   REF   3  LAST  801   31,2663  55'555 1          TS     ELINCR  +1
 0280   REF   3  LAST  801   31,2664  55'557 0          TS     AZINCR  +1

 0281   REF  18  LAST  368   31,2665  3 0120 1          CA     FIXLOC           SET PD TO 0
 0282   REF   2  LAST  266   31,2666  54 166 1          TS     PUSHLOC

 0283   REF 124  LAST  800   31,2667  0 6060 1          TC     INTPRET
 0284                        31,2670   52375 1          VLOAD  VSU
 0285   REF   8  LAST  801   31,2671   03635 1                 LAND
 0286   REF   7  LAST  797   31,2672   03521 1                 R                       -     -
 0287                        31,2673   41434 1          RTB    PUSH             PUSH DOWN UNIT (LAND - R)
 0288   REF   3  LAST  800   31,2674   21724 0                 NORMUNIT
 0289                        31,2675   76435 1          VXV    VSL1
 0290   REF   2  LAST  119   31,2676   02145 0                 YNBPIP                         -       -     -
 0291                        31,2677   65361 0          VXSC   PDDL             PUSH DOWN - ELINCR(YNB * UNIT(LAND - R))
 0292   REF   4  LAST  802   31,2700   03555 1                 ELINCR
 0293   REF   4  LAST  802   31,2701   03557 0                 AZINCR
 0294                        31,2702   52361 1          VXSC   VSU
 0295   REF   3  LAST  802   31,2703   02145 0                 YNBPIP
 0296                        31,2704   41455 0          VAD    PUSH             RESULTING VECTOR IS 1/2 REAL SIZE

 0297                        31,2705   45345 1          DLOAD  DSU              MAKE SURE REDESIGNATION IS NOT
 0298                        31,2706   00001 0                 0                  TOO CLOSE TO THE HORIZON
 0299   REF   1              31,2707   05662 0                 DEPRCRIT
 0300                        31,2710   71240 1          BMN    DLOAD
 0301   REF   1              31,2711   62714 1                 REDES1
 0302   REF   2  LAST  802   31,2712   05662 0                 DEPRCRIT
 0303                        31,2713   00001 0          STORE  0
 0304                        31,2714   45345 1  REDES1  DLOAD  DSU
 0305   REF   9  LAST  802   31,2715   03635 1                 LAND
 0306   REF   8  LAST  802   31,2716   03521 1                 R
 0307                        31,2717   74271 0          DDV    VXSC
 0308                        31,2720   00001 0                 0
 0309                        31,2721   53455 0          VAD    UNIT
 0310   REF   9  LAST  802   31,2722   03521 1                 R
 0311                        31,2723   76561 1          VXSC   VSL1
 0312   REF   4  LAST  801   31,2724   02324 0                 /LAND/
 0313   REF   4  LAST  800   31,2725   03545 0          STORE  LANDTEMP
 0314                        31,2726   77776 1          EXIT                    LOOKANGL WILL BE COMPUTED AT RGVGCALC

 0315   REF   7  LAST  801   31,2727  0 3751 1          TC     FASTCHNG

 0316                        31,2730  0 0006 1          EXTEND
 0317   REF   5  LAST  802   31,2731  3 1545 1          DCA    LANDTEMP
 0318   REF  10  LAST  802   31,2732  53'635 1          DXCH   LAND
 0319                        31,2733  0 0006 1          EXTEND
 0320   REF   6  LAST  802   31,2734  3 1547 0          DCA    LANDTEMP +2
 0321   REF  11  LAST  802   31,2735  53'637 0          DXCH   LAND     +2
 0322                        31,2736  0 0006 1          EXTEND
 0323   REF   7  LAST  802   31,2737  3 1551 1           DCA    LANDTEMP +4
 0324   REF  12  LAST  802   31,2740  53'641 1           DXCH   LAND     +4

 0325   REF   4  LAST  801   31,2741  1 2752 1           TCF    RGVGCALC

R0326   *****************************************************************************************************************
R0328   COMPUTE STATE IN GUIDANCE COORDINATES
R0329   *****************************************************************************************************************

R0331              RGVGCALC COMPUTATIONS ARE AS FOLLOWS:-

R0332                       VELOCITY RELATIVE TO THE SURFACE:

R0333                                   -         -   -   -
R0334                                   ANGTERM = V + R * WM

R0335                       STATE IN GUIDANCE COORDINATES:

R0336                                   -     *   -   -
R0337                                   RGU = CG (R - LAND)

R0338                                   -     *   -   -    -
R0339                                   VGU = CG (V - WM * R)

R0340                       DEPRESSION ANGLE FOR DISPLAY:

R0341                                                         -   -     -
R0342                                   LOOKANGL = ARCSIN(UNIT(R - LAND).XMBPIP)

 0343   REF 125  LAST  802   31,2742  0 6060 1  CALCRGVG TC     INTPRET         IN IGNALG, COMPUTE V FROM INTEGRATION
 0344                        31,2743   64375 1           VLOAD  MXV               OUTPUT AND TRIM CORRECTION TERM
 0345   REF  14  LAST  784   31,2744   00025 0                  VATT1             COMPUTED LAST PASS AND LEFT IN UNFC/2
 0346   REF  30  LAST  788   31,2745   01732 0                  REFSMMAT
 0347                        31,2746   53362 0           VSR1   VAD
 0348   REF   6  LAST  784   31,2747   03252 1                  UNFC/2
 0349   REF   3  LAST  784   31,2750   03527 1           STORE  V
 0350                        31,2751   77776 1           EXIT

 0351   REF 126  LAST  803   31,2752  0 6060 1  RGVGCALC TC     INTPRET         ENTER HERE TO RECOMPUTE RG AND VG
 0352                        31,2753   47375 0           VLOAD  VXV
 0353   REF  10  LAST  802   31,2754   03521 1                  R
 0354   REF   4  LAST  800   31,2755   02316 1                  WM
 0355                        31,2756   70455 1           VAD    VSR2            RESCALE TO UNITS OF 2(9) M/CS
 0356   REF   4  LAST  803   31,2757   03527 1                  V
 0357   REF   1              31,2760   02222 1           STORE  ANGTERM
 0358                        31,2761   77721 0           MXV
 0359   REF   6  LAST  782   31,2762   02572 0                  CG              NO SHIFT SINCE ANGTERM IS DOUBLE SIZED
 0360   REF   6  LAST  783   31,2763   27627 1           STOVL  VGU
 0361   REF  11  LAST  803   31,2764   03521 1                  R                         -   -
 0362                        31,2765   41451 1           VSU    PUSH            PUSH DOWN R - LAND
 0363   REF  13  LAST  803   31,2766   03635 1                   LAND
 0364                        31,2767   76521 0           MXV     VSL1
 0365   REF   7  LAST  803   31,2770   02572 0                   CG
 0366   REF   6  LAST  783   31,2771   16624 0           STODL   RGU
 0367   REF 283  LAST  800   31,2772   00162 1                   MPAC      +5
 0368   REF   3  LAST  328   31,2773   26614 0           STOVL   RANGEDSP        SM Z-AXIS RANGE FOR DISPLAY IN N68
 0369                        31,2774   50234 1           RTB     DOT             NOW IN MPAC IS SINE(LOOKANGL)/4
 0370   REF   4  LAST  802   31,2775   21724 0                   NORMUNIT
 0371   REF   2  LAST  119   31,2776   02137 0                   XNBPIP
 0372                        31,2777   77776 1           EXIT

 0373   REF  19  LAST  802   31,3000  3 0120 1           CA      FIXLOC          RESET PUSH DOWN POINTER
 0374   REF   3  LAST  802   31,3001  54 166 1           TS      PUSHLOC

 0375   REF 284  LAST  804   31,3002  3 0154 1           CA      MPAC            COMPUTE LOOKANGL ITSELF
 0376                        31,3003  6 0000 1           DOUBLE
 0377   REF 217  LAST  798   31,3004  0 4607 1           TC      BANKCALL
 0378   REF   1              31,3005   61656 0           CADR    SPARCSIN -1
 0379   REF   1              31,3006  6 3765 0           AD      1/2DEG
 0380   REF   1              31,3007  6 1353 0           AD      ELBIAS          BIAS LPD ANGLE FOR WINDOW BENDING
 0381                        31,3010  0 0006 1           EXTEND
 0382   REF   1              31,3011  7 3764 0           MP      180DEGS
 0383   REF   1              31,3012  55'667 0           TS      LOOKANGL        LOOKANGL FOR DISPLAY DURING P64

 0384   REF   6  LAST  801   31,3013  51'346 1  BRSPOT3  INDEX   WCHPHASE
 0385   REF   1              31,3014  1 2376 0           TCF     WHATGUID

R0386   ********************************************************************************************************************
R0388   TTF/8 COMPUTATION
R0389   ********************************************************************************************************************

 0391  *REF   7  LAST  804   31,3015  3 1346 1  TTF/8CL  CA      WCHPHASE
 03915 *REF   1              31,3016  0 3675 0           TC      INTPRETX
 0392                        31,3017   77743 1           DLOAD*
 0393   REF   1              31,3020   02443 0                   JDG2TTF,1
 0394   REF   2  LAST  156   31,3021   23571 0           STODL*  TABLTTF  +6     A(3) = 8 JDG  TO TABLTTF
 0395   REF   1              31,3022   02437 0                   ADG2TTF,1                  2
 0396   REF   3  LAST  804   31,3023   17567 0           STODL   TABLTTF  +4     A(2) = 6 ADG  TO TABLTTF
 0397   REF   7  LAST  803   31,3024   03633 1                   VGU      +4                2
 0398                        31,3025   42605 1           DMP     DAD*
 0399   REF   1              31,3026   05660 1                   3/4DP
 0400   REF   1              31,3027   02433 1                   VDG2TTF,1
 0401   REF   4  LAST  804   31,3030   23565 0           STODL*  TABLTTF  +2     A(1) = (6 VGU  + 18 VDG )/8 TO TABLTTF
 0402   REF   1              31,3031   02407 0                   RDG  +4,1                   2          2
 0403                        31,3032   41225 1           DSU     DMP
 0404   REF   7  LAST  804   31,3033   02630 0                   RGU      +4
 0405   REF   1              31,3034   05656 1                   3/8DP
 0406   REF   5  LAST  804   31,3035   03563 1           STORE   TABLTTF         A(0) = -24(RGU  - PDG )/64 TO TABLTTF
 0407                        31,3036   77776 1           EXIT                                   2      2
 0408   REF  29  LAST  618   31,3037  3 4735 1           CA     BIT8
 0409   REF   6  LAST  804   31,3040  55'572 1           TS     TABLTTF  +10    FRACTIONAL PRECISION FOR TTF TO TABLE

 0410                        31,3041  0 0006 1           EXTEND
 0411   REF   6  LAST  800   31,3042  3 1643 1           DCA    TTF/8
 0412   REF 285  LAST  804   31,3043  52 155 1           DXCH   MPAC            LOADS TTF/8 (INITIAL GUESS) INTO MPAC
 0413   REF  53  LAST  798   31,3044  3 4743 0           CAF    TWO             DEGREE - ONE
 0414   REF 109  LAST  769   31,3045  54 001 1           TS     L
 0415   REF   1              31,3046  3 3757 1           CAF    TABLTTFL
 0416   REF   1              31,3047  0 3545 0           TC     ROOTPSRS        YIELDS TTF/8 IN MPAC
 0417   REF   8  LAST  804   31,3050  51'346 1           INDEX  WCHPHASE
 0418   REF   1              31,3051  1 2412 0           TCF    WHATALM

 0419                        31,3052  0 0006 1           EXTEND                 GOOD RETURN
 0420   REF 286  LAST  805   31,3053  3 0155 0           DCA    MPAC            FETCH TTF/8 KEEPING IT IN MPAC
 0421   REF   7  LAST  805   31,3054  53'643 0           DXCH   TTF/8           CORRECTED TTF/8

 0422   REF   2  LAST  800   31,3055  0 3702 1           TC     TDISPSET

A0423                                                (CONTINUE TO QUADGUID)


R0424   ****************************************************************************************************************
R0426   MAIN GUIDANCE EQUATION
R0427   ****************************************************************************************************************

R0429                        AS PUBLISHED:-

R0430                                                 -     -        -     -
R0431                                   -     -     6(VDG + VG)   12(RDG - RG)
R0432                                   ACG = ADG + ----------- + ------------
R0433                                                   TTF         (TTF)(TTF)

R0434                        AS HERE PROGRAMMED:-

R0435                                               -     -
R0436                                        3 (1/4(RDG - RG)   -     - )
R0437                                        - (------------- + VDG + VG)
R0438                                  -     4 (    TTF/8               )   -
R0439                                  ACG = ---------------------------- + ADG
R0440                                                   TTF/8

 0441   REF   8  LAST  805   31,3056  4 1642 1  QUADGUID CS     TTF/8
 0442   REF   1              31,3057  6 1426 0           AD     LEADTIME        LEADTIME IS A NEGATIVE NUMBER
 0443   REF  18  LAST  793   31,3060  6 4724 1           AD     POSMAX          SAFEGUARD THE COMPUTATIONS THAT FOLLOW
 0444   REF 110  LAST  805   31,3061  54 001 1           TS     L                 BY FORCING -TTF+LEADTIME > OR = ZERO
 0445   REF 111  LAST  805   31,3062  4 0001 1           CS     L
 0446   REF 112  LAST  805   31,3063  6 0001 0           AD     L
 0447                        31,3064  22 007 0           ZL
 0448                        31,3065  0 0006 1           EXTEND
```

```
0449    REF   9  LAST  805   31,3066  11'642 1         DV      TTF/8         - RATIO OF LAG-DIMINISHED TTF TO TTF
0450    REF  57  LAST  793   31,3067  54 130 1         TS      BUF
0451                         31,3070  0 0006 1         EXTEND
0452                         31,3071  7 0000 0         SQUARE
0453    REF  58  LAST  806   31,3072  54 131 0         TS      BUF   +1
0454    REF  59  LAST  806   31,3073  6 0130 0         AD      BUF
0455    REF  60  LAST  806   31,3074  56 131 1         XCH     BUF   +1      RATIO SQUARED - RATIO
0456    REF  61  LAST  806   31,3075  6 0131 1         AD      BUF   +1
0457    REF 287  LAST  805   31,3076  54 154 0         TS      MPAC          COEFFICIENT FOR VGU TERM
0458    REF  62  LAST  806   31,3077  6 0131 1         AD      BUF   +1
0459    REF  20  LAST  804   31,3100  50 120 1         INDEX   FIXLOC
0460                         31,3101  54 032 1         TS      26D           COEFFICIENT FOR RDG-RGU TERM
0461    REF  63  LAST  806   31,3102  6 0131 1         AD      BUF   +1
0462    REF  21  LAST  806   31,3103  50 120 1         INDEX   FIXLOC
0463                         31,3104  54 034 1         TS      28D           COEFFICIENT FOR VDG TERM
0464    REF  64  LAST  806   31,3105  6 0130 0         AD      BUF
0465    REF  19  LAST  805   31,3106  6 4724 1         AD      POSMAX
0466    REF  65  LAST  806   31,3107  6 0131 1         AD      BUF   +1
0467    REF  66  LAST  806   31,3110  6 0131 1         AD      BUF   +1
0468    REF  22  LAST  806   31,3111  50 120 1         INDEX   FIXLOC
0469                         31,3112  54 036 0         TS      30D           COEFFICIENT FOR ADG TERM

0470    REF 151  LAST  801   31,3113  3 4746 0         CAF     ZERO
0471    REF   4  LAST  348   31,3114  54 163 1         TS      MODE

04715  *REF   9  LAST  805   31,3115  3 1346 1         CA      WCHPHASE
0472    REF   2  LAST  804   31,3116  0 3675 0         TC      INTPRETX
0473                         31,3117   65361 0         VXSC    PDDL
0474    REF   8  LAST  804   31,3120   03627 1                 VGU
0475                         31,3121   00035 1                 28D
0476                         31,3122   47157 1         VXSC*   RTB
0477    REF   1              31,3123   02413 0                 VDG,1
0478    REF   1              31,3124   63671 1                 ZEROMID
0479                         31,3125   47113 1         PDVL*   RTB
0480    REF   2  LAST  804   31,3126   02403 1                 RDG,1
0481    REF   2  LAST  806   31,3127   63671 1                 ZEROMID
0482                         31,3130   70251 0         VSU     V/SC
0483    REF   8  LAST  804   31,3131   02624 0                 RGU
0484    REF  10  LAST  806   31,3132   03643 0                 TTF/8
0485                         31,3133   74342 1         VSR2    VXSC
0486                         31,3134   00033 1                 26D
0487                         31,3135   53255 0         VAD     VAD
0488                         31,3136   74341 1         V/SC    VXSC
0489    REF  11  LAST  806   31,3137   03643 0                 TTF/8
0490    REF   2  LAST  804   31,3140   05660 1                 3/4DP
0491                         31,3141   73725 0         PDDL    VXSC*
0492                         31,3142   00037 0                 30D
0493    REF   1              31,3143   02423 0                 ADG,1
0494                         31,3144   53234 1         RTB     VAD
0495    REF   3  LAST  806   31,3145   63671 1                 ZEROMID
```

```
 0496                         31,3146   76505 0  AFCCALC1 VXM     VSL1              VERTGUID COMES HERE
 0497    REF   8  LAST  804   31,3147   02572 0                    CG
 0498                         31,3150   70315 1           PDVL     V/SC
 0499    REF   6  LAST  782   31,3151   01236 1                    GDT/2
 0500    REF   1              31,3152   05654 0                    GSCALE
 0501                         31,3153   45445 0           BVSU     STADR
 0502    REF   7  LAST  803   31,3154   74525 0           STORE    UNFC/2            UNFC/2 NEED NOT BE UNITIZED
 0503                         31,3155   77646 0           ABVAL
 0504    REF   3  LAST  789   31,3156   17464 1  AFCCALC2 STODL    /AFC/             MAGNITUDE OF AFC FOR THROTTLE
 0505    REF   8  LAST  807   31,3157   03252 1                    UNFC/2            VERTICAL COMPONENT
 0506                         31,3160   65316 0           DSQ      PDDL
 0507    REF   9  LAST  807   31,3161   03254 1                    UNFC/2    +2      OUT-OF-PLANE
 0508                         31,3162   65316 0           DSQ      PDDL
 0509    REF   1              31,3163   05652 0                    HIGHESTF
 0510                         31,3164   63471 0           DDV      DSQ
 0511    REF   6  LAST  793   31,3165   01244 1                    MASS                                     2       2       2
 0512                         31,3166   45225 0           DSU      DSU               AMAXHORIZ = SQRT(ATOTAL  - A     - A   )
 0513                         31,3167   71244 0           BPL      DLOAD                                         1       0
 0514    REF   1              31,3170   63172 0                    AFCCALC3
 0515    REF  15  LAST  797   31,3171   06505 1                    ZEROVECS
 0516                         31,3172   43366 0  AFCCALC3 SQRT     DAD
 0517    REF  10  LAST  807   31,3173   03256 0                    UNFC/2    +4
 0518                         31,3174   44244 0           BPL      BDSU
 0519    REF   1              31,3175   63200 0                    AFCCLEND
 0520    REF  11  LAST  807   31,3176   03256 0                    UNFC/2    +4
 0521    REF  12  LAST  807   31,3177   03256 0           STORE    UNFC/2    +4
 0522                         31,3200   77776 1  AFCCLEND EXIT
 0523    REF   8  LAST  802   31,3201   0 3751 1          TC       FASTCHNG

 0524    REF  10  LAST  806   31,3202   3 1346 1          CA       WCHPHASE          PREPARE FOR PHASE SWITCHING LOGIC
 0525    REF   4  LAST  798   31,3203   55'621 1          TS       WCHPHOLD
 0526    REF   6  LAST  799   31,3204   25'623 1          INCR     FLPASS0           INCREMENT PASS COUNTER

 0527    REF  11  LAST  807   31,3205   51'346 1  BRSPOT4  INDEX    WCHPHASE
 0528    REF   1              31,3206   1 2401 1          TCF      AFTRGUID

R0529    ***************************************************************************************************************
R0531    NEW PHASE NOW?
R0532    ***************************************************************************************************************

 0534    REF  12  LAST  807   31,3207   51'346 1  EXTLOGIC INDEX    WCHPHASE          IS TTF NEARER ZERO THAN CRITERION?
 0535    REF   2  LAST  145   31,3210   3 1423 0          CA       TENDBRAK
 0536    REF  12  LAST  806   31,3211   6 1642 0          AD       TTF/8
 0537                         31,3212   0 0006 1          EXTEND
 0538    REF   2  LAST  794   31,3213   6 3222 0          BZMF     CGCALC            NO

 0539    REF   9  LAST  807   31,3214   0 3751 1          TC       FASTCHNG          YES:  INCREMENT WCHPHASE, ZERO FLPASS0

 0540    REF   5  LAST  807   31,3215   3 1621 0          CA       WCHPHOLD
 0541    REF  79  LAST  792   31,3216   6 4744 1          AD       ONE
 0542   REF  13  LAST  807   31,3217  55'346 0            TS      WCHPHASE
 0543   REF 152  LAST  806   31,3220  3 4746 0            CAF     ZERO
 0544   REF   7  LAST  807   31,3221  55'623 0            TS      FLPASS0

A0545                                              (CONTINUE TO CGCALC)

R0546   ****************************************************************************************************
R0548   ERECT GUIDANCE-STABLE MEMBER TRANSFORMATION MATRIX
R0549   ****************************************************************************************************

 0551  *REF   6  LAST  807   31,3222  3 1621 0  CGCALC    CA      WCHPHOLD
 0552  *REF   3  LAST  806   31,3223  0 3675 0            TC      INTPRETX
 0553  *                     31,3224   77543 0            DLOAD*  EXIT
 0554  *REF   2  LAST  125   31,3225   02453 1                    TCGFBRAK,1
 0555  *REF  13  LAST  807   31,3226  3 1642 0            CA      TTF/8
 0556  *REF 113  LAST  805   31,3227  54 001 1            TS      L
 0557  *REF 288  LAST  806   31,3230  20 155 1            DAS     MPAC
 0558  *REF 289  LAST  808   31,3231  10 155 1            CCS     MPAC +1
 0559  *REF 290  LAST  808   31,3232  10 154 0            CCS     MPAC
 0566   REF   1              31,3233  1 3264 0            TCF     EXITSPOT
 0567   REF   2  LAST  808   31,3234  1 3264 0            TCF     EXITSPOT
 0568                        31,3235  13 236 1            NOOP

 0569  *REF 127  LAST  803   31,3236  0 6060 1            TC      INTPRET
 0570                        31,3237   53575 0            VLOAD   UNIT
 0571   REF  14  LAST  804   31,3240   03635 1                    LAND
 0572   REF   9  LAST  807   31,3241   16572 0            STODL   CG
 0573   REF  14  LAST  808   31,3242   03643 0                    TTF/8
 0574                        31,3243   74203 0            DMP*    VXSC
 0575   REF   2  LAST  125   31,3244   02447 1                    GAINBRAK,1       NUMERO MYSTERIOSO
 0576   REF   2  LAST  803   31,3245   02222 1                    ANGTERM
 0577                        31,3246   77655 1            VAD
 0578   REF  15  LAST  808   31,3247   03635 1                    LAND
 0579                        31,3250   47051 0            VSU     RTB
 0580   REF  12  LAST  803   31,3251   03521 1                    R
 0581   REF   5  LAST  804   31,3252   21724 0                    NORMUNIT
 0582                        31,3253   47035 1            VXV     RTB
 0583   REF  16  LAST  808   31,3254   03635 1                    LAND
 0584   REF   6  LAST  808   31,3255   21724 0                    NORMUNIT
 0585   REF  10  LAST  808   31,3256   26600 0            STOVL   CG   +6          SECOND ROW
 0586   REF  11  LAST  808   31,3257   02572 0                    CG
 0587                        31,3260   76435 1            VXV     VSL1
 0588   REF  12  LAST  808   31,3261   02600 0                    CG   +6
 0589   REF  13  LAST  808   31,3262   02606 0            STORE   CG   +14
 0590                        31,3263   77776 1            EXIT

 0591   REF   7  LAST  808   31,3264  51'621 0  EXITSPOT  INDEX   WCHPHOLD
 0592   REF   1              31,3265  1 2404 1            TCF     WHATEXIT

R0593   ****************************************************************************************************
```

```
R0595    ROUTINES FOR EXITING FROM LANDING GUIDANCE
R0596    ******************************************************************************************************************

R0598    1.        EXGSUB IS THE RETURN WHEN GUIDSUB IS CALLED BY THE IGNITION ALGORITHM.

R0600    2.        EXBRAK IN THE EXIT USED DURING THE BRAKING PHASE.   IN THIS CASE UNIT(R) IS THE WINDOW POINTING VECTOR.

R0602    3.        EXNORM IS THE EXIT USED AT OTHER TIMES DURING THE BURN.

R0603              (EXOVFLOW IS A SUBROUTINE OF EXBRAK AND EXNORM CALLED WHEN OVERFLOW OCCURRED ANYWHERE IN GUIDANCE.)

 0605    REF 128   LAST  808    31,3266  0 6060 1  EXGSUB    TC       INTPRET          COMPUTE TRIM VELOCITY CORRECTION TERM
 0606                           31,3267   47175 1            VLOAD    RT8
 0607    REF  13   LAST  807    31,3270   03252 1                     UNFC/2
 0608    REF   7   LAST  808    31,3271   21724 0                     NORMUNIT
 0609                           31,3272   74361 0            VXSC     VXSC
 0610    REF   5   LAST  784    31,3273   03423 1                     ZOOMTIME
 0611    REF   1                31,3274   22001 0                     TRIMACCL
 0612    REF  14   LAST  809    31,3275   03252 1            STORE    UNFC/2
 0613                           31,3276   77776 1            EXIT

 0614    REF   3   LAST  796    31,3277  11'647 1            CCS      NGUIDSUB
 0615    REF   1                31,3300  1 2423 1            TCF      GUIDSUB
 0616    REF   3   LAST  783    31,3301  11'646 0            CCS      NIGNLOOP
 0617                           31,3302  1 3305 0            TCF      +3
 0618    REF  29   LAST  767    31,3303  0 5571 1            TC       ALARM
 0619                           31,3304   01412 1            OCT      01412

 0620    REF  48   LAST  785    31,3305  0 4626 1     +3     TC       POSTJUMP
 0621    REF   1                31,3306   64712 1            CADR     DDUMCALC

 0622    REF 129   LAST  809    31,3307  0 6060 1  EXBRAK    TC       INTPRET
 0623                           31,3310   77775 1            VLOAD
 0624    REF   8   LAST  775    31,3311   03537 0                     UNIT/R/
 0625    REF   2   LAST  141    31,3312   03260 0            STORE    UNWC/2
 0626                           31,3313   77776 1            EXIT
 0627    REF   1                31,3314  1 3371 0            TCF      STEER?

 0628    REF 130   LAST  809    31,3315  0 6060 1  EXNORM    TC       INTPRET
 0629                           31,3316   52375 1            VLOAD    VSU
 0630    REF  17   LAST  808    31,3317   03635 1                     LAND
 0631    REF  13   LAST  808    31,3320   03521 1                     R
 0632                           31,3321   77634 0            RTB
 0633    REF   8   LAST  809    31,3322   21724 0                     NORMUNIT
 0634    REF   3   LAST  809    31,3323   03260 0            STORE    UNWC/2           UNIT(LAND - R) IS TENTATIVE CHOICE
 0635                           31,3324   50235 0            VXV      DOT
 0636    REF   3   LAST  804    31,3325   02137 0                     XNBPIP
 0637    REF  14   LAST  808    31,3326   02600 0                     CG +6
 0638                           31,3327   77776 1            EXIT                      WITH PROJ IN MPAC 1/8 REAL SIZE
```

```
0639   REF 291  LAST  808   31,3330  4 0154 0            CS       MPAC           GET COEFFICIENT FOR CG +14
0640   REF   1              31,3331  6 3766 0            AD       PROJMAX
0641   REF  20  LAST  806   31,3332  6 4724 1            AD       POSMAX
0642   REF  67  LAST  806   31,3333  54 130 1            TS       BUF
0643   REF  68  LAST  810   31,3334  4 0130 1            CS       BUF
0644   REF  69  LAST  810   31,3335  26 130 1            ADS      BUF            RESULT IS 0 IF PROJMAX - PROJ NEGATIVE

0645   REF   1              31,3336  4 3767 0            CS       PROJMIN        GET COEFFICIENT FOR UNIT(LAND - R)
0646   REF 292  LAST  810   31,3337  6 0154 1            AD       MPAC
0647   REF  21  LAST  810   31,3340  6 4724 1            AD       POSMAX
0648   REF  70  LAST  810   31,3341  54 131 0            TS       BUF +1
0649   REF  71  LAST  810   31,3342  4 0131 0            CS       BUF +1
0650   REF  72  LAST  810   31,3343  26 131 0            ADS      BUF +1         RESULT IS 0 IF PROJ - PROJMIN NEGATIVE

0651   REF  14  LAST  785   31,3344  3 4742 1            CAF      FOUR
0652   REF  14  LAST  612   31,3345  7 6263 1  UNWCLOOP  MASK     SIX
0653   REF 190  LAST  792   31,3346  54 002 1            TS       Q
0654   REF   7  LAST  801   31,3347  3 5005 1            CA       EBANK5
0655   REF  36  LAST  801   31,3350  54 003 0            TS       EBANK
0656   REF  15  LAST  809   E5,1571                      EBANK=   CG
0657   REF  73  LAST  810   31,3351  3 0130 0            CA       BUF
0658                        31,3352  0 0006 1            EXTEND
0659   REF 191  LAST  810   31,3353  5 0002 0            INDEX    Q
0660   REF  16  LAST  810   31,3354  7 1605 1            MP       CG   +14
0661   REF  18  LAST  745   31,3355  24 006 1            INCR     BBANK
0662   REF   4  LAST  809   E6,1657                      EBANK=   UNWC/2
0663   REF 192  LAST  810   31,3356  50 002 0            INDEX    Q
0664   REF   5  LAST  810   31,3357  53'660 1            DXCH     UNWC/2
0665                        31,3360  0 0006 1            EXTEND
0666   REF  74  LAST  810   31,3361  7 0131 0            MP       BUF +1
0667   REF 193  LAST  810   31,3362  50 002 0            INDEX    Q
0668   REF   6  LAST  810   31,3363  21'660 1            DAS      UNWC/2
0669   REF 194  LAST  810   31,3364  10 002 1            CCS      Q
0670   REF   1              31,3365  1 3345 1            TCF      UNWCLOOP

0671   REF   1              31,3366  3 1773 0            CA       AZBIAS         SET OUTER GIMBAL
0672   REF   1              31,3367  55'676 0            TS       OGABIAS          ANGLE BIAS FOR WINDOW BENDING

0673   REF  19  LAST  810   31,3370  24 006 1            INCR     BBANK
0674   REF  11  LAST  792   E7,1612                      EBANK=   PIF

0675   REF   1              31,3371  3 0121 0  STEER?    CA       OVFIND         OVERFLOW?
0676                        31,3372  0 0006 1            EXTEND
0677   REF   1              31,3373  1 3376 1            BZF      STEERSW?       N: CHECK STEERSW

0678   REF   1              31,3374  0 3736 0            TC       OVFDESC        Y: REMEDIAL ACTION AND
0679   REF   2  LAST  796   31,3375  1 3415 0            TCF      DISPEXIT          SKIP ISSUANCE OF CMDS. NO STEERSW CHK

0680   REF  14  LAST  757   31,3376  4 0076 1  STEERSW?  CS       FLAGWRD2       IS STEERSW UP?
0681   REF   1              31,3377  7 4732 1            MASK     STEERBIT
```

```
 0682                             31,3400  0 0006 1           EXTEND
 0683     REF   1                 31,3401  1 3407 0           BZF      THRTCALL            Y: ISSUF GUIDANCE CMDS

 0684                             31,3402  0 0004 0  RATESTOP INHINT                       N: REMEDIAL ACTION
 0685     REF  39  LAST  784      31,3403  0 4665 0           TC       IBNKCALL               AND
 0686     REF   4  LAST  758      31,3404   40166 1           FCADR    STOPRATE               SKIP ISSUANCE OF CMDS
 0687                             31,3405  0 0003 1           RELINT
 0688     REF   3  LAST  810      31,3406  1 3415 0           TCF      DISPEXIT

 0689     REF   2  LAST  811      31,3407            GDUMP1   =        THRTCALL
 0690     REF   1                 31,3407  0 2144 1  THRTCALL TC       THROTTLE
 0691     REF  10  LAST  807      31,3410  0 3751 1           TC       FASTCHNG
 0692     REF 131  LAST  809      31,3411  0 6060 1           TC       INTPRET
 0693                             31,3412   77624 1           CALL
 0694     REF   2  LAST  767      31,3413   61072 0                    FINDCDUW -2
 0695                             31,3414   77776 1           EXIT


A0696                                                 (CONTINUE TO DISPEXIT)


R0697    *************************************************************************************************************************
R0699    GUIDANCE LOOP DISPLAYS
R0700    *************************************************************************************************************************

 0702                             31,3415  0 0006 1  DISPEXIT EXTEND                       KILL GROUP 3:   DISPLAYS WILL BF
 0703     RFF  14  LAST  739      31,3416  3 4746 0           DCA      NEGO                  RFSTORED BY NEXT GUIDANCF CYCLE
 0704     REF   3  LAST  732      31,3417  52 756 1           DXCH     -PHASE3

 0705     REF   4  LAST  811      31,3420            ENDLLJOB =        DISPEXIT +3

 0706     REF   5  LAST  811      31,3420            DISPFX66 =        DISPEXIT +3
 0707     REF  12  LAST  734      31,3420  4 0104 0     +3    CS       FLAGWRD8            IF FLUNDISP IS SET, NO DISPLAY THIS PASS
 0708     REF   2  LAST  734      31,3421  7 4733 0           MASK     FLUNDBIT
 0709                             31,3422  0 0006 1           EXTEND
 0710     REF 122  LAST  784      31,3423  1 5146 0           BZF      ENDOFJOB

 0711     RFF   8  LAST  808      31,3424  51'621 0           INDEX    WCHPHOLD
 0712     REF   1                 31,3425  1 2406 0           TCF      WHATDISP

 0713     REF   1                 31,3426  0 5156 0  P63DISPS TC       VACRLEAS
 07131    REF  19  LAST  618      31,3427  4 0107 0           CS       FLGWRD11            HAVE LR UPCATES BEEN PERMITTED?
 071315   REF   1                 31,3430  7 4735 0           MASK     LRINHBIT
 071317                           31,3431  0 0006 1           EXTEND
 07132    REF   1                 31,3432  1 3441 1           BZF      N63STAT             YES: DO STATIC DISPLAY

 07133    REF   1                 31,3433  3 3770 1           CAF      V06N63              NO:   FLASH NOUN 63, CORRECT RESPONSE IS
 071335   REF 216  LAST  804      31,3434  0 4607 1           TC       BANKCALL                   V57E WHICH STOPS THE FLASHING
 07134    REF   2  LAST  740      31,3435   20452 0           CADR     REFLASH
 071345   REF 123  LAST  811      31,3436  0 5146 1           TC       ENDOFJOB            TERMINATE  IGNORE AND KEEP FLASHING
 07135  REF 124  LAST  811   31,3437  0 5146 1            TC      ENDOFJOB         PROCEED     IGNORE AND KEEP FLASHING
 071355 REF 125  LAST  812   31,3440  0 5146 1            TC      ENDOFJOB         ENTER       IGNORE AND KEEP FLASHING

 0714   REF   2  LAST  811   31,3441  3 3770 1  N63STAT   CAF     V06N63
 0715   REF 219  LAST  811   31,3442  0 4607 1  DISPCOMN  TC      BANKCALL
 0716   REF   3  LAST  740   31,3443   20460 1            CADR    REGODSP

 0717   REF   3  LAST  801   31,3444  3 1666 0  P64DISPS  CA      TREDES           HAS TREDES REACHED ZERO?
 0718                        31,3445  0 0006 1            EXTEND
 0719   REF   1              31,3446  1 3475 0            BZF     RED-OVER         YES:  CLEAR REDESIGNATION FLAG

 0720   REF   5  LAST  801   31,3447  4 0102 0            CS      FLAGWRD6         NO:   IS REDFLAG SET?
 0721   REF   2  LAST  801   31,3450  7 4737 1            MASK    REDFLBIT
 0722                        31,3451  0 0006 1            EXTEND
 0723   REF   1              31,3452  1 3477 1            BZF     REDES-OK         YES:  DO STATIC DISPLAY

 0724   REF   2  LAST  811   31,3453  0 5156 0            TC      VACRLEAS
 0725   REF   1              31,3454  3 3771 0            CAF     V06N64           OTHERWISE USE FLASHING DISPLAY
 0726   REF 220  LAST  812   31,3455  0 4607 1            TC      BANKCALL
 0727   REF   3  LAST  811   31,3456   20452 0            CADR    REFLASH
 0728   REF  29  LAST  798   31,3457  1 6001 1            TCF     GOTOPOOH         TERMINATE
 0729   REF   1              31,3460  1 3462 0            TCF     P64CEED          PROCEED     PERMIT REDESIGNATIONS
 0730   REF   2  LAST  795   31,3461  1 3444 1            TCF     P64DISPS         RECYCLE

 0731   REF 153  LAST  808   31,3462  3 4746 0  P64CEED   CAF     ZERO
 0732   REF   4  LAST  801   31,3463  55'645 0            TS      ELINCR1
 0733   REF   5  LAST  802   31,3464  55'644 1            TS      AZINCR1

 07331                       31,3465  0 0004 0            INHINT                   ENABLE RUPT 10 FOR REDESIGNATIONS
 07332  REF   4  LAST  485   31,3466  0 6040 0            TC      C13STALL
 07333  REF  26  LAST  777   31,3467  3 4731 0            CAF     BIT12
 07334                       31,3470  0 0006 1            EXTEND
 07335  REF  13  LAST  577   31,3471  05 013 0            WOR     CHAN13

 0734   REF  56  LAST  798   31,3472  0 5506 1            TC      UPFLAG           ENABLE REDESIGNATION LOGIC
 0735   REF   3  LAST  799   31,3473   00143 1            ADRES   REDFLAG

 0736   REF 126  LAST  812   31,3474  1 5146 0            TCF     ENDOFJOB

 0737   REF  76  LAST  799   31,3475  0 5520 0  RED-OVER  TC      DOWNFLAG
 0738   REF   4  LAST  812   31,3476   00143 1            ADRES   REDFLAG
 0739   REF   3  LAST  812   31,3477  0 5156 0  REDES-OK  TC      VACRLEAS
 0740   REF   2  LAST  812   31,3500  3 3771 0            CAF     V06N64
 0741   REF   1              31,3501  1 3442 1            TCF     DISPCOMN


 0742   REF   4  LAST  812   31,3502  0 5156 0  VERTDISP  TC      VACRLEAS
 0743   REF   1              31,3503  3 3772 0            CAF     V06N60
 0744   REF 221  LAST  812   31,3504  0 4607 1            TC      BANKCALL
 0745   REF   4  LAST  812   31,3505   20452 0            CADR    REFLASH
 0746   REF  30  LAST  812   31,3506  1 6001 1             TCF     GOTOPOOH         TERMINATE
 0747   REF   1              31,3507  1 3511 0             TCF     STOPFIRE         PROCEED
 0748   REF   2  LAST  813   31,3510  1 3511 0             TCF     STOPFIRE         V32F

 0749   REF  77  LAST  812   31,3511  0 5520 0  STOPFIRE TC       DOWNFLAG
 0750   REF   2  LAST  797   31,3512   00016 0             ADRES   P66PROFL         FLAG TO STOP P66 HORIZONTAL
 0751   REF 127  LAST  812   31,3513  1 5146 0             TCF     ENDOFJOB

 0752   REF   2  LAST  811   31,3514  0 2147 1  THROT66   TC       THROTTLE +3
 0753   REF   2  LAST  797   31,3515  25'623 1             INCR    CNTTHROT         COUNT ONE THROTTLE COMPLETION

 0754   REF   1              31,3516  1 3420 0             TCF     DISPEX66
```

```
P0755    =========================================================================================================
R0757    GUIDANCE FOR P66
R0758    =========================================================================================================

R0760                THE P66 HORIZONTAL (HZ) EQUATION IS:

R0761                          UNFC/2X = GHZ

R0762                          UNFC/2Y = (LIMIT AHZLIM)(-QHZ UNFC/2Y   -(VY-VHZCY)/TAUHZ)
R0764                                                              I-1

R0765                          UNFC/2Z = (LIMIT AHZLIM)(-QHZ UNFC/2Z   -(VZ-VHZCZ)/TAUHZ)
R0767                                                              I-1

R0768                WHERE  GHZ IS LUNAR GRAVITY
R0769                       QHZ AND 1/TAUHZ ARE GAIN CONSTANTS
R0770                       VHZCY AND VHZCZ ARE THE Y AND Z COMPONENTS OF COMMANDED
R0771                          VELOCITY, PLATFORM COORDINATES. THESE ARE INITIALIZED
R0772                          TO MOONRATE
R0773                       (LIMIT AHZLIM) INDICATES THE CONTENT OF THE SUBSEQUENT
R0774                          PARENTHESES IS MAGNITUDE LIMITED TO AHZLIM

 0775    REF  61  LAST  796    31,3517  0 5355 1  P66       TC      PHASCHNG        TERMINATE GROUP 3
 0776                          31,3520    00003 1           OCT     00003

 0777    REF 132  LAST  811    31,3521  0 6060 1            TC      INTPRET
 0778                          31,3522    45234 0           RTB     DSU             IS THERE TIME FOR P66?
 0779    REF  23  LAST  718    31,3523    21603 1                   LOADTIME
 0780    REF  15  LAST  798    31,3524    01234 0                   PIPTIME
 0781                          31,3525    51021 0           BDSU    BPL
 0782    REF   2  LAST  126    31,3526    02500 0                   2LATE466
 0783    REF   1               31,3527    65074 1                   P66HZ           Y: DOIT
 0784                          31,3530    77414 0           CLEAR   EXIT            N: OMIT
 0785    REF   2  LAST  798    31,3531    00663 1                   RODFLAG

 0786    REF   2  LAST  797    31,3532  4 1354 0            CS      TOOFEW          INITIALIZE CNTTHROT TO TOOFEW AND LOAD
 0787    REF   3  LAST  813    31,3533    57623 1           XCH     CNTTHROT        ACCUMULATOR WITH ITS PREVIOUS CONTENTS
 0788                          31,3534  0 0006 1            EXTEND                  TOO FEW THROTTLINGS SINCE LAST OMISSION?
 0789    REF   1               31,3535  6 3537 0            BZMF    OMITWALM

 0790    REF   2  LAST  813    31,3536  1 3420 0            TCF     DISPEX66        N: PERMIT OMISSION SANS ALARM

 0791                          31,3537  0 0004 0  OMITWALM  INHINT
 0792    REF 222  LAST  812    31,3540  0 4607 1            TC      BANKCALL
 0793    REF   5  LAST  811    31,3541    40166 1           CADR    STOPRATE
 0794    REF  30  LAST  809    31,3542  0 5571 1            TC      ALARM           Y: PERMIT OMISSION WITH ALARM
 0795                          31,3543    01466 1           OCT     01466

 0796    REF   3  LAST  814    31,3544  1 3420 0            TCF     DISPEX66
```

```
P0797    ==========================================================================================
R0799    P66 HORIZONTAL CHANNELS
R0800    ==========================================================================================

 0802    REF   1                32,2000                        SETLOC P66LOC
 0803                           32,3074                        BANK
 0804    REF   2 LAST   41 TO   42:      1      1*             COUNT* $$/F2DPS

 0805                           32,3074  74375 0   P66HZ       VLOAD  VXSC
 0806    REF  15  LAST  809     32,3075  03252 1                      UNFC/2           P63, P64, & P66 UNITS 2(-4)M/CS/CS
 0807    REF   2  LAST  126     32,3076  02476 0                      QHZ
 0808                           32,3077  52315 1               PDVL   VSU
 0809    REF   2  LAST  797     32,3100  03434 1                      VHZC             IN 2(7)M/CS
 0810    REF   5  LAST  803     32,3101  03527 1                      V                IN 2(7)M/CS
 0811                           32,3102  52341 0               V/SC   VSU              YIELDS UNLIM HZ ACCEL CMD, 2(-4)M/CS/CS
 0812    REF   2  LAST  126     32,3103  02475 0                      TAUHZ            IN 2(11)CS
 0813                           32,3104  77776 1               EXIT

 0814    REF   2  LAST  340     32,3105  3 5022 1              CA     PRIO21           ASSURE THIS SERVICER JOB ENDS
 0815    REF  15  LAST  801     32,3106  0 5137 1              TC     PRIOCHNG         BEFORE NEXT SERVICER JOB BEGINS

 0816    REF   1                32,3107  3 3436 0              CA     GHZ
 0817    REF 293  LAST  810     32,3110  54 154 0              TS     MPAC             X COMPONENT = G

 0818    REF   8  LAST  810     32,3111  3 5005 1              CA     EBANK5
 0819    REF  37  LAST  810     32,3112  54 003 0              TS     EBANK
 0820    REF   1                E5,1777                        EBANK= END-E5

 0821    REF 294  LAST  815     32,3113  22 157 1              LXCH   MPAC      +3
 0822    REF   2  LAST  126     32,3114  3 1476 0              CA     AHZLIM
 0823    REF 223  LAST  814     32,3115  0 4607 1              TC     BANKCALL
 0824    REF   1                32,3116   61713 0              FCADR  LIMITSUB
 0825    REF 295  LAST  815     32,3117  54 157 0              TS     MPAC      +3     Y COMPONENT LIMITED TO AHZLIM

 0826    REF 296  LAST  815     32,3120  22 161 1              LXCH   MPAC      +5
 0827    REF   3  LAST  815     32,3121  3 1476 0              CA     AHZLIM
 0828    REF 224  LAST  815     32,3122  0 4607 1              TC     BANKCALL
 0829    REF   2  LAST  815     32,3123   61713 0              FCADR  LIMITSUB
 0830    REF 297  LAST  815     32,3124  54 161 0              TS     MPAC      +5     Z COMPONENT LIMITED TO AHZLIM

 0831    REF  11  LAST  801     32,3125  3 5007 0              CA     EBANK7
 0832    REF  38  LAST  815     32,3126  54 003 0              TS     EBANK
 0833    REF   1                E7,1777                        EBANK= END-E7

 0834    REF   2  LAST  810     32,3127  3 0121 0              CA     OVFIND           OVERFLOW?
 0835                           32,3130  0 0006 1              EXTEND
 0836    REF   1                32,3131  1 3135 1              BZF    ENGARM?          N: KEEP CHECKING
 0837    REF 225  LAST  815     32,3132  0 4607 1              TC     BANKCALL         Y: TAKE REMEDIAL ACTION
 0838    REF   2  LAST  810     32,3133   63736 0              FCADR  OVFDESC             AND
 0839    REF   1                32,3134  1 3164 0              TCF    P66VERT             SKIP ISSUANCE OF HZ CMDS
 0840    REF  32  LAST  619    32,3135  3 4742 1  ENGARM?  CA      BIT3           IS ENGINE ARM SWITCH STILL ON?
 0841                          32,3136  0 0006 1           EXTEND
 0842    REF   5  LAST  743    32,3137  02 030 0           RAND    CHAN30
 0843                          32,3140  0 0006 1           EXTEND
 0844    REF   1               32,3141  1 3146 0           BZF     CDUWHZ         Y: ISSUE HZ CMDS

 0845    REF  27  LAST  612    32,3142  3 0074 1           CA      FLAGWRD0       N: HAVE WE PROCEEDED AFTER TOUCHDOWN?
 0846    REF   1               32,3143  7 4744 0           MASK    P66PROBT
 0847                          32,3144  0 0006 1           EXTEND
 0848    REF   1               32,3145  1 3154 0           BZF     ASTROPRO       Y: PREVENT RCS FIRINGS
 0849    REF 133  LAST  814    32,3146  0 6060 1  CDUWHZ   TC      INTPRET        N: ISSUE HZ CMDS
 0850    REF  16  LAST  815    32,3147   03252 1           STORE   UNFC/2         MUST STORE FOR SUCCEEDING PASS
 0851                          32,3150   77624 1           CALL
 0852    REF   3  LAST  811    32,3151   61074 0                   FINDCDUW
 0853                          32,3152   77776 1           EXIT

 0854    REF   2  LAST  815    32,3153  1 3164 0           TCF     P66VERT

 0855    REF   1               32,3154  3 3435 0  ASTROPRO CA      IDLADR         Y: PREVENT RCS JET FIRINGS
 0856    REF   3  LAST  230    32,3155  55'262 1           TS      T5ADR             AND
 0857    REF   3  LAST  816    32,3156  1 3164 0           TCF     P66VERT           SKIP HZ CMDS, BUT CONTINUE DISPLAYS

R0858    ==========================================================================================================
R0860    P66 VERTICAL CHANNEL
R0861    ==========================================================================================================

 0863    REF   5  LAST  709    32,3157  3 7731 0  RODTASK  CA      PRIO22         BUMPS ALL OF SERVICER JOB EXCEPT RODCOMP
 0864    REF  35  LAST  757    32,3160  0 5076 0           TC      FINDVAC
 0865    REF  31  LAST  781    E7,1515                     EBANK=  DVCNTR
 0866    REF   1               32,3161   03167 1           2CADR   RODCOMP
 0866    REF   1               32,3162   64067 1
 0867    REF  54  LAST  778    32,3163  1 5263 1           TCF     TASKOVER

 0868    REF  15  LAST  758    32,3164  3 4770 0  P66VERT  CA      1SEC
 0869    REF  22  LAST  777    32,3165  0 5175 1           TC      TWIDDLE
 0870    REF   1               32,3166   03157 1           ADRES   RODTASK

 0871    REF   1               32,3167  3 7732 0  RODCOMP  CA      PRIO23         LET ONLY ONE JOB THRU RODCOMP AT A TIME
 0872    REF  16  LAST  815    32,3170  0 5137 1           TC      PRIOCHNG

 0873                          32,3171  0 0004 0           INHINT

 0874    REF 154  LAST  812    32,3172  3 4746 0           CAF     ZERO
 0875    REF   4  LAST  799    32,3173  57'746 0           XCH     RODCOUNT
 0876                          32,3174  0 0006 1           EXTEND
 0877    REF   3  LAST  798    32,3175  7 1756 0           MP      RODSCALE
 0878    REF   2  LAST  797    32,3176  21'645 0           DAS     VDGVERT        UPDATE DESIRED ALTITUDE RATE.

 0879    REF  35  LAST  791    32,3177  3 4741 1  MANTHRT? CAF     BIT4
 08793   REF   5  LAST  743    32,3200  7 0374 0           MASK    CHANBKUP
 08794  REF 221  LAST  797   32,3201  10 C00 0            CCS     A
 08795  REF   1              32,3202  1 3213 0            TCF     RODCOMPA       IGNORE CHAN 3C BIT 5. ASSUME AUTO THROT

 08796  REF  36  LAST  746   32,3203  3 4740 0            CAF     BIT5           ARE WE IN AUTO THROTTLE?
 0880                        32,3204  C 0C06 1            EXTEND
 0881   REF   6  LAST  816   32,3205  02 030 0            RAND    CHAN30
 0882                        32,3206  C C006 1            EXTEND
 0883   REF   2  LAST  817   32,3207  1 3213 0            BZF     RODCOMPA       Y: CONTINUE ROD

 0884                        32,3210  0 0006 1            EXTEND                 N: RESET VDGVERT TO CURRENT HDOT
 0885   REF   9  LAST  797   32,3211  3 1474 1            DCA     HDOTDISP
 0886   REF   3  LAST  816   32,3212  53'645 0            DXCH    VDGVERT

R0887   READ THE PIPAS FOR P66

 0888                        32,3213  0 0006 1  RCDCOMPA  EXTEND
 0889   REF  11  LAST  396   32,3214  3 0040 0            DCA     PIPAX
 0890   REF   3  LAST  797   32,3215  53'764 1            DXCH    OLDPIPAX       CURRENT PIPA READINGS INTO OLDPIPAX,Y,Z
 0891   REF  20  LAST  570   32,3216  52 071 0            DXCH    RUPTREG1       SAVE PRIOR READINGS IN RUPTREG1,2,3
 0892   REF   5  LAST  396   32,3217  3 0041 1            CA      PIPAZ
 0893   REF   2  LAST  158   32,3220  57'765 1            XCH     OLDPIPAZ
 0894   REF   3  LAST  384   32,3221  56 C72 1            XCH     RUPTREG3

 0895                        32,3222  C 0C06 1            EXTEND                 SNAPSHOT TIME OF PIPA READING.
 0896   REF  25  LAST  758   32,3223  3 0025 0            DCA     TIME2
 0897   REF   3  LAST  791   32,3224  53'762 1            DXCH    THISTPIP

 0898   REF   2  LAST  798   32,3225  0 3425 1            TC      DEIMUBOB       REFER CURRENT PIPAX READING TO THE CM

R0899   COMPUTE DELV SINCE PIPTIME. RETURN FROM DEIMUBOB WITH CORRECTED OLDPIPAX IN A

A0901                                                                            CURRENT P66 PIPA
 0902   REF   1              32,3226  6 1157 0            AD      PIPATMPX       + PIPA BY PIPASR IF B4 COPYCYCL, 0 AFTER
 0903   REF 298  LAST  815   32,3227  54 154 0            TS      MPAC           = DELV SINCE VALIDITY OF V, 2(14)CM/SEC
 0904   REF   2  LAST  158   32,3230  3 1764 0            CA      OLDPIPAY
 0905   REF   1              32,3231  6 1160 1            AD      PIPATMPY
 0906   REF 299  LAST  817   32,3232  54 157 0            TS      MPAC +3
 0907   REF   3  LAST  817   32,3233  3 1765 1            CA      OLDPIPAZ
 0908   REF   1              32,3234  6 1161 0            AD      PIPATMPZ
 0909   REF 300  LAST  817   32,3235  54 161 0            TS      MPAC +5

R0910   COMPUTE DELV SINCE THE LAST P66 PASS

 0911   REF   4  LAST  817   32,3236  4 1763 0            CS      OLDPIPAX       - CURRENT P66 PIPA
 0912   REF   3  LAST  797   32,3237  6 1253 1            AD      TEMX           - PIPA BY PIPASR IF INTERVENING, ELSE 0
 0913   REF  21  LAST  817   32,3240  6 CC70 0            AD      RUPTREG1       + PIPA BY P66 ON THE LAST P66 PASS
 0914   REF   4  LAST  797   32,3241  55'766 0            TS      DELVROD        = -DELV SINCE LAST P66 PASS, 2(14)CM/SEC
 0915   REF   3  LAST  817   32,3242  4 1764 1            CS      OLDPIPAY
 0916   REF   2  LAST  108   32,3243  6 1254 0            AD      TEMY
 0917   REF   6  LAST  181   32,3244  6 C071 1            AD      RUPTREG2
 0918   REF   5  LAST  817   32,3245  55'770 1            TS      DELVROD +2
 0919   REF   4  LAST  817   32,3246  4 1765 0            CS      OLDPIPAZ
 0920   REF   2  LAST  108   32,3247  6 1255 1            AD      TEMZ
 0921   REF   4  LAST  817   32,3250  6 0072 1            AD      RUPTREG3
 0922   REF   6  LAST  818   32,3251  55'772 0            TS      DELVROD +4

R0923   PRE-INTERPRETIVE HOUSEKEEPING AND RESETTING PIPASR'S TEMS FOR NEXT P66

 0924   REF 155  LAST  816   32,3252  3 4746 0            CAF     ZERO
 0925   REF 301  LAST  817   32,3253  54 155 1            TS      MPAC +1         ZERO LO-ORDER MPAC COMPONENTS
 0926   REF 302  LAST  818   32,3254  54 160 1            TS      MPAC +4
 0927   REF 303  LAST  818   32,3255  54 162 0            TS      MPAC +6
 0928   REF   4  LAST  817   32,3256  55'253 0            TS      TEMX            ZERO TEMX, TEMY, AND TEMZ SO WE WILL
 0929   REF   3  LAST  817   32,3257  55'254 1            TS      TEMY                 KNOW WHEN READACCS CHANGES THEM.
 0930   REF   3  LAST  818   32,3260  55'255 0            TS      TEMZ
 0931   REF  80  LAST  807   32,3261  4 4744 0            CS      ONE
 0932   REF   5  LAST  806   32,3262  54 163 1            TS      MODE            INDICATE VECTOR IN MPAC

R0933   COMPUTE THE CURRENT P66 VELOCITY AND CERTAIN DISPLAYS

 0934   REF 134  LAST  816   32,3263  0 6060 1            TC      INTPRET
 0935                        32,3264   65361 0  ITRPNT1   VXSC    PDDL            PUSH DELV SINCE LAST P66 IN 2(7)M/CS (6)
 0936   REF   1              32,3265   26074 0                    KPIP1           1/10,000 IN 2(-7)
 0937   REF   4  LAST  817   32,3266   03762 1                    THISTPIP
 0938                        32,3267   77625 0            DSU
 0939   REF  16  LAST  814   32,3270   01234 0                    PIPTIME
 0940                        32,3271   00037 0            STORE   30D             TTPIP = T-TPIP IN 2(28)CS
 0941                        32,3272   63271 0            DDV     PDVL            QUOTIENT = TTPIP/(1SEC) IN 2(2)       (8)
 0942   REF   1              32,3273   27057 0                    4SEC(28)
 0943   REF   7  LAST  807   32,3274   01236 1                    GDT/2           GDT/2 = VEL IN 100 CS IN 2(7)M/CS
 0944                        32,3275   74251 1            VSU     VXSC            (TTPIP/1SEC)(GDT/2-VBIAS),2(9)M/CS   (6)
 0945   REF   2  LAST  127   32,3276   02616 1                    VBIAS           IN 2(7)M/CS
 0946                        32,3277   53352 0            VSL2    VAD             SHIFT YIELDS 2(7)M/CS
 0947   REF   6  LAST  815   32,3300   03527 1                    V               IN 2(7)M/CS
 0948                        32,3301   45455 1            VAD     STADR                                                 (0)
 0949                        32,3302   53746 1            STOVL   24D             STORE P66 VELOCITY IN 2(7)M/CS
 0950   REF  14  LAST  809   32,3303   03521 1                    R
 0951                        32,3304   77656 1            UNIT
 0952                        32,3305   00017 1            STORE   14D             UNIT(R)
 0953                        32,3306   72441 0            DOT     SL1
 0954                        32,3307   00031 0                    24D             P66 VELOCITY IN 2(7)M/CS
 0955   REF  10  LAST  817   32,3310   17474 0            STODL   HDOTDISP        HDOT FOR NOUN 60 IN 2(7)M/CS
 0956                        32,3311   00037 0                    30D             TTPIP IN 2(28)CS
 0957                        32,3312   41261 1            SL      DMP             DELTAH IN 2(24)M =
 0958                        32,3313   20214 1                    11D             2(11) TTPIP IN 2(28)CS HDOT IN 2(7)M/CS
 0959   REF  11  LAST  818   32,3314   03474 0                    HDOTDISP
 0960                        32,3315   45215 0            DAD     DSU             DELTAH + |R| - |LAND|
 0961                        32,3316   00045 0                    36D             |R| FROM PRECEDING UNIT OPERATION
 0962   REF   5  LAST  802   32,3317   02324 0                    /LAND/
 0963   REF   5  LAST  329   32,3320   17775 1            STODL   HCALC1          ALTITUDE FOR N 60 IN 2(24)M
```

```
R0964   COMPUTE UNCORRECTED COMMANDED THRUST ACCELERATION

0965   REF  12  LAST  818   32,3321   03474 0                   HDOTDISP    IN 2(7)M/CS
0966                        32,3322   56221 0         BDSU      DDV
0967   REF   4  LAST  817   32,3323   03645 0                   VDGVERT     IN 2(7)M/CS
0968   REF   2  LAST  126   32,3324   02536 0                   TAUROD      TAU IN 2(9)CS
0969                        32,3325   51515 1         PDVL      ABVAL       PUSH (VDG-HDOT)/TAU IN 2(-2)M/CS/CS   (2)
0970   REF   8  LAST  818   32,3326   01236 1                   GDT/2       GDT/2 = VEL IN 100 CS IN 2(7)M/CS
0971                        32,3327   60471 0         DDV       SR2         DDV YIELDS G IN 2(-4)M/CS/CS
0972   REF   2  LAST  807   32,3330   05654 0                   GSCALE      100 CS IN 2(11)M/CS
0973                        32,3331   00025 0         STORE     20D         |G| IN 2(-2)M/CS/CS
0974                        32,3332   43234 0         RTB       DAD         UP (VDG-HDOT)/TAU                     (0)
0975   REF   1              32,3333   47600 1                   QTPROLOG    QUICTRIG PRESERVES MPAC
0976                        32,3334   45115 0         PDVL      CALL        (VDG-HDOT)/TAU+|G| IN 2(-2)M/CS/CS    (2)
0977   REF   9  LAST  784   32,3335   06503 1                   UNITX       X AXIS IN NB COORDS
0978   REF   5  LAST  600   32,3336   47665 1                   *NBSM*      TRANSFORMS TO SM COORDS
0979                        32,3337   77641 1         DOT                   YIELDS COS/4 OF ANGLE OF X WRT VERT
0980                        32,3340   00017 1                   14D         UNIT(R)
0981                        32,3341   00027 1         STORE     22D         COS/4
0982                        32,3342   45465 1         BDDV      STADR       YIELDS ((VDG-HDOT)/TAU+|G|)/COS =     (0)
0983   REF   4  LAST  807   32,3343   50313 0         STOVL     /AFC/       |AFC| RAW IN 2(-4)M/CS/CS

R0984   COMPUTE MEASURED THRUST ACCELERATION

0985   REF   7  LAST  818   32,3344   03767 1                   DELVROD     -DELV SINCE LAST P66 IN 2(14)CM/SEC
0986                        32,3345   53361 0         VXSC      VAD         ADD SINCE DELV IS REVERSE SIGN
0987   REF   2  LAST  818   32,3346   26074 0                   KPIP1       1/10,000 IN 2(-7)
0988   REF   3  LAST  818   32,3347   02616 1                   VBIAS       IN 2(7)M/CS
0989                        32,3350   65246 1         ABVAL     PDDL        PUSH DE-BIASED |DELV| IN 2(7)M/CS     (2)
0990   REF   5  LAST  818   32,3351   03762 1                   THISTPIP
0991                        32,3352   65225 1         DSU       PDDL        PUSH PERP66 IN 2(28)CS                (4)
0992   REF   3  LAST  798   32,3353   03760 0                   LASTTPIP
0993   REF   6  LAST  819   32,3354   03762 1                   THISTPIP
0994   REF   4  LAST  819   32,3355   17760 0         STODL     LASTTPIP    REPLACE LASTTPIP LOADING PERP66       (2)
0995                        32,3356   55271 0         DDV       BDDV                                              (0)
0996   REF   1              32,3357   25441 1                   SHFTFACT    SCALES PERP66 TO 2(11)CS
0997                        32,3360   41325 0         PDDL      DMP         PUSH |AF| IN 2(-4)M/CS/CS             (2)

R0998   ADD VELOCITY EXTRAPOLATION CORRECTION TO YIELD UNLIMITED COMMANDED THRUST ACCELERATION

1000   REF   7  LAST  798   32,3361   03611 1                   FWEIGHT     FW IN 2(14)BITS
1001   REF   1              32,3362   25440 0                   BIT1H       SCALES FW TO 2(28)BITS
1002                        32,3363   56271 0         DDV       DDV         THINK OF DIVIDES BEING REVERSED IN ORDER
1003   REF   7  LAST  807   32,3364   01244 1                   MASS        IN 2(16)KG
1004   REF   2  LAST  793   32,3365   22006 1                   SCALEFAC    SF RESCALES FW TO 10,000 2(12)NEWTON
1005                        32,3366   65215 1         DAD       PDDL        PUSH FW/SF/MASS+|AF| IN 2(-4)M/CS/CS (4)
1006                        32,3367   00001 0                   0D          |AF|
1007                        32,3370   00025 0                   20D         |G|
1008                        32,3371   45271 1         DDV       DSU         |G|/COS-FW/SF/MASS-|AF|,2(-4)M/CS/CS (2)
1009                        32,3372   00027 1                   22D         COS/4
```

```
 1010                            32,3373   43205 1             DMP     DAD               (L/T)(|G|/COS-FW/SF/MASS-|AF|)+|AFC|
 1011    REF   2  LAST  126      32,3374   02540 1                     LAG/TAU           (L/T) DIMENSIONLESS
 1012    REF   5  LAST  819      32,3375   03464 1                     /AFC/
 1013                            32,3376   56325 0             PDDL    DDV               PUSH |AFC| UNLIMITED IN 2(-4)M/CS/CS (4)

R1014    LIMIT MINFORCE/MASS <= |AFC| <= MAXFORCE/MASS

 1015    REF   2  LAST  126      32,3377   02544 0                     MAXFORCE
 1016    REF   8  LAST  819      32,3400   01244 1                     MASS
 1017                            32,3401   56325 0             PDDL    DDV                                                   (6)
 1018    REF   2  LAST  126      32,3402   02542 0                     MINFORCE
 1019    REF   9  LAST  820      32,3403   01244 1                     MASS
 1020                            32,3404   44206 0             PUSH    BDSU                                                  (8)
 1021                            32,3405   00003 1                     2D
 1022                            32,3406   71240 1             BMN     DLOAD                                                 (6)
 1023    REF   1                 32,3407   65415 1                     AFCSPOT
 1024                            32,3410   41545 0             DLOAD   PUSH                                                  (6)
 1025                            32,3411   51021 0             BDSU    BPL
 1026                            32,3412   00003 1                     2D
 1027    REF   2  LAST  820      32,3413   65415 1                     AFCSPOT
 1028                            32,3414   77745 1             DLOAD                                                         (4)
 1029                            32,3415   77745 1   AFCSPOT   DLOAD                                          (2),(4),OR (6)
 1030                            32,3416   77601 0             SETPD                                                         (2)
 1031                            32,3417   00003 1                     2D
 1032    REF   6  LAST  820      32,3420   17464 1             STODL   /AFC/             CORRECTED AND LIMITED |AFC|         (0)
 1033                            32,3421   77776 1   ITRPNT2   EXIT
 1034    REF 304  LAST  818      32,3422  52 155 1             DXCH    MPAC              FETCH MEASURED THRUST ACCEL FOR THROTTLE
 1035    REF  49  LAST  809      32,3423  0 4626 1             TC      POSTJUMP
 1036    REF   1                 32,3424   63514 1             FCADR   THROT66

R1037    THE FOLLOWING SUBROUTINE REFERS THE X PIPA READING TO THE CENTER OF MASS
R1038    BY SUBTRACTING THOSE PIPA COUNTS PRODUCED BY VERTICAL IMU MOTION
R1039    RELATIVE TO THE CENTER OF MASS.  THE SPACECRAFT X AXIS IS ASSUMED
R1040    APPROXIMATELY VERTICAL.  THE EQUATION IS:

R1041              OLDPIPAX = OLDPIPAX - OMEGAQ RIMUZ

R1042    WHERE OLDPIPAX IS THE CURRENT P66 PIPA READING, OMEGAQ IS THE ATTITUDE
R1043    RATE ABOUT THE Q (Y) AXIS, AND RIMUZ IS THE Z COORDINATE OF THE IMU.

 1044    REF   7  LAST  735      32,3425  3 5006 1   DEIMUBOB  CA      EBANK6
 1045    REF  39  LAST  815      32,3426  54 003 0             TS      EBANK
 1046    REF   1                 E6,1775                       EBANK=  END-E6
 1047    REF  10  LAST  756      32,3427  4 1422 0             CS      OMEGAQ            PITCH RATE IN UNITS 45 DEG/SEC
 1048    REF  20  LAST  810      32,3430  24 006 1             INCR    BBANK
 1049    REF   2  LAST  815      E7,1777                       EBANK=  END-E7
 1050                            32,3431  0 0006 1             EXTEND
 1051    REF   1                 32,3432  7 3442 1             MP      RIMUZ             IMU Z IN UNITS (180/PI 45) 2(14) CM
 1052    REF   5  LAST  817      32,3433  27'763 0             ADS     OLDPIPAX          CURRENT P66 PIPA X IN UNITS 2(14) CM/SEC
 1053    REF 195  LAST  810      32,3434  0 0002 0             TC      Q
```

```
R1054   CONSTANTS FOR P66

 1055   REF   2  LAST  234    32,3435    02037 1  IDLADR   GENADR DAPIDLER
 1056                         32,3436    00053 1  GHZ      DEC    1.62292 E-4 B+4 GRAVITY IN 2(-4)M/CS/CS

 1057                         32,3437    00001 0  BIT1H    OCT    00001           MUST PRECEDE A ZERO
 1058                         32,3440    00000 1  SHFTFACT 2DEC   1 B-17          SCALES P66 PERIOD TO 2(11)CS
 1058                         32,3441    04000 0
 1060                         32,3442    00143 1  RIMUZ    DEC    99.486 B-14     1.2667 M IN UNITS (180/PI 45) 2(14) CM
```

```
P1061   ==========================================================================================
R1063   REDESIGNATOR TRAP
R1064   ==========================================================================================

R1066   FNC       INSERT
 1067                           11,2302                      BANK    11
 1068   REF   1                 11,2000                      SETLOC  F2DPS*11
 1069                           11,2302                      BANK

 1070   REF   1                                              COUNT*  $$/F2DPS

 1071   REF   4  LAST   571     11,2302  56 016 0  PITFALL   XCH     BANKRUPT
 1072                           11,2303  0 0006 1            EXTEND
 1073   REF   4  LAST   571     11,2304  22 012 1            QXCH    QRUPT

 1074   REF   4  LAST   736     11,2305  0 5323 0            TC      CHECKMM         IF NOT IN P64, NO REASON TO CONTINUE
 1075                           11,2306   00100 0            DEC     64
 1076   REF  17  LAST   576     11,2307  1 5272 1            TCF     RESUME

 1077                           11,2310  0 0006 1            EXTEND
 1078   REF   4  LAST   797     11,2311  00 031 0            READ    CHAN31
 1079                           11,2312  4 0000 0            COM
 1080   REF   1                 11,2313  7 2401 1            MASK    ALL4BITS
 1081   REF   4  LAST   164     11,2314  55'647 1            TS      ELVIRA
 1082   REF  54  LAST   805     11,2315  3 4743 0            CAF     TWO
 1083   REF   3  LAST   157     11,2316  55'646 0            TS      ZERLINA
 1084   REF  13  LAST   681     11,2317  3 4747 1            CAF     FIVE
 1085   REF  23  LAST   816     11,2320  0 5175 1            TC      TWIDDLE
 1086   REF   1                 11,2321   02326 1            ADRES   REDESMON
 1087   REF  18  LAST   822     11,2322  1 5272 1            TCF     RESUME


R1088   REDESIGNATION MONITOR  (INITIATED BY PITFALL)


 1089   REF   4  LAST   822     11,2323  55'646 0  PREMON1   TS      ZERLINA
 1090   REF  12  LAST   575     11,2324  3 4750 1  PREMON2   CAF     SEVEN
 1091   REF   5  LAST   777     11,2325  0 5226 1            TC      VARDELAY
 1092                           11,2326  0 0006 1  REDESMON  EXTEND
 1093   REF   5  LAST   822     11,2327  00 031 0            READ    CHAN31
 1094                           11,2330  4 0000 0            COM
 1095   REF   2  LAST   822     11,2331  7 2401 1            MASK    ALL4BITS
 1096   REF   5  LAST   822     11,2332  57'647 0            XCH     ELVIRA
 1097   REF 114  LAST   808     11,2333  54 001 1            TS      L
 1098   REF   6  LAST   822     11,2334  11'647 1            CCS     ELVIRA          DO ANY BITS APPEAR THIS PASS?
 1099   REF   1                 11,2335  1 2324 1            TCF     PREMON2           Y: CONTINUE MONITOR

 1100   REF 115  LAST   822     11,2336  10 001 1            CCS     L                 N: ANY LAST PASS?
 1101   REF   1                 11,2337  1 2347 1            TCF     COUNT'EM            Y: COUNT 'EM, RESET RUPT, TERMINATE
 1102   REF   5  LAST   822     11,2340  11'646 0            CCS     ZERLINA             N: HAS ZERLINA REACHED ZERO YET?
 1103   REF   1                 11,2341  1 2323 0             TCF     PREMON1                N: DIMINISH ZERLINA, CONTINUE
 1104   REF   5   LAST   812    11,2342  0 6040 0  RESETRPT   TC      C13STALL               Y: RESET RUPT, TERMINATE
 1105   REF  27   LAST   812    11,2343  3 4731 0             CAF     BIT12
 1106                           11,2344  0 0006 1             EXTEND
 1107   REF  14   LAST   812    11,2345  05 013 0             WOR     CHAN13
 1108   REF  55   LAST   816    11,2346  1 5263 1             TCF     TASKOVER

 1109   REF  30   LAST   797    11,2347  3 4730 1  COUNT'EM   CAF     BIT13            ARE WE IN ATTITUDE-HOLD?
 1110                           11,2350  0 0006 1             EXTEND
 1111   REF   6   LAST   822    11,2351  02 031 1             RAND    CHAN31
 1112                           11,2352  0 0006 1             EXTEND
 1113   REF   1                 11,2353  1 2342 1             BZF     RESETRPT         YES:  SKIP REDESIGNATION LOGIC.

 1114   REF 116   LAST   822    11,2354  3 0001 0             CA      L                NO
 1115   REF   1                 11,2355  7 4737 1             MASK    -AZBIT
 1116   REF 222   LAST   817    11,2356  10 000 0             CCS     A
 1117   REF   1                 11,2357  4 2402 1    -AZ      CS      AZEACH
 1118   REF   6   LAST   812    11,2360  27'644 1             ADS     AZINCR1
 1119   REF 117   LAST   823    11,2361  3 0001 0             CA      L
 1120   REF   1                 11,2362  7 4740 1             MASK    +AZBIT
 1121   REF 223   LAST   823    11,2363  10 000 0             CCS     A
 1122   REF   2   LAST   823    11,2364  3 2402 0    +AZ      CA      AZEACH
 1123   REF   7   LAST   823    11,2365  27'644 1             ADS     AZINCR1
 1124   REF 118   LAST   823    11,2366  3 0001 0             CA      L
 1125   REF   1                 11,2367  7 4744 0             MASK    -ELBIT
 1126   REF 224   LAST   823    11,2370  10 000 0             CCS     A
 1127   REF   1                 11,2371  4 2402 1    -EL      CS      ELEACH
 1128   REF   5   LAST   812    11,2372  27'645 0             ADS     ELINCR1
 1129   REF 119   LAST   823    11,2373  3 0001 0             CA      L
 1130   REF   1                 11,2374  7 4743 1             MASK    +ELBIT
 1131   REF 225   LAST   823    11,2375  10 000 0             CCS     A
 1132   REF   2   LAST   823    11,2376  3 2402 0    +EL      CA      ELEACH
 1133   REF   6   LAST   823    11,2377  27'645 0             ADS     ELINCR1
 1134   REF   2   LAST   823    11,2400  1 2342 1             TCF     RESETRPT

R1135   THESE EQUIVALENCIES ARE BASED ON GSOP CHAPTER 4, REVISION 16 OF P64LM


 1136   REF  38   LAST   718       4743            +ELBIT     =       BIT2             -PITCH


 1137   REF  39   LAST   755       4744            -ELBIT     =       BIT1             +PITCH


 1138   REF  37   LAST   817       4740            +AZBIT     =       BIT5


 1139   REF  40   LAST   792       4737            -AZBIT     =       BIT6
 1140                       11,2401   00063 1  ALL4BITS OCT      00063


 1141                       11,2402   00436 0  AZEACH   DEC      .01746           ONE DEGREE


 1142  REF   3  LAST  823   11,2402            ELEACH   =        AZEACH           ONE DEGREE


 1157                       31,3545                     BANK     31
 1158  REF   2  LAST   40   31,2000                     SETLOC   F2DPS*31
 1159                       31,3545                     BANK

 1160  REF   4 LAST  799 TO  815:   525   567*          COUNT*   $$/F2DPS

R1161  ****************************************************************************************************
P1163  DOUBLE PRECISION ROOT FINDER SUBROUTINE (BY ALLAN KLUMPP)
P1164  ****************************************************************************************************

R1166                                                            N         N-1
R1167           ROOTPSRS FINDS ONE ROOT OF THE POWER SERIES A X   + A    X     + ... + A X + A
R1169                                                      N        N-1                1     0

R1171  USING NEWTON'S METHOD STARTING WITH AN INITIAL GUESS FOR THE ROOT. THE ENTERING DATA MUST BE AS FOLLOWS:

A1173                                          A        SR       LOC-3            ADRES FOR REFERENCING PWR COF TABL
A1174                                          L        SP       N-1              N IS THE DEGREE OF THE POWER SERIES
A1175                                          MPAC     DP       X                INITIAL GUESS FOR ROOT

A1176                                          LOC-2N   DP       A(0)
A1177                                                   ...
A1178                                          LOC      DP       A(N)
A1179                                          LOC+2    SR       PRECROOT         PREC RQD OF ROOT (AS FRACT OF 1ST GUESS)

P1180  THE DP RESULT IS LEFT IN MPAC UPON EXIT, AND A SP COUNT OF THE ITERATIONS TO CONVERGENCE IS LEFT IN MPAC+2.
R1182  RETURN IS NORMALLY TO LOC(TC ROOTPSRS)+3.   IF ROOTPSRS FAILS TO CONVERGE IN 8 PASSES, RETURN IS TO LOC+1 AND
R1184  OUTPUTS ARE NOT TO BE TRUSTED.

P1185           PRECAUTION: ROOTPSRS MAKES NO CHECKS FOR OVERFLOW OR FOR IMPROPER USAGE. IMPROPER USAGE COULD
R1187  PRECLUDE CONVERGENCE OR REQUIRE EXCESSIVE ITERATIONS. AS A SPECIFIC EXAMPLE, ROOTPSRS FORMS A DERIVATIVE
R1189  COEFFICIENT TABLE BY MULTIPLYING EACH A(I) BY I, WHERE I RANGES FROM 1 TO N. IF AN ELEMENT OF THE DERIVATIVE
R1191  COEFFICIENT TABLE = 1 OR > 1 IN MAGNITUDE, ONLY THE EXCESS IS RETAINED. ROOTPSRS MAY CONVERGE ON THE CORRECT
R1193  ROOT NONETHELESS, BUT IT MAY TAKE AN EXCESSIVE NUMBER OF ITERATIONS. THEREFORE THE USER SHOULD RECOGNIZE:

R1195  1. USER'S RESPONSIBILITY TO ASSURE THAT I X A(I) < 1 IN MAGNITUDE FOR ALL I.

R1197  2. USER'S RESPONSIBILITY TO ASSURE OVERFLOW WILL NOT OCCUR IN EVALUATING EITHER THE RESIDUAL OR THE DERIVATIVE
R1199     POWER SERIES.   THIS OVERFLOW WOULD BE PRODUCED BY SUBROUTINE POWRSERS, CALLED BY ROOTPSRS, AND MIGHT NOT
P1201     PRECLUDE EVENTUAL CONVERGENCE.
```

```
R1202   3. AT PRESENT, ERASABLE LOCATIONS ARE RESERVED ONLY FOR N UP TO 5.   AN N IN EXCESS OF 5 WILL PRODUCE CHAOS.
R1204      ALL ERASABLES USED BY ROOTPSRS ARE UNSWITCHED LOCATED IN THE REGION FROM MPAC-33 OCT TO MPAC+7.

R1206   4. THE ITERATION COUNT RETURNED IN MPAC+2 MAY BE USED TO DETECT ABNORMAL PERFORMANCE.

A1208                                                                                 STORE ENTERING DATA, INITLIZE ERASABLES

 1209                          31,3545  0 0006 1  ROOTPSRS EXTEND
 1210   REF   1                31,3546  22 132 1           QXCH   RETROOT             RETURN ADRES
 1211   REF   1                31,3547  54 117 1           TS     PWRPTR              PWR TABL POINTER
 1212   REF 305  LAST  820     31,3550  52 160 1           DXCH   MPAC        +3      PWR TABL ADRES, N-1
 1213   REF   1                31,3551  3 3670 0           CA     DERTABLL
 1214   REF   1                31,3552  54 141 1           TS     DERPTR              DER TABL POINTER
 1215   REF 306  LAST  825     31,3553  54 161 0           TS     MPAC        +5      DER TABL ADRES
 1216   REF 307  LAST  825     31,3554  10 160 1           CCS    MPAC        +4      NO POWER SERIES OF DEGREE 1 OR LESS
 1217   REF 308  LAST  825     31,3555  54 162 0           TS     MPAC        +6      N-2
 1218   REF 156  LAST  818     31,3556  3 4746 0           CA     ZERO                MODE USED AS ITERATION COUNTER. MODE
 1219   REF   6  LAST  818     31,3557  54 163 1           TS     MODE                MUST BE POS SO ABS WON'T COMP MPAC+3 ETC

A1220                                                                                 COMPUTE CRITERION TO STOP ITERATING

 1221                          31,3560  0 0006 1           EXTEND
 1222   REF 309  LAST  825     31,3561  3 0155 0           DCA    MPAC                FETCH ROOT GUESS, KEEPING IT IN MPAC
 1223   REF   1                31,3562  52 127 1           DXCH   ROOTPS              AND IN ROOTPS
 1224   REF 310  LAST  825     31,3563  50 157 1           INDEX  MPAC        +3      PWR TABL ADRES
 1225                          31,3564  3 0005 1           CA     5                   PRECROOT TO A
 1226   REF   8  LAST  477     31,3565  0 7330 0           TC     SHORTMP             YIELDS DP PRODUCT IN MPAC
 1227   REF   1                31,3566  0 4704 0           TC     USPRCADR
 1228   REF   1                31,3567   01226 0           CADR   ABS                 YIELDS ABVAL OF CRITERION ON DX IN MPAC
 1229   REF 311  LAST  825     31,3570  52 155 1           DXCH   MPAC
 1230   REF   1                31,3571  52 125 0           DXCH   DXCRIT              CRITERION

A1231                                                                                 SET UP DER COF TABL

 1232                          31,3572  0 0006 1           EXTEND
 1233   REF   2  LAST  825     31,3573  5 0117 0           INDEX  PWRPTR
 1234                          31,3574  3 0004 0           DCA    3
 1235   REF 312  LAST  825     31,3575  52 155 1           DXCH   MPAC                A(N) TO MPAC

 1236   REF 313  LAST  825     31,3576  3 0160 0           CA     MPAC        +4      N-1 TO A

 1237   REF   1                31,3577  54 140 0  DERCLOOP TS     PWRCNT              LOOP COUNTER
 1238   REF  81  LAST  818     31,3600  6 4744 1           AD     ONE
 1239   REF   1                31,3601  0 7337 1           TC     DMPNSUB             YIELDS DERCOF = I X A(I) IN MPAC
 1240                          31,3602  0 0006 1           EXTEND
 1241   REF   3  LAST  825     31,3603  5 0117 0           INDEX  PWRPTR
 1242                          31,3604  3 0002 0           DCA    1
 1243   REF 314  LAST  825     31,3605  52 155 1           DXCH   MPAC                A(I-1) TO MPAC, FETCHING DERCOF
 1244   REF   2  LAST  825     31,3606  50 141 0           INDEX  DERPTR
 1245                          31,3607  52 004 1           DXCH   3                   DERCOF TO DER TABL
 1246    REF  55  LAST  822    31,3610  4 4743 1             CS      TWO
 1247    REF   4  LAST  825    31,3611  26 117 1             ADS     PWRPTR         DECREMENT PWR POINTER
 1248    REF  56  LAST  826    31,3612  4 4743 1             CS      TWO
 1249    REF   3  LAST  825    31,3613  26 141 1             ADS     DERPTR         DECREMENT DER POINTER
 1250    REF   2  LAST  825    31,3614  10 140 0             CCS     PWRCNT
 1251    REF   1               31,3615  1 3577 0             TCF     DERCLOOP

A1252                                                                               CONVERGE ON ROOT

 1253                          31,3616  0 0006 1  ROOTLOOP   EXTEND
 1254    REF   2  LAST  825    31,3617  3 0127 0             DCA     ROOTPS         FETCH CURRENT ROOT
 1255    REF 315  LAST  825    31,3620  52 155 1             DXCH    MPAC           LEAVE IN MPAC
 1256                          31,3621  0 0006 1             EXTEND
 1257    REF 316  LAST  826    31,3622  3 0162 1             DCA     MPAC      +5   LOAD A, L WITH DER TABL ADRES, N-2
 1258    REF   1               31,3623  0 7236 1             TC      POWRSERS       YIELDS DERIVATIVE IN MPAC

 1259                          31,3624  0 0006 1             EXTEND
 1260    REF   3  LAST  826    31,3625  3 0127 0             DCA     ROOTPS
 1261    REF 317  LAST  826    31,3626  52 155 1             DXCH    MPAC           CURRENT ROOT TO MPAC, FETCHING DERIVTIVE
 1262    REF  75  LAST  810    31,3627  52 131 0             DXCH    BUF            LEAVE DERIVATIVE IN BUF AS DIVISOR
 1263                          31,3630  0 0006 1             EXTEND
 1264    REF 318  LAST  826    31,3631  3 0160 0             DCA     MPAC      +3   LOAD A, L WITH PWR TABL ADRES, N-1
 1265    REF   2  LAST  826    31,3632  0 7236 1             TC      POWRSERS       YIELDS RESIDUAL IN MPAC

 1266    REF   2  LAST  825    31,3633  0 4704 0             TC      USPRCADR
 1267    REF   1               31,3634   00353 1             CADR    DDV/BDDV       YIELDS -DX IN MPAC

 1268                          31,3635  0 0006 1             EXTEND
 1269    REF 319  LAST  826    31,3636  4 0155 1             DCS     MPAC           FETCH DX, LEAVING -DX IN MPAC
 1270    REF   4  LAST  826    31,3637  20 127 1             DAS     ROOTPS         CORRECTED ROOT NOW IN ROOTPS

 1271    REF   3  LAST  826    31,3640  0 4704 0             TC      USPRCADR
 1272    REF   2  LAST  825    31,3641   01226 0             CADR    ABS            YIELDS ABS(DX) IN MPAC
 1273                          31,3642  0 0006 1             EXTEND
 1274    REF   2  LAST  825    31,3643  4 0125 0             DCS     DXCRIT
 1275    REF 320  LAST  826    31,3644  20 155 1             DAS     MPAC           ABS(DX)-ABS(DXCRIT) IN MPAC

 1276    REF   7  LAST  825    31,3645  3 0163 0             CA      MODE
 1277    REF  36  LAST  816    31,3646  7 4741 0             MASK    BIT4           KLUMPP SAYS GIVE UP AFTER EIGHT PASSES
 1278    REF 226  LAST  823    31,3647  10 000 0             CCS     A
 1279    REF   2  LAST  825    31,3650  0 0132 1  BADROOT    TC      RETROOT

 1280    REF   8  LAST  826    31,3651  24 163 0             INCR    MODE           INCREMENT ITERATION COUNTER
 1281    REF 321  LAST  826    31,3652  10 154 0             CCS     MPAC           TEST HI ORDER DX
 1282    REF   1               31,3653  1 3616 1             TCF     ROOTLOOP
 1283    REF   1               31,3654  1 3656 0             TCF     TESTLODX
 1284    REF   1               31,3655  1 3662 1             TCF     ROOTSTOR
 1285    REF 322  LAST  826    31,3656  10 155 1  TESTLODX   CCS     MPAC      +1   TEST LO ORDER DX
 1286    REF   2  LAST  826    31,3657  1 3616 1             TCF     ROOTLOOP
 1287    REF   2  LAST  826    31,3660  1 3662 1             TCF     ROOTSTOR
 1288   REF   3  LAST  826   31,3661  1 3662 1           TCF      ROOTSTOR
 1289   REF   5  LAST  826   31,3662  52 127 1  ROOTSTOR DXCH     ROOTPS
 1290   REF 323  LAST  826   31,3663  52 155 1           DXCH     MPAC
 1291   REF   9  LAST  826   31,3664  3 0163 0           CA       MODE
 1292   REF 324  LAST  827   31,3665  54 156 1           TS       MPAC     +2      STORE SP ITERATION COUNT IN MPAC+2
 1293   REF   3  LAST  826   31,3666  50 132 1           INDEX    RETROOT
 1294                        31,3667  1 0002 1           TCF      2

 1295   REF   1              31,3670   00147 0  DERTABLL ADRES    DERCOFN  -3


R1296   *****************************************************************************************************************
R1298   TRASHY LITTLE SUBROUTINES
R1299   *****************************************************************************************************************

 1301   REF 157  LAST  825   31,3671  3 4746 0  ZEROMID  CAF      ZERO             ROUTINE TO ZERO THE MIDDLE COMPONENT
 1302   REF 325  LAST  827   31,3672  54 157 0           TS       MPAC     +3        OF A VECTOR IN MPAC.   "TCF DANZIG"
 1303   REF 326  LAST  827   31,3673  54 160 1           TS       MPAC     +4        COULD BE A "TC Q" AT THE EXPENSE OF
 1304   REF   1              31,3674  1 6102 0           TCF      DANZIG             A TINY AMOUNT OF TIME.


 1305  *REF 227  LAST  826   31,3675  50 000 1  INTPRETX INDEX    A                SET X1 ON THE WAY TO THE INTERPRETER
 1306   REF   1              31,3676  4 2415 1           CS       TARGTDEX
 1307   REF  23  LAST  806   31,3677  50 120 1           INDEX    FIXLOC
 1308   REF  22  LAST  773   31,3700  54 046 1           TS       X1
 1309   REF 135  LAST  818   31,3701  1 6060 0           TCF      INTPRET


 1310   REF  15  LAST  808   31,3702  3 1642 0  TDISPSET CA       TTF/8
 1311                        31,3703  0 0006 1           EXTEND
 1312   REF   1              31,3704  7 4741 0           MP       TSCALINV
 1313   REF   4  LAST  328   31,3705  53'476 1           DXCH     TTFDISP

 1314   REF   9  LAST  815   31,3706  3 5005 1           CA       EBANK5           TREDES BECOMES ZERO TWO PASSES
 1315   REF  40  LAST  820   31,3707  54 003 0           TS       EBANK              BEFORE TCGFAPPR IS REACHED
 1316   REF   2  LAST  125   E5,1454                     EBANK=   TCGFAPPR
 1317   REF   3  LAST  827   31,3710  3 1454 0           CA       TCGFAPPR
 1318   REF  21  LAST  820   31,3711  24 006 1           INCR     BBANK
 1319   REF  22  LAST  827   31,3712  24 006 1           INCR     BBANK
 1320   REF  16  LAST  827   E7,1642                     EBANK=   TTF/8
 1321   REF  17  LAST  827   31,3713  6 1642 0           AD       TTF/8
 1322                        31,3714  0 0006 1           EXTEND
 1323   REF   1              31,3715  7 3763 1           MP       TREDESCL
 1324   REF   1              31,3716  6 3760 0           AD       -DEC103
 1325   REF   2  LAST  379   31,3717  6 4726 0           AD       NEGMAX
 1326   REF 120  LAST  823   31,3720  54 001 1           TS       L
 1327   REF 121  LAST  827   31,3721  4 0001 1           CS       L
 1328   REF 122  LAST  827   31,3722  6 0001 0           AD       L
 1329   REF   1              31,3723  6 3762 1           AD       +DEC99
 1330   REF  22  LAST  810   31,3724  6 4724 1           AD       POSMAX
 1331    REF   4  LAST  812    31,3725  55'666 1             TS      TREDES
 1332    REF   5  LAST  828    31,3726  4 1666 1             CS      TREDES
 1333    REF   6  LAST  828    31,3727  27'666 1             ADS     TREDES
 1334    REF 196  LAST  828    31,3730  0 0002 0             TC      Q

 1335    REF   2  LAST  461    31,3731  0 5644 1  1406P00    TC      P00DOO
 1336                          31,3732   21406 0             OCT     21406
 1337    REF  31  LAST  814    31,3733  0 5571 1  1406ALM    TC      ALARM
 1338                          31,3734   01406 1             OCT     01406
 1339    REF   1               31,3735  1 3402 0             TCF     RATESTOP

R1340    DESCENT OVERFLOW SUBROUTINE
 1341                          31,3736  0 0006 1  OVFDESC    EXTEND
 1342    REF   1               31,3737  23'456 1             QXCH    OVFRET

 1343    REF  32  LAST  828    31,3740  0 5571 1             TC      ALARM
 1344                          31,3741   01410 0             OCT     01410

 1345                          31,3742  0 0004 0             INHINT                        MUST USE INHINT, IBNKCALL, RELINT
 1346    REF  40  LAST  811    31,3743  0 4665 0             TC      IBNKCALL              BECAUSE DAP COULD INTERRUPT STOPRATE AND
 1347    REF   6  LAST  814    31,3744   40166 1             FCADR   STOPRATE              BECAUSE WE COME FROM P66HZ VIA BANKCALL
 1348                          31,3745  0 0003 1             RELINT

 1349    REF 158  LAST  827    31,3746  3 4746 0             CA      ZERO
 1350    REF   3  LAST  815    31,3747  54 121 1             TS      OVFIND

 1351    REF   2  LAST  828    31,3750  0 1456 1             TC      OVFRET
```

```
P1352
R1353      ****************************************************************************************************
R1355      SPECIALIZED "PHASCHNG" SUBROUTINE
R1356      ****************************************************************************************************

 1358      REF   1                E3,1440                         EBANK= PHSNAME2
 1359      REF   2  LAST  234    31,3751   3 5000 1  FASTCHNG CA      EBANK3          SPECIALIZED 'PHASCHNG' ROUTINE
 1360      REF  41  LAST  827    31,3752  56 C03 1            XCH     EBANK
 1361      REF 123  LAST  827    31,3753  52 002 1            DXCH    L
 1362      REF   1               31,3754  55'442 0            TS      PHSNAME3
 1363      REF  42  LAST  829    31,3755  22 003 1            LXCH    EBANK
 1364      REF   3  LAST  794    E7,1621                      EBANK= E2DPS
 1365      REF 228  LAST  827    31,3756   0 C000 1            TC      A


R1366      ****************************************************************************************************
R1368      PARAMETER TABLE INDIRECT ADDRESSES
R1369      ****************************************************************************************************

 1371      REF   2  LAST  125    E5,1402                RDG       =      RBRFGX
 1372      REF   2  LAST  125    E5,1412                VDG       =      VBRFGX
 1373      REF   2  LAST  125    E5,1422                ADG       =      ABRFGX
 1374      REF   2  LAST  125    E5,1432                VDG2TTF   =      VBRFG*
 1375      REF   2  LAST  125    F5,1436                ADG2TTF   =      ABRFG*
 1376      REF   2  LAST  125    E5,1442                JDG2TTF   =      JBRFG*

R1377      ****************************************************************************************************
R1379      LUNAR LANDING CONSTANTS
R1380      ****************************************************************************************************

 1382      REF   7  LAST  805    31,3757    01565 0  TABLTTFL ADRES  TABLTTF  +3     ADDRESS FOR REFERENCING TTF TABLE


 1383      REF  28  LAST  823       4731             TTFSCALE =      BIT12


 1384      REF  37  LAST  826       4741             TSCALINV =      BIT4


 1385                            31,3760    77630 1  -DEC103  DEC    -103


 1386                            31,3761    00155 0  P64DB    OCT    00155           0.3 DEGREES SCALED AT CDU SCALING


 1387                            31,3762    0C143 1  +DEC99   DEC    +99


 1388                            31,3763    75340 1  TREDESCL DEC    -.08
 1389                      31,3764   00264 1  180DEGS   DEC     +180

 1390                      31,3765   00056 1  1/2DEG    DEC     +.00278

 1391                      31,3766   01542 0  PROJMAX   DEC     .42262 B-3         SIN(25')/8 TO COMPARE WITH PROJ

 1392                      31,3767   01022 0  PROJMIN   DEC     .25882 B-3         SIN(15')/8 TO COMPARE WITH PROJ

 1393                      31,3770   01477 1  V06N63    VN      0663               P63

 1394                      31,3771   01500 0  V06N64    VN      0664               P64

 1395                      31,3772   01474 1  V06N60    VN      0660               P65, P66, P67

 1396                      22,3651                      BANK    22
 1397    REF    1          22,2000                      SETLOC  LANDCNST
 1398                      22,3651                      BANK
 1399    REF    1                                       COUNT*  $$/F2DPS

 1400                      22,3651   00021 1  HIGHESTF  2DEC    4.34546769 B-12
 1400                      22,3652   14161 1
 1401                      22,3653   01440 0  GSCALE    2DEC    100 B-11
 1401                      22,3654   00000 1
 1402                      22,3655   14000 1  3/8DP     2DEC    .375
 1402                      22,3656   00000 1
 1403                      22,3657   30000 1  3/4DP     2DEC    .750
 1403                      22,3660   00000 1
 1404                      22,3661   77534 0  DEPRCRIT  2DEC    -.02 B-1
 1404                      22,3662   45074 0
R1405    ****************************************************************************************************************
R1407    ****************************************************************************************************************
```

```
0001                            21,2042                            BANK     21
0002   REF    1                 21,2000                            SETLOC   R11
0003                            21,2042                            BANK

0004   REF   32  LAST  816      E7,1515                            EBANK=   DVCNTR
0005   REF    1                                                    COUNT*   $$/R11

0006   REF   16  LAST  757      21,2042   4 0103 1   R10,R11      CS       FLAGWRD7          IS SERVICER STILL RUNNING?
0007   REF    6  LAST  707      21,2043   7 4740 1                MASK     AVEGFBIT
0008   REF  229  LAST  829      21,2044  10 000  0                CCS      A
0009   REF   56  LAST  823      21,2045   1 5263 1                TCF      TASKOVER          LET AVGEND TAKE CARE OF GROUP 2.
0010   REF    1                 21,2046  11'055  1                CCS      PIPCTR
0011   REF    1                 21,2047   1 2054 0                TCF      STORPCTR
0012                            21,2050   0 0006 1                EXTEND
00121  REF   15  LAST  811      21,2051   3 4746 0                DCA      NEGO
00122  REF    5  LAST  732      21,2052  52 754  0                DXCH     -PHASE2
00123  REF    1                 21,2053   1 2060 1                TCF      R10,R11A

0013   REF    1                 21,2054  55'722  0   STORPCTR     TS       PIPCTR1

0016   REF    3  LAST  451      21,2055   3 6010 0                CAF      OCT31
0017   REF   24  LAST  822      21,2056   0 5175 1                TC       TWIDDLE
0018   REF    2  LAST  251      21,2057    02042 0                ADRES    R10,R11
0019   REF    3  LAST  618      21,2060   3 4744 1   R10,R11A     CAF      HFLSHBIT
0020   REF   20  LAST  811      21,2061   7 0107 0   FLASHH?      MASK     FLGWRD11
0021                            21,2062   0 0006 1                EXTEND
0022   REF    1                 21,2063   1 2067 0                BZF      FLASHV?           H FLASH OFF, SO LEAVE ALONE

0023   REF    2  LAST  618      21,2064   3 4740 0                CA       HLITE
0024   REF  124  LAST  829      21,2065  54 001  1                TS       L
0025   REF    1                 21,2066   0 4577 0                TC       FLIP              FLIP H LITE

0026   REF    1                 21,2067   3 4743 0   FLASHV?      CA       VFLSHBIT          VFLASHBIT MUST BE BIT 2.
0027   REF   21  LAST  831      21,2070   7 0107 0                MASK     FLGWRD11
0028                            21,2071   0 0006 1                EXTEND
0029   REF    1                 21,2072   1 2076 0                BZF      10,11             V FLASH OFF

0030   REF    2  LAST  618      21,2073   3 4742 1                CA       VLITE
0031   REF  125  LAST  831      21,2074  54 001  1                TS       L
0032   REF    2  LAST  831      21,2075   0 4577 0                TC       FLIP              FLIP V LITE


0033   REF    4  LAST  734      21,2076   3 0105 0   10,11        CA       FLAGWRD9          IS THE LETABORT FLAG SET ?
0034   REF    2  LAST  734      21,2077   7 4734 1                MASK     LETABBIT
0035                            21,2100   0 0006 1                EXTEND
0036   REF    1                 21,2101   1 2170 1                BZF      LANADISP          NO.  PROCEED TO R10.

0037   REF   14  LAST  797      21,2102   4 1010 0   P71NOW?      CS       MODREG            YES.  ARE WE IN P71 NOW?
0038   REF    1                 21,2103   6 2147 1                AD       1DEC71
0039                            21,2104   0 0006 1                EXTEND
```

page 541

```
 0040   REF   2  LAST  831   21,2105  1 2170 1             BZF     LANADISP        YES.  PROCEED TO R10.

 00405  REF  40  LAST  823   21,2106  3 4744 1             CAF     BIT1
 00406  REF   5  LAST  816   21,2107  7 0374 0             MASK    CHANBKUP
 00407  REF 230  LAST  831   21,2110  10 000 0             CCS     A
 00408  REF   3  LAST  832   21,2111  1 2170 1             TCF     LANADISP        IGNORE CHAN BITS - ASSUME NO ABORT

 0041                        21,2112  0 0006 1             EXTEND                  NO.  IS AN ABORT STAGE COMMANDED?
 0042   REF   7  LAST  817   21,2113  00 030 1             READ    CHAN30
 0043                        21,2114  4 0000 0             COM
 0044   REF 126  LAST  831   21,2115  54 001 1             TS      L
 0045   REF  38  LAST  829   21,2116  7 4741 0             MASK    BIT4
 0046   REF 231  LAST  832   21,2117  10 000 0             CCS     A
 0047   REF   2  LAST  253   21,2120  1 2136 0             TCF     P71A            YES.

 0048   REF  15  LAST  831   21,2121  4 1010 0  P70NOW?    CS      MODREG          NO.  ARE WE IN P70 NOW?
 0049   REF   1              21,2122  6 2146 0             AD      1DEC70
 0050                        21,2123  0 0006 1             EXTEND
 0051   REF   4  LAST  832   21,2124  1 2170 1             BZF     LANADISP        YES.  PROCEED TO R10.

 0052   REF 127  LAST  832   21,2125  3 0001 0             CA      L               NO.  IS AN ABORT COMMANDED?
 0053   REF  41  LAST  832   21,2126  7 4744 0             MASK    BIT1
 0054   REF 232  LAST  832   21,2127  10 000 0             CCS     A
 0055   REF   2  LAST  253   21,2130  1 2133 0             TCF     P70A            YES.
 0056   REF   5  LAST  832   21,2131  1 2170 1             TCF     LANADISP        NO.  PROCEED TO R10.

 0057   REF   1                                            COUNT*  $$/P70

 0058   REF   1              21,2132  0 2150 1  P70        TC      LEGAL?
 0059   REF 159  LAST  828   21,2133  4 4746 1  P70A       CS      ZERO
 0060                        21,2134  1 2137 1             TCF     +3
 0061   REF   2  LAST  832   21,2135  0 2150 1  P71        TC      LEGAL?
 0062   REF  57  LAST  826   21,2136  3 4743 0  P71A       CAF     TWO
 0063   REF 197  LAST  828   21,2137  54 002 1     +3      TS      Q
 0064                        21,2140  0 0004 0             INHINT
 0065                        21,2141  0 0006 1             EXTEND
 0066   REF   1              21,2142  3 2145 0             DCA     CNTABTAD
 0067                        21,2143  52 006 0             DTCB

 0068   REF  33  LAST  831   E7,1515                       EBANK=  DVCNTR
 0069   REF   1              21,2144   03417 0  CNTABTAD   2CADR   CONTABRT
 0069   REF   1              21,2145   12067 0
 0070                        21,2146   00106 0  1DEC70     DEC     70
 0071                        21,2147   00107 1  1DEC71     DEC     71

 0072                        05,3417                       BANK    05
 0073   REF   1              05,2000                       SETLOC  ABORTS1
 0074                        05,3417                       BANK
 0075   REF   1                                            COUNT*  $$/P70
 0076   REF   1                05,3417  3 3422 0  CONTABRT CAF     ABRTJADR
 0077   REF   1                05,3420  54 017 0           TS      BRUPT
 0078                          05,3421  5 0017 1           RESUME

 0079   REF   1                05,3422  1 3423 0  ABRTJADR TCF     ABRTJASK

 0080   REF   1                05,3423  3 3503 1  ABRTJASK CAF     OCTAL27
 0081   REF 198  LAST  832     05,3424  6 0002 0           AD      Q
 0082   REF 128  LAST  832     05,3425  54 001 1           TS      L
 0083                          05,3426  4 0000 0           COM
 0084   REF   6  LAST  742     05,3427  52 760 1           DXCH    -PHASE4
 0085   REF 199  LAST  833     05,3430  50 002 0           INDEX   Q
 0086   REF   1                05,3431  3 3502 0           CAF     MODE70
 0087   REF  16  LAST  832     05,3432  55'010 0           TS      MODREG

 0088   REF  24  LAST  752     05,3433  55'162 1           TS      DISPDEX           INSURE DISPDEX IS POSITIVE.

 0089   REF 200  LAST  833     05,3434  10 002 1           CCS     Q                 SET APSFLAG IF P71.
 0090   REF  19  LAST  753     05,3435  4 0106 1           CS      FLGWRD10          SET APSFLAG PRIOR TO THE ENEMA.
 0091   REF  11  LAST  753     05,3436  7 4730 0           MASK    APSFLBIT
 0092   REF  20  LAST  833     05,3437  26 106 1           ADS     FLGWRD10
 0093   REF   1                05,3440  4 3505 0           CS      DAPBITS           DAPBITS = OCT 40640 = BITS 6,8,9,15
 0094   REF  25  LAST  756     05,3441  7 0111 1           MASK    DAPBOOLS          RESET ULLAGE,DRIFT,XOVRIINH,AND PULSES
 0095   REF  26  LAST  833     05,3442  54 111 1           TS      DAPBOOLS

 0096   REF   1                05,3443  3 3506 1           CAF     1DEGDB            INSURE DAP DEADBAND IS SET TO 1 DEGREE
 0097   REF   4  LAST  799     05,3444  55'343 0           TS      DB

 0098   REF  26  LAST  796     05,3445  4 0101 0           CS      FLAGWRD5          SET ENGONFLG.
 0099   REF   5  LAST  756     05,3446  7 4736 0           MASK    ENGONBIT
 0100   REF  27  LAST  833     05,3447  26 101 0           ADS     FLAGWRD5

 0101   REF   8  LAST  756     05,3450  4 4346 0           CS      PRIO30            INSURE THAT THE ENGINE IS ON, IF ARMED.
 0102                          05,3451  0 0006 1           EXTEND
 0103   REF  26  LAST  756     05,3452  02 011 0           RAND    DSALMOUT
 0104   REF  31  LAST  823     05,3453  6 4730 1           AD      BIT13
 0105                          05,3454  0 0006 1           EXTEND
 0106   REF  27  LAST  833     05,3455  01 011 0           WRITE   DSALMOUT

 0107   REF   5  LAST  292     05,3456  3 4726 0           CAF     LRBYBIT           TERMINATE R12.
 0108   REF  22  LAST  831     05,3457  54 107 0           TS      FLGWRD11

 0109   REF  28  LAST  816     05,3460  4 0074 0           CS      FLAGWRD0          SIGNAL THE LAD TO DISPLAY LATVEL IN
 0110   REF   1                05,3461  7 4743 1           MASK    R10FLBIT            INERTIAL COORDINATES AND FORVEL ZERO
 0111   REF  29  LAST  833     05,3462  26 074 0           ADS     FLAGWRD0

 0113                          05,3463  0 0006 1           EXTEND                    LOAD TEVENT FOR THE DOWNLINK.
 0114   REF  26  LAST  817     05,3464  3 0025 0           DCA     TIME2
 0115   REF   6  LAST  756     05,3465  53'342 1           DXCH    TEVENT
 0116                               05,3466  0 0006 1             EXTEND
 0117     REF    1                  05,3467  3 3501 0             DCA      SVEXITAD
 0118     REF    3   LAST   735     05,3470  53'252 1             DXCH     AVGEXIT

 0119     REF    1                  05,3471  0 2657 1             TC       ABTKLEAN          KILL GROUPS 1,3, AND 6.

 0120     REF   24   LAST   731     05,3472  3 6266 0             CAF      THREE             SET UP 4.3SPOT FOR GOABORT
 0121     REF  129   LAST   833     05,3473  54 001 1             TS       L
 0122                               05,3474  4 0000 0             COM
 0123     REF    7   LAST   833     05,3475  52 760 1             DXCH     -PHASE4

 0124     REF   50   LAST   820     05,3476  0 4626 1             TC       POSTJUMP
 0125     REF    1                  05,3477   12767 1             CADR     ENEMA

 0126     REF   34   LAST   832     E7,1515                       EBANK=   DVCNTR
 0127     REF    6   LAST   757     05,3500   03656 1  SVEXITAD   2CADR    SERVEXIT
 0127                               05,3501   64067 1
 0128                               05,3502   00106 0  MODE70     DEC      70
 0129                               05,3503   00027 1  OCTAL27    OCT      27
 0130                               05,3504   00107 1  MODE71     DEC      71

 0131                               05,3505   40640 1  DAPBITS    OCT      40640

 0132                               05,3506   00554 0  1DEGDB     OCT      00554
 0133                               32,3443                       BANK     32
 0134     REF    1                  32,2000                       SETLOC   ABORTS
 0135                               32,3443                       BANK

 0136     REF    1                                                COUNT*   $$/P70

 0137     REF   15   LAST   810     32,3443  3 4742 1  GOABORT    CAF      FOUR
 0138     REF   35   LAST   834     32,3444  55'515 0             TS       DVCNTR

 0139     REF    1                  32,3445  3 3653 1             CAF      WHICHADR
 0140     REF   27   LAST   781     32,3446  55'455 0             TS       WHICH

 0141     REF  136   LAST   827     32,3447  0 6060 1             TC       INTPRET
 0142                               32,3450   43014 0             CLEAR    CLEAR
 0143     REF    1                  32,3451   04665 0                      FLRCS
 0144     REF    4   LAST   742     32,3452   04265 1                      FLUNDISP
 0145                               32,3453   43014 0             CLEAR    SET
 0146     REF    5   LAST   758     32,3454   03670 0                      IDLEFLAG
 0147     REF    1                  32,3455   06464 1                      ACC4-2FL
 0148                               32,3456   45014 0             SET      CALL
 0149     REF    1                  32,3457   04462 0                      P7071FLG
 0150     REF    2   LAST   729     32,3460   61063 0                      INITCDUW
 0151                               32,3461   77776 1             EXIT

 0152     REF    5   LAST   822     32,3462  0 5323 0             TC       CHECKMM
 0153                               32,3463   00106 0  70DEC      DEC      70
 0154    REF   1               32,3464  1 3577 0            TCF     P71RET

 0155    REF 137  LAST  834    32,3465  0 6060 1  P70INIT   TC      INTPRET
 0156                          32,3466   77624 1            CALL
 0157    REF   1               32,3467   65626 0                    TGOCOMP
 0158                          32,3470   54345 1            DLOAD   SL
 0159    REF   1               32,3471   34003 0                    MDOTDPS
 0160                          32,3472   20205 1                    4D
 0161                          32,3473   77665 1            BDDV
 0162    REF  10  LAST  820    32,3474   01244 1                    MASS
 0163    REF   2  LAST  123    32,3475   16262 0            STODL   TBUP
 0164    REF  11  LAST  835    32,3476   01244 1                    MASS
 0165                          32,3477   70471 1            DDV     SR1
 0166    REF   1               32,3500   16015 1                    K(1/DV)
 0167    REF   2  LAST  160    32,3501   03635 1            STORE   1/DV1
 0168    REF   2  LAST  160    32,3502   03637 0            STORE   1/DV2
 0169    REF   2  LAST  160    32,3503   03641 1            STORE   1/DV3
 0170                          32,3504   77665 1            BDDV
 0171    REF   1               32,3505   25652 1                    K(AT)
 0172    REF   3  LAST  212    32,3506   16254 0            STODL   AT
 0173    REF   1               32,3507   34015 1                    100PCTTO
 0174    REF   2  LAST  123    32,3510   02260 1            STORE   TTO
 0175                          32,3511   57535 0            SLOAD   DCOMP
 0176    REF   2  LAST  749    32,3512   26002 1                    DPSVEX
 0177                          32,3513   77702 1            SR2
 0178    REF   2  LAST  123    32,3514   36256 0            STCALL  VE
 0179    REF   1               32,3515   60267 1                    COMMINIT
 0180                          32,3516   77745 1  INJTARG   DLOAD
 0181    REF   2  LAST  127    32,3517   02564 1                    ABTRDOT
 0182    REF   3  LAST  328    32,3520   36264 1            STCALL  RDOTD            INITIALIZE RDOTD.
 0183    REF   1               32,3521   57315 1                    YCOMP            COMPUTE Y
 0184                          32,3522   45246 0            ABS     DSU
 0185    REF   2  LAST  127    32,3523   02562 1                    YLIM             /Y/-DYMAX
 0186                          32,3524   75240 0            BMN     SIGN             IF <0, XR<.5DEG, LEAVE YCO AT 0
 0187    REF   1               32,3525   65530 1                    YOK              IF >0, FIX SIGN OF DEFICIT, THIS IS YCO.
 0188    REF   2  LAST  124    32,3526   02326 1                    Y
 0189    REF   2  LAST  160    32,3527   03633 1            STORE   YCO
 0190                          32,3530   45345 1  YOK       DLOAD   DSU
 0191    REF   3  LAST  835    32,3531   03633 1                    YCO
 0192    REF   3  LAST  835    32,3532   02326 1                    Y
 0193                          32,3533   77661 0            SR
 0194                          32,3534   20606 0                    5D
 0195    REF   3  LAST  328    32,3535   03643 0            STORE   XRANGE
 0196                          32,3536   45014 0            SET     CALL
 0197    REF   1               32,3537   04461 0                    FLVR
 0198    REF   1               32,3540   71650 1                    THETCOMP
 0199                          32,3541   51025 1            DSU     BPL
 0200    REF   2  LAST  126    32,3542   02556 0                    THETCRIT
 0201                          32,3543   65547 1                    +4
 0202                          32,3544   52175 0            VLOAD   GOTO
 0203   REF   2  LAST  126   32,3545   02546 1                    J1PARM
 0204   REF   1              32,3546   65552 0                    STORPARM
 0205                        32,3547   43175 0     +4      VLOAD  SET          IF J2 IS USED, SET THE
 0206   REF   2  LAST  126   32,3550   02552 1                    J2PARM       ABORT TARGETING FLAG
 02061  REF   2  LAST  240   32,3551   04470 0                    ABTTGFLG
 0207   REF   2  LAST  127   32,3552   16572 0  STORPARM STODL    JPARM
 0208   REF   2  LAST  160   32,3553   03631 0                    RCO
 0209   REF   2  LAST  127   32,3554   02576 1             STORE  RP
 0210                        32,3555   77414 0             SET    EXIT
 0211   REF   1              32,3556   04471 1                    ROTFLAG

 0212   REF   1              32,3557  0 3635 1  UPTHROT    TC     THROTUP

 0213   REF  62  LAST  814   32,3560  0 5355 1             TC     PHASCHNG
 0214                        32,3561   04024 0             OCT    04024

 0215   REF  57  LAST  812   32,3562  0 5506 1             TC     UPFLAG
 0216   REF   1              32,3563   00216 1             ADRES  FLAP

 0217   REF 226  LAST  815   32,3564  0 4607 1  UPTHROT1   TC     BANKCALL     VERIFY THAT THE PANEL SWITCHES
 0218   REF   2  LAST  728   32,3565   73710 0             CADR   P40AUTO      ARE PROPERLY SET.

 0219   REF   2  LAST  836   32,3566  0 3635 1             TC     THROTUP

 0220   REF   4  LAST  742   32,3567  3 5020 0             CAF    PRIO17       LET SERVICER FINISH BEFORE CONNECTING
 0221   REF  17  LAST  816   32,3570  0 5137 1             TC     PRIOCHNG         ASCENT GUIDANCE EQUATIONS.

 0222                        32,3571  0 0006 1             EXTEND
 0223   REF   1              32,3572  3 3655 1             DCA    ATMAGAD
 0224   REF   4  LAST  834   32,3573  53'252 1             DXCH   AVGEXIT

 0225   REF  63  LAST  836   32,3574  0 5355 1  GRP4OFF    TC     PHASCHNG     TERMINATE USE OF GROUP 4.
 0226                        32,3575   00004 0             OCT    00004

 0227   REF 128  LAST  813   32,3576  1 5146 0             TCF    ENDOFJOB

 0228   REF  78  LAST  813   32,3577  0 5520 0  P71RET     TC     DOWNFLAG
 0229   REF   2  LAST  787   32,3600   00215 1             ADRES  LETABORT

 0230   REF   2  LAST  753   32,3601  3 6000 1             CAF    THRESH2      SET DVMON THRESHOLD TO THE ASCENT VALUE.
 0231   REF   5  LAST  781   32,3602  55'250 0             TS     DVTHRUSH

 0232   REF 138  LAST  835   32,3603  0 6060 1             TC     INTPRET
 0233                        32,3604   77624 1             CALL
 0234   REF   1              32,3605   60243 1                    P12INIT
 0235                        32,3606   45014 0             BON    CALL
 0236   REF   2  LAST  836   32,3607   04707 0                    FLAP
 0237   REF   1              32,3610   65614 1                    OLDTIME
 0238   REF   2  LAST  835   32,3611   65626 0                    TGOCOMP      IF FLAP=0, TGO=T-TIG
 0239                        32,3612   77650 1             GOTO
 0240   REF    1                 32,3613   65516 0                    INJTARG
 0241                            32,3614   72545 0  OLDTIME  DLOAD    SL1               IF FLAP=1,TGO=2 TGO
 0242   REF   15  LAST   770     32,3615   03517 1                    TGO
 0243   REF    1                 32,3616   03502 0           STORE    TGO1
 0244                            32,3617   77776 1           EXIT

 0245   REF   64  LAST   836     32,3620  0 5355 1           TC       PHASCHNG
 0246                            32,3621   04024 0           OCT      04024

 0247                            32,3622  C 0006 1           EXTEND
 0248   REF    2  LAST   837     32,3623  3 1502 1           DCA      TGO1
 0249   PEF   16  LAST   837     32,3624  53'517 1           DXCH     TGO
 0250   REF    1                 32,3625  1 3564 1           TCF      UPTHROT1

R0252   ***********************************************************************

 0253                            21,2150                     BANK     21
 0254   REF    2  LAST   831     21,2000                     SETLOC   R11
 0255                            21,2150                     BANK

 0256   REF    2 LAST  832 TO  832:     14     14*           COUNT*   $$/P70

 0257   REF   10  LAST   242     21,2150  4 C774 1  LEGAL?   CS       MMNUMBER          IS THE DESIRED PGM ALREADY IN PROGRESS?
 0258   REF   17  LAST   833     21,2151  6 1010 1           AD       MODREG
 0259                            21,2152  0 C006 1           EXTEND
 0260   REF    1                 21,2153  1 2164 1           BZF      ABORTALM

 0261   REF    5  LAST   831     21,2154  4 0105 1           CS       FLAGWRD9          ARE THE ABORTS ENABLED?
 0262   REF    3  LAST   831     21,2155  7 4734 1           MASK     LETABBIT
 0263   REF  233  LAST   832     21,2156  10 000 0           CCS      A
 0264   REF    2  LAST   837     21,2157  1 2164 1           TCF      ABORTALM

 0265   REF   17  LAST   831     21,2160  3 0103 0           CA       FLAGWRD7          IS SERVICER ON THE AIR?
 0266   REF    7  LAST   831     21,2161  7 4740 1           MASK     AVEGFBIT
 0267   REF  234  LAST   837     21,2162  10 C00 0           CCS      A
 0268   REF  201  LAST   833     21,2163  0 0002 0           TC       Q                 YES.  ALL IS WELL.
 0269   REF    7  LAST   513     21,2164  0 4355 0  ABORTALM TC       FALTON
 0270   REF   10  LAST   473     21,2165  0 4450 1           TC       RELDSP
 0271   REF   51  LAST   834     21,2166  0 4626 1           TC       POSTJUMP
 0272   REF    6  LAST   580     21,2167   21062 0           CADR     PINBRNCH

 0273                            32,3626                     BANK     32
 0274   REF    2  LAST   834     32,2000                     SETLOC   ABORTS
 0275                            32,3626                     BANK

 0276   REF    2 LAST  834 TO  837:    115    115*           COUNT*   $$/P70

R0277   ***********************************************************************

 0278                            32,3626   45234 0  TGOCOMP  RTB      DSU
 0279    REF   24   LAST   814    32,3627    21603 1                      LOADTIME
 0280    REF   38   LAST   784    32,3630    03442 0                      TIG
 0281                             32,3631    77661 0             SL
 0282                             32,3632    20214 1                      I1D
 0283    REF   17   LAST   837    32,3633    03517 1             STORE    TGO
 0284                             32,3634    77616 0             RVQ

R0285    ****************************************************************

 0286    REF   32   LAST   833    32,3635   3 4730 1   THROTUP   CAF      BIT13
 0287    REF    5   LAST   791    32,3636   54 055 0             TS       THRUST
 0288    REF   39   LAST   832    32,3637   3 4741 1             CAF      BIT4
 0289                             32,3640   0 0006 1             EXTEND
 0290    REF   11   LAST   791    32,3641   05 014 1             WOR      CHAN14
 0291    REF  202   LAST   837    32,3642   0 0002 0             TC       Q

R0292 ·  ****************************************************************

 0293                             32,3643    00000 1   10SECS    2DEC     1000
 0293                             32,3644    01750 1
 0294                             32,3645    00021 1   HINJECT   2DEC     18288 B-24       60,000 FEET EXPRESSED IN METERS.
 0294                             32,3646    33400 0
 0295                             32,3647    11021 1   (TGO)A    2DEC     37000 B-17
 0295                             32,3650    00000 1
 0296                             32,3651    00507 0   K(AT)     2DEC     .02              SCALING CONSTANT
 0296                             32,3652    25605 0
 0297    REF    1                 32,3653    02114 1   WHICHADR REMADR ABRTABLE

R0298    ****************************************************************

 0299    REF   36   LAST   834    E7,1515                          EBANK=   DVCNTR
 0300    REF    2   LAST   744    32,3654    03375 0   ATMAGAD   2CADR    ATMAG
 0300                             32,3655    70067 1
 0001                           24,3644                          BANK    24
 0002    REF   1                30,2000                          SETLOC  P12
 0003                           30,2061                          BANK

 0004    REF  37  LAST  838     E7,1515                          EBANK=  DVCNTR
 0005    REF   1                                                 COUNT*  $$/P12

 0006    REF  65  LAST  837     30,2061  0 5355 1  P12LM         TC      PHASCHNG
 0007                           30,2062   04C24 0                OCT     04024

 0008    REF 227  LAST  836     30,2063  0 4607 1                TC      BANKCALL
 0009    REF   9  LAST  781     30,2064   33757 1                CADR    R02BOTH        CHECK THE STATUS OF THE IMU.

 0011    REF   3  LAST  836     30,2065  3 6000 1                CAF     THRESH2        INITIALIZE DVMON
 0012    REF   6  LAST  836     30,2066  55'250 0                TS      DVTHRUSH
 0013    REF  16  LAST  834     30,2067  3 4742 1                CAF     FOUR
 0014    REF  38  LAST  839     30,2070  55'515 0                TS      DVCNTR

 0017    REF   1                30,2071  3 3014 1                CAF     V06N33A
 0018    REF 228  LAST  839     30,2072  0 4607 1                TC      BANKCALL       FLASH TIG
 0019    REF  22  LAST  787     30,2073   20471 1                CADR    GOFLASH
 0020    REF  31  LAST  813     30,2074  1 6001 1                TCF     GOTOPOOH
 0021                           30,2075  1 2077 1                TCF     +2             PROCEED
 0022                           30,2076  1 2071 1                TCF     -5             ENTER

 0023    REF  66  LAST  839     30,2077  0 5355 1                TC      PHASCHNG
 0024                           30,2100   04024 0                OCT     04024

 0025    REF 139  LAST  836     30,2101  0 6060 1                TC      INTPRET
 0026                           30,2102   43014 0                SET     SET
 0027    REF   5  LAST  781     30,2103   03067 0                        MUNFLAG
 0028    REF   2  LAST  834     30,2104   06464 1                        ACC4-2FL
 0029                           30,2105   43014 0                SET     CLEAR
 0030    REF   1                30,2106   00075 0                        R10FLAG
 0031    REF   5  LAST  781     30,2107   C0270 1                        RNDVZFLG
 0032                           30,2110   43014 0                SET     SET
 0033    REF   1                30,2111   04464 0                        FLPI
 0034    REF   2  LAST  835     30,2112   04461 0                        FLVR
 0035   *                       30,2113   45014 0                CLEAR   CALL
 00355  *REF   2  LAST  834     30,2114   04665 0                        FLRCS
 0036    REF   2  LAST  782     30,2115   71346 0                        GUIDINIT
 0037                           30,2116   77624 1                CALL
 0038    REF   2  LAST  836     30,2117   60243 1                        P12INIT
 0039                           30,2120   77745 1  P12LM8        DLOAD
 0040    REF   1                30,2121   25650 0                        (TGO)A         SET TGO TO AN INITIAL NOMINAL VALUE.
 0041    REF  18  LAST  838     30,2122   17517 1                STODL   TGO
 0042    REF  39  LAST  838     30,2123   03442 0                        TIG
 0043    REF  46  LAST  784     30,2124   34041 0                STCALL  TDEC1
 0044    REF   9  LAST  782     30,2125   27115 1                        LEMPREC        ROTATE THE STATE VECTORS TO THE
 0045                           30,2126   64375 1                VLOAD   MXV            IGNITION TIME.
 0046   REF  21  LAST  762   30,2127   00007 0                    VATT
 0047   REF  31  LAST  803   30,2130   01732 0                    REFSMMAT
 0048                        30,2131   77772 0           VSL1
 0049   REF   2  LAST  155   30,2132   27601 0           STOVL    VIS          COMPUTE VIS = VEL(TIG)*2(-7)M/CS.
 0050   REF  25  LAST  762   30,2133   00001 0                    RATT
 0051                        30,2134   52521 0           MXV      VSL6
 0052   REF  32  LAST  840   30,2135   01732 0                    REFSMMAT
 0053   REF  15  LAST  818   30,2136   37521 0           STCALL R              COMPUTE R = POS(TIG)*2(-24)M.
 0054   REF   3  LAST  782   30,2137   67037 1                    MUNGRAV      COMPUTE GDT1/2(TIG)*2(-7)M/CS.
 0055                        30,2140   53575 0           VLOAD    UNIT
 0056   REF  16  LAST  840   30,2141   03521 1                    R
 0057   REF   9  LAST  809   30,2142   37537 1           STCALL UNIT/R/        COMPUTE UNIT/R/ FOR YCOMP.
 0058   REF   2  LAST  835   30,2143   57315 1                    YCOMP
 0059                        30,2144   57461 0           SR       DCOMP
 0060                        30,2145   20606 0                    5D
 0061   REF   4  LAST  835   30,2146   17643 0           STODL    XRANGE       INITIALIZE XRANGE FOR NOUN 76.
 0062   REF   1              30,2147   31372 0                    VINJNOM
 0063   REF   4  LAST  328   30,2150   16270 0           STODL    ZDOTD
 0064   REF   1              30,2151   31374 0                    RDOTDNOM
 0065   REF   4  LAST  835   30,2152   02264 0           STORE    RDOTD
 0066.                       30,2153   77776 1           EXIT

 0067   REF  67  LAST  839   30,2154  0 5355 1           TC       PHASCHNG
 0068                        30,2155   04024 0           OCT      04024

 0069   REF   1              30,2156  3 3013 0 NEWLOAD   CAF      V06N76       FLASH CROSS-RANGE AND APOLUNE VALUES.
 0070   REF 229  LAST  839   30,2157  0 4607 1           TC       BANKCALL
 0071   REF  23  LAST  839   30,2160   20471 1           CADR     GOFLASH
 0072   REF  32  LAST  839   30,2161  1 6001 1           TCF      GOTOPOOH
 0073                        30,2162  1 2164 1           TCF      +2           PROCEED
 0074   REF   1              30,2163  1 2156 0           TCF      NEWLOAD      ENTER NEW DATA.

 0075   REF   1              30,2164  3 2306 0           CAF      P12ADRES
 0076   REF  28  LAST  834   30,2165   55455 0           TS       WHICH

 0077   REF  68  LAST  840   30,2166  0 5355 1           TC       PHASCHNG
 0078                        30,2167   04024 0           OCT      04024

 0079   REF 140  LAST  839   30,2170  0 6060 1           TC       INTPRET
 0080                        30,2171   54345 1           DLOAD    SL
 0081   REF   5  LAST  840   30,2172   03643 0                    XRANGE
 0082                        30,2173   20206 1                    5D
 0083                        30,2174   77615 0           DAD
 0084   REF   4  LAST  835   30,2175   02326 1                    Y
 0085   REF   4  LAST  835   30,2176   27633 1           STOVL    YCO
 0086   REF  10  LAST  840   30,2177   03537 0                    UNIT/R/
 0087                        30,2200   53361 0           VXSC     VAD
 0088   REF   1              30,2201   31370 1                    49FPS
 0089   REF   3  LAST  840   30,2202   03601 0                    VIS
 0090   REF   7  LAST  818   30,2203   03527 1           STORE    V            V(TIPOVER) = V(IGN) + 57FPS (UNIT/R/)
```

```
0091                            30,2204   72441 0              DOT     SL1
0092   REF  11  LAST  840       30,2205   03537 0                      UNIT/R/
0093   REF   1                  30,2206   37474 1              STCALL  RDOT              RDOT * 2(-7)
0098   REF   1                  30,2207   60307 0                      ASCENT
0099                            30,2210   77745 1   P12RET     DLOAD
0100   REF   2  LAST  124       30,2211   02352 1                      ATP               ATP(2)*2(18)
0101                            30,2212   65316 0              DSQ     PDDL
0102   REF   2  LAST  124       30,2213   02346 1                      ATY               ATY(2)*2(18)
0103                            30,2214   43316 1              DSQ     DAD
0104                            30,2215   75454 0              BZE     SQRT
0105   REF   1                  30,2216   60222 0                      YAWDUN
0106                            30,2217   55352 0              SL1     BDDV
0107   REF   3  LAST  841       30,2220   02346 1                      ATY
0108                            30,2221   77736 0              ARCSIN
0109   REF   3  LAST  328       30,2222   26354 1   YAWDUN     STOVL   YAW
0110   REF  17  LAST  816       30,2223   03252 1                      UNFC/2
0111                            30,2224   50256 0              UNIT    DOT
0112   REF  12  LAST  841       30,2225   03537 0                      UNIT/R/
0113                            30,2226   65552 0              SL1     ARCCOS
0114                            30,2227   77676 0              DCOMP
0115   REF   2  LAST  328       30,2230   02356 0              STORE   PITCH
0116                            30,2231   77776 1              EXIT
0117   REF  69  LAST  840       30,2232 0 5355 1               TC      PHASCHNG
0118                            30,2233   04024 0              OCT     04024

0119                            30,2234 0 0004 0               INHINT
0120   REF  41  LAST  828       30,2235 0 4665 0               TC      IBNKCALL
0121   REF   3  LAST  784       30,2236   40143 0              CADR    PFLITEDB
0122   REF  79  LAST  836       30,2237 0 5520 0               TC      DOWNFLAG
0123   REF   2  LAST  839       30,2240   00213 1              ADRES   FLPI

0124   REF  52  LAST  837       30,2241 0 4626 1               TC      POSTJUMP
0125   REF   3  LAST  785       30,2242   74130 0              CADR    BURNBABY

0126                            30,2243   77745 1   P12INIT    DLOAD                     INITIALIZE ENGINE DATA. USED FOR P12 AND
0127   REF   1                  30,2244   16013 1                      (1/DV)A           P71.
0128   REF   3  LAST  835       30,2245   03641 1              STORE   1/DV3
0129   REF   3  LAST  835       30,2246   03637 0              STORE   1/DV2
0130   REF   3  LAST  835       30,2247   17635 1              STODL   1/DV1
0131   REF   1                  30,2250   16017 0                      (AT)A
0132   REF   4  LAST  835       30,2251   16254 0              STODL   AT
0133   REF   1                  30,2252   16021 0                      (TBUP)A
0134   REF   3  LAST  835       30,2253   16262 0              STODL   TBUP
0135   REF   1                  30,2254   34013 1                      ATDECAY
0136                            30,2255   54276 0              DCOMP   SL
0137                            30,2256   20214 1                      11D
0138   REF   3  LAST  835       30,2257   02260 1              STORE   TTO
0139                            30,2260   57535 0              SLOAD   DCOMP
0140   REF   2  LAST  753       30,2261   26001 1                      APSVEX
0141                            30,2262   77702 1              SR2
```

```
 0142  REF   3  LAST  835   30,2263   02256 1            STORE  VE
 0143                       30,2264   43414 1            BOFF   RVQ
 0144  REF   3  LAST  836   30,2265   04747 1                   FLAP
 0145  REF   2  LAST  835   30,2266   60267 1                   COMMINIT
 0146                       30,2267   43345 1  COMMINIT DLOAD  DAD               INITIALIZE TARGET DATA. USED BY P12, P70
 0147  REF   1              30,2270   25646 1                   HINJECT           AND P71 IF IT DOES NOT FOLLOW P70.
 0148  REF   6  LAST  818   30,2271   02324 0                   /LAND/
 0149  REF   3  LAST  836   30,2272   17631 0            STODL  RCO
 0150  REF   8  LAST  782   30,2273   06505 1                   HI6ZEROS
 0151  REF   1              30,2274   03654 0            STORE  TXO
 0152  REF   5  LAST  840   30,2275   03633 1            STORE  YCO
 0154  REF   2  LAST  123   30,2276   26266 1            STOVL  YDOTD
 0155  REF   1              30,2277   01563 0                   VRECTCSM
 0156                       30,2300   64235 1            VXV    MXV
 0157  REF   5  LAST  251   30,2301   01555 0                   RRECTCSM
 0158  REF  33  LAST  840   30,2302   01732 0                   REFSMMAT
 0159                       30,2303   77656 1            UNIT
 0160  REF   2  LAST  127   30,2304   02600 0            STORE  QAXIS
 0161                       30,2305   77616 0            RVQ

 0162  REF   1              30,2306   02024 0  P12ADRES REMADR P12TABLE

 0163  REF   1              34,2000                      SETLOC ASENT8
 0164                       34,3346                      BANK
 0165  REF   1                                           COUNT* $$/P12

 0166                       34,3346   40220 0  GUIDINIT STQ    SETPD
 0167  REF   6  LAST  743   34,3347   01163 1                   TEMPR60
 0168                       34,3350   00001 0                   0D
 0169                       34,3351   41575 0            VLOAD  PUSH
 0170  REF   8  LAST  782   34,3352   06477 0                   UNITZ
 0171                       34,3353   41434 1            RTB    PUSH
 0172  REF  25  LAST  836   34,3354   21603 1                   LOADTIME
 0173                       34,3355   77624 1            CALL
 0174  REF   2  LAST  782   34,3356   55716 1                   RP-TO-R
 0175                       34,3357   74321 1            MXV    VXSC
 0176  REF  34  LAST  842   34,3360   01732 0                   REFSMMAT
 0177  REF   1              34,3361   16027 0                   MOONRATE
 0178  REF   5  LAST  803   34,3362   26316 1            STOVL  WM
 0179  REF   9  LAST  737   34,3363   02021 0                   RLS
 0180                       34,3364   52446 0            ABVAL  SL3
 0181  REF   7  LAST  842   34,3365   36324 1            STCALL /LAND/
 0182  REF   7  LAST  842   34,3366   01163 1                   TEMPR60

 0183                       34,3367   00046 0  49FPS    2DEC   .149352 B-6       EXPECTED RDOT AT TIPOVER
 0183                       34,3370   07374 0
 0184                       34,3371   04145 0  VINJNOM  2DEC   16.79299 B-7      5509.5 FPS(APO=30NM WITH RDOT = 19.5FPS)
 0184                       34,3372   20055 0
 0185                       34,3373   00007 0  RDOTDNOM 2DEC   .059436 B-7       19.5 FPS
 0185                       34,3374   23346 1
```

```
L         ASCENT GUIDANCE                                                                             USER'S PAGE NO.    1       FO S3

 0001                          34,3375                           BANK    34
 0002   REF    1               34,2000                           SETLOC ASCFILT
 0003                          34,3375                           BANK

 0004   REF   39  LAST   839   F7,1515                           EBANK= DVCNTR

 0005   REF    1                                                 COUNT* $$/ASENT

 0006   REF   70  LAST   841   34,3375  0 5355 1  ATMAG          TC      PHASCHNG
 0007                          34,3376   00035 1                 OCT     00035
 0008   REF  141  LAST   840   34,3377  0 6060 1                 TC      INTPRET
 0009                          34,3400   77614 1                 BON
 0010   REF    3  LAST   839   34,3401   04705 1                         FLRCS
 0011   REF    2  LAST   841   34,3402   60307 0                         ASCENT
 0012                          34,3403   45345 1                 DLOAD   DSU
 0013   REF    2  LAST   154   34,3404   03514 1                         ABDVCONV
 0014   REF    1               34,3405   26116 0                         MINABDV
 0015                          34,3406   43040 1                 BMN     CLEAR
 0016   REF    1               34,3407   60750 0                         ASCTERM4
 0017   REF   16  LAST   787   34,3410   04267 0                         SURFFLAG
 0018                          34,3411   67214 1                 CLEAR   SLOAD
 0019   REF   10  LAST   615   34,3412   02676 1                         RENDWFLG
 0020   REF    1               34,3413   31451 0                         BIT3H
 0021                          34,3414   77471 0                 DDV     EXIT
 0022   REF    3  LAST   844   34,3415   03514 1                         ABDVCONV
 0023   REF  327  LAST   827   34,3416  52 155 1                 DXCH    MPAC
 0024   REF    4  LAST   841   34,3417  53'641 1                 DXCH    1/DV3
 0025   REF    4  LAST   841   34,3420  53'637 0                 DXCH    1/DV2
 0026   REF    4  LAST   841   34,3421  53'635 1                 DXCH    1/DV1
 0027   REF    1               34,3422  53'571 1                 DXCH    1/DV0
 0028   REF  142  LAST   844   34,3423  0 6060 1                 TC      INTPRET
 0029                          34,3424   43345 1                 DLOAD   DAD
 0030   REF    2  LAST   844   34,3425   03571 1                         1/DV0
 0031   REF    5  LAST   844   34,3426   03635 1                         1/DV1
 0032                          34,3427   43215 0                 DAD     DAD
 0033   REF    5  LAST   844   34,3430   03637 0                         1/DV2
 0034   REF    5  LAST   844   34,3431   03641 1                         1/DV3
 0035                          34,3432   41205 0                 DMP     DMP
 0036   REF    4  LAST   842   34,3433   02256 1                         VE
 0037   REF    1               34,3434   21011 1                         2SEC(9)
 0038                          34,3435   65252 1                 SL3     PDDL
 0039   REF    4  LAST   841   34,3436   02262 0                         TBUP
 0040                          34,3437   43342 0                 SR1     DAD
 0041                          34,3440   77625 0                 DSU
 0042   REF    1               34,3441   21006 1                         6SEC(18)
 0043   REF    5  LAST   844   34,3442   16262 0                 STODL   TBUP
 0044   REF    5  LAST   844   34,3443   02256 1                         VE
 0045                          34,3444   56342 1                 SR1     DDV
 0046   REF    6  LAST   844   34,3445   02262 0                         TBUP
 0047   REF    5  LAST   841   34,3446   36254 1                 STCALL  AT
 0048    REF   3  LAST  844   34,3447   60307 0                    ASCENT
 0049                         34,3450   00004 0  BIT3H     OCT     4
```

```
P0050


 0051                          30,2307                            BANK    30
 0052    REF   2  LAST   40    30,2000                            SETLOC  ASENT
 0053                          30,2307                            BANK
 0054    REF   2 LAST    40 TO  40:      2       2*               COUNT*  $$/ASENT


 0055                          30,2307   51575 1  ASCENT          VLOAD   ABVAL
 0056    REF  17  LAST  840    30,2310   03521 1                          R
 0057    REF   2  LAST  124    30,2311   26272 1                  STOVL   /R/MAG
 0058    REF  13  LAST  841    30,2312   03537 0                          UNIT/R/
 00581                         30,2313   53435 0                  VXV     UNIT
 00582   REF   3  LAST  842    30,2314   02600 0                          QAXIS
 00583   REF   1               30,2315   02606 0                  STORE   ZAXIS1
 0059                          30,2316   72441 0                  DOT     SL1
 0060    REF   8  LAST  840    30,2317   03527 1                          V              Z.V = ZDOT*2(-8).
 0061    REF   2  LAST  124    30,2320   26304 1                  STOVL   ZDOT           ZDOT*2(-7)
 0062    REF   2  LAST  846    30,2321   02606 0                          ZAXIS1
 0063                          30,2322   76435 1                  VXV     VSL1
 0064    REF  14  LAST  846    30,2323   03537 0                          UNIT/R/        Z X UR = LAXIS*2(-2)
 0065    REF   2  LAST  124    30,2324   02274 1                  STORE   LAXIS          LAXIS*2(-1)
 0066                          30,2325   72441 0                  DOT     SL1
 0067    REF   9  LAST  846    30,2326   03527 1                          V              L.V = YDOT*2(-8).
 0068    REF   2  LAST  124    30,2327   36302 0                  STCALL  YDOT           YDOT * 2(-7)
 0069    REF   3  LAST  840    30,2330   57315 1                          YCOMP
 0070                          30,2331   77775 1                  VLOAD
 0071    REF   2  LAST  154    30,2332   03563 1                          GDT1/2         LOAD GDT1/2*2(-7)M/CS.
 0072                          30,2333   50341 1                  V/SC    DOT
 0073    REF   1               30,2334   27053 1                          2SEC(18)
 0074    REF  15  LAST  846    30,2335   03537 0                          UNIT/R/        G.UR*2(9) = GR*2(9).
 0075                          30,2336   47315 0                  PDVL    VXV            STORE IN PDL(0)                   (2)
 0076    REF  16  LAST  846    30,2337   03537 0                          UNIT/R/        LOAD UNIT/R/*2(-1).
 0077    REF  10  LAST  846    30,2340   03527 1                          V              UR*2(-1) X V*2(-7) = H/R*2(-8).
 0078                          30,2341   56236 0                  VSQ     DDV            H(2)/R(2)*2(-16).
 0079    REF   3  LAST  846    30,2342   02272 1                          /R/MAG         H(2)/R(3)*2(9).
 0080                          30,2343   43352 1                  SL1     DAD
 0081                          30,2344   77626 0                  STADR
 0082    REF   2  LAST  124    30,2345   75471 1                  STORE   GEFF           GEFF*2(10)M/CS/CS
 0083                          30,2346   45014 0                  BOFF    CALL           IF P7071FLG = 1 (I.E. P70 OR P71)
 0084    REF   2  LAST  834    30,2347   04742 1                          P7071FLG           CALL ZDOTDCMP TO UPDATE ZDOTD
 0085                          30,2350   60352 0                          +2                 ON THE BASIS OF THE LAST PP.
 0086    REF   1               30,2351   71620 0                          ZDOTDCMP
 0087                          30,2352   45345 1     +2           DLOAD   DSU
 0088    REF   5  LAST  840    30,2353   02270 0                          ZDOTD
 0089    REF   3  LAST  846    30,2354   02304 1                          ZDOT
 0090    REF   2  LAST  124    30,2355   02334 1                  STORE   DZDOT          DZDOT = (ZDOTD - ZDOT)*2(7)M/CS.
 0091                          30,2356   65361 0                  VXSC    PDDL
 0092    REF   3  LAST  846    30,2357   02606 0                          ZAXIS1
 0093  REF   3  LAST  842   30,2360   02266 1                   YDOTD
 0094                       30,2361   77625 0          DSU
 0095  REF   3  LAST  846   30,2362   02302 1                   YDOT
 0096  REF   2  LAST  124   30,2363   02332 1          STORE    DYDOT       DYDOT  =  (YDOTD  -  YDOT)*2(7)M/CS.
 0097                       30,2364   65361 0          VXSC     PDDL
 0098  REF   3  LAST  846   30,2365   02274 1                   LAXIS
 0099  REF   5  LAST  840   30,2366   02264 0                   RDOTD
 0100                       30,2367   77625 0          DSU
 0101  REF   2  LAST  841   30,2370   03474 0                   RDOT
 0102  REF   2  LAST  124   30,2371   02330 0          STORE    DRDOT       DRDOT  =  (RDOTD  -  RDOT)*2(7)M/CS.
 0103                       30,2372   53361 0          VXSC     VAD
 0104  REF  17  LAST  846   30,2373   03537 0                   UNIT/R/
 0105                       30,2374   76455 1          VAD      VSL1
 0106                       30,2375   77626 0          STADR
 0107  REF   3  LAST  212   30,2376   74131 1          STORE    VGVECT      VG  =  (DRDOT)R  +  (DYDOT)L  +  (DZDOT)Z.
 0108                       30,2377   41345 0          DLOAD    DMP         LOAD TGO
 0109  REF  19  LAST  839   30,2400   03517 1                   TGO         TGO GEFF
 0110  REF   3  LAST  846   30,2401   02306 0                   GEFF
 0111                       30,2402   76561 1          VXSC     VSL1
 0112  REF  18  LAST  847   30,2403   03537 0                   UNIT/R/     TGO GEFF UR
 0113                       30,2404   77645 0          BVSU
 0114  REF   4  LAST  847   30,2405   03646 0                   VGVECT      COMPENSATED FOR GEFF
 0115  REF   5  LAST  847   30,2406   03646 0          STORE    VGVECT      STORE FOR DOWNLINK
 0116                       30,2407   76521 0          MXV      VSL1        GET VGBODY FOR N85 DISPLAY
 0117  REF   4  LAST  809   30,2410   02137 0                   XNBPIP
 0118  REF  12  LAST  753   30,2411   27502 0          STOVL    VGBODY
 0119  REF   6  LAST  847   30,2412   03646 0                   VGVECT
 0120                       30,2413   43046 1          ABVAL    BOFF        MAGNITUDE OF VGVECT
 0121  REF   4  LAST  844   30,2414   04745 0                   FLRCS       IF FLRCS=0,DO NORMAL GUIDANCE
 0122  REF   1              30,2415   60424 0                   MAINENG
 0123                       30,2416   77671 1          DDV                  USE TGO=VG/AT   WITH RCS
 0124  REF   1              30,2417   20001 1                   AT/RCS
 0125  REF  20  LAST  847   30,2420   37517 0          STCALL   TGO         THIS WILL BE USED ON NEXT CYCLE
 0126  REF   1              30,2421   71571 1                   RPCOMP1     COMPUTE NEW RP FOR NEXT CYCLE.
 0127                       30,2422   77650 1          GOTO
 0128  REF   1              30,2423   60746 1                   ASCTERM2
 0129                       30,2424   41471 0  MAINENG DDV      PUSH        VG/VE  IN PDL(0)                        (2)
 0130  REF   6  LAST  844   30,2425   02256 1                   VE
 0131                       30,2426   44342 1          SR1      BDSU        1 - VG / 2 VE
 0132  REF   1              30,2427   17774 0                   NEARONE
 0133                       30,2430   41205 0          DMP      DMP         TBUP VG(1-KT VG/VE)/VE                  (0)
 0134  REF   7  LAST  844   30,2431   02262 0                   TBUP         = TGO
 0135                       30,2432   77625 0          DSU                  COMPENSATE FOR TAILOFF
 0136  REF   4  LAST  841   30,2433   02260 1                   TTO
 0137  REF  21  LAST  847   30,2434   03517 1          STORE    TGO
 0138                       30,2435   57461 0          SR       DCOMP
 0139                       30,2436   20614 0                   11D
 0140  REF  27  LAST  752   30,2437   17454 1          STODL    TTOGO       TGO*2(-28)CS
 0141  REF  22  LAST  847   30,2440   03517 1                   TGO
 0142                       30,2441   45214 1          BON      DSU
```

```
0143  REF   6  LAST  834   30,2442   03710 1                     IDLEFLAG
0144  REF   1              30,2443   60447 0                     T2TEST
0145  REF   1              30,2444   21000 1                     4SEC(17)        ( TGO - 4 )*2(-17)CS.
0146                       30,2445   77640 0           BMN
0147  REF   1              30,2446   71457 1                     ENGOFF
0148                       30,2447   77745 1  T2TEST   DLOAD
0149  REF  23  LAST  847   30,2450   03517 1                     TGO
0150                       30,2451   50025 0           DSU       BMN             IF TGO - T2 NEG., GO TO CMPONENT
0151  REF   1              30,2452   21002 0                     T2A
0152  REF   1              30,2453   60607 0                     CMPONENT
0153                       30,2454   45345 1           DLOAD     DSU
0154  REF   8  LAST  847   30,2455   02262 0                     TBUP
0155  REF  24  LAST  848   30,2456   03517 1                     TGO
0156                       30,2457   45071 0           DDV       CALL            1-TGO/TBUP
0157  REF   9  LAST  848   30,2460   02262 0                     TBUP
0158  REF   1              30,2461   61015 1                     LOGSUB
0159                       30,2462   41461 1           SL        PUSH            -L IN PDL(0)                              (2)
0160                       30,2463   20206 1                     5
0161                       30,2464   44265 0           BDDV      BDSU            -TGO/L*2(-17)
0162  REF  25  LAST  848   30,2465   03517 1                     TGO
0163  REF  10  LAST  848   30,2466   02262 0                     TBUP            TBUP + TGO/L = D12*2(-17)
0164                       30,2467   43006 0           PUSH      BON             STORE IN PDL(2)                           (4)
0165  REF   1              30,2470   04703 1                     FLPC            IF FLPC = 1, GO TO CONST
0166  REF   1              30,2471   60500 1                     NORATES
0167                       30,2472   45345 1           DLOAD     DSU
0168  REF  26  LAST  848   30,2473   03517 1                     TGO
0169  REF   1              30,2474   21004 0                     T3
0170                       30,2475   43044 0           BPL       SET             FLPC=1
0171  REF   1              30,2476   60505 1                     RATES
0172  REF   2  LAST  846   30,2477   04463 1                     FLPC
0173                       30,2500   77745 1  NORATES  DLOAD
0174  REF   9  LAST  842   30,2501   06505 1                     HI6ZEROS
0175  REF   2  LAST  124   30,2502   02342 0           STORE     PRATE           B = 0
0176  REF   2  LAST  124   30,2503   36344 1           STCALL    YRATE           D = 0
0177  REF   1              30,2504   60567 0                     CONST           GO TO CONST
0178                       30,2505   45345 1  RATES    DLOAD     DSU
0179  REF  27  LAST  848   30,2506   03517 1                     TGO
0180                       30,2507   00003 1                     02D             TGO - D12 = D21*2(-17)
0181                       30,2510   72406 0           PUSH      SL1             IN PDL(4)                                 (6)
0182                       30,2511   52421 1           BDSU      SL3             (1/2TGO - D21)*2(-13) = E * 2(-13)
0183  REF  28  LAST  848   30,2512   03517 1                     TGO                                                       (8)
0184                       30,2513   41325 0           PDDL      DMP             IN PDL(6)
0185  REF  29  LAST  848   30,2514   03517 1                     TGO
0186  REF   3  LAST  847   30,2515   03474 0                     RDOT            RDOT TGO * 2(-24)
0187                       30,2516   45215 0           DAD       DSU             R + RDOT TGO
0188  REF   4  LAST  846   30,2517   02272 1                     /R/MAG          R + RDOT TGO - RCO
0189  REF   4  LAST  842   30,2520   03631 0                     RCO             MPAC = - DR*2(-24).
0190                       30,2521   41325 0           PDDL      DMP             -DR IN PDL(8)                             (10)
0191  REF   3  LAST  847   30,2522   02330 0                     DRDOT
0192                       30,2523   00005 1                     04D             D21 DRDOT*2(-24)
```

```
0193                              30,2524  62415 0            DAD    SL2        (D21 DRDOT-DR)*2(-22)               (8)
0194                              30,2525  56271 0            DDV    DDV
0195                              30,2526  00007 0                   06D        (D21 DRDOT-DR)/E*2(-9)
0196  REF  30  LAST  848          30,2527  03517 1                   TGO
0197  REF   3  LAST  848          30,2530  02342 0            STORE  PRATE      B * 2(8)
0198                              30,2531  71240 1            BMN    DLOAD      B>0 NOT PERMITTED
0199  REF   1                     30,2532  60536 1                   CHKBMAG
0200  REF  10  LAST  848          30,2533  06505 1                   HI6ZEROS
0201  REF   4  LAST  849          30,2534  36342 1            STCALL PRATE
0202  REF   1                     30,2535  60550 1                   PROK
0203                              30,2536  56202 1  CHKBMAG   SR4    DDV        B*2(4)
0204  REF  11  LAST  848          30,2537  02262 0                   TBUP       (B / TAU) * 2(21)
0205                              30,2540  51025 1            DSU    BPL
0206  REF   1                     30,2541  26114 1                   PRLIMIT    ( B/ TAU) * 2(21) MAX.
0207  REF   2  LAST  849          30,2542  60550 1                   PROK
0208                              30,2543  41345 0            DLOAD  DMP
0209  REF   2  LAST  849          30,2544  26114 1                   PRLIMIT
0210  REF  12  LAST  849          30,2545  02262 0                   TBUP       B MAX. * 2(4)
0211                              30,2546  77612 1            SL4               BMAX*2(8)
0212  REF   5  LAST  849          30,2547  02342 0            STORE  PRATE
0213                              30,2550  77745 1  PROK      DLOAD
0214  REF  31  LAST  849          30,2551  03517 1                   TGO
0215                              30,2552  43205 1            DMP    DAD        YDOT TGO
0216  REF   4  LAST  847          30,2553  02302 1                   YDOT
0217  REF   5  LAST  840          30,2554  02326 1                   Y          Y + YDOT TGO
0218                              30,2555  65225 1            DSU    PDDL       Y + YDOT TGO - YCO
0219  REF   6  LAST  842          30,2556  03633 1                   YCO        MPAC = - DY*2(-24.) IN PDL(8)      (10)
0220  REF   3  LAST  847          30,2557  02332 1                   DYDOT
0221                              30,2560  43205 1            DMP    DAD        D21 DYDOT - DY                     (8)
0222                              30,2561  00005 1                   04D
0223                              30,2562  56312 1            SL2    DDV        (D21 DYDOT - DY)/E*2(-9)
0224                              30,2563  40271 1            DDV    SETPD      (D21 DYDOT - DY)/E TGO*2(8)
0225  REF  32  LAST  849          30,2564  03517 1                   TGO          = D*2(8)
0226                              30,2565  00005 1                   04
0227  REF   3  LAST  848          30,2566  02344 0            STORE  YRATE
0228                              30,2567  41345 0  CONST     DLOAD  DMP        LOAD B*2(8)
0229  REF   6  LAST  849          30,2570  02342 0                   PRATE      B D12*2(-9)
0230                              30,2571  00003 1                   02D
0231                              30,2572  56325 0            PDDL   DDV        D12 B  IN PDL(4)                   (6)
0232  REF   4  LAST  848          30,2573  02330 0                   DRDOT      LOAD DRDOT*2(-7)
0233                              30,2574  00001 0                   00D        -DRDOT/L*2(-7)
0234                              30,2575  45302 1            SR2    DSU        (-DRDOT/L-D12 B)=A*2(-9)            (4)
0235                              30,2576  77626 0            STADR
0236  REF   2  LAST  124          30,2577  61441 1            STODL  PCONS
0237  REF   4  LAST  849          30,2600  02344 0                   YRATE      D*2(8)
0238                              30,2601  65205 0            DMP    PDDL       D12 D,EXCH WITH -L IN PDL(0)       (2,2)
0239                              30,2602  60465 0            BDDV   SR2        -DYDOT/L*2(-9)
0240  REF   4  LAST  849          30,2603  02332 1                   DYDOT
0241                              30,2604  77625 0            DSU               (-DYDOT/L-D12 D)=C*2(-9)
0242                              30,2605  00001 0                   00D
```

```
0243    REF   2  LAST  124  30,2606    02340 1            STORE  YCONS
0244                        30,2607    43001 1  CMPONENT  SETPD  BOFF
0245                        30,2610    00001 0                   00D
0246    REF   3  LAST  846  30,2611    04742 1                   P7071FLG
0247                        30,2612    60615 0                   +3              IF P7071FLG = 1 (I.E. P70 OR P71)
0248                        30,2613    77624 1            CALL                       COMPUTE NEW RP FOR NEXT CYCLE.
0249    REF   1             30,2614    71575 0                   RPCOMP2
0250                        30,2615    41345 0     +3     DLOAD  DMP
0251    REF   1             30,2616    27053 1                   100CS
0252    REF   7  LAST  849  30,2617    02342 0                   PRATE           B(T-TO)*2(-9)
0253                        30,2620    56215 1            DAD    DDV             (A+B(T-TO))*2(-9)
0254    REF   3  LAST  849  30,2621    02336 0                   PCONS           (A+B(T-TO))/TBUP*2(8)
0255    REF  13  LAST  849  30,2622    02262 0                   TBUP
0256                        30,2623    45352 1            SL1    DSU
0257    REF   4  LAST  847  30,2624    02306 0                   GEFF            ATR*2(9)
0258    REF   2  LAST  124  30,2625    16350 0            STODL  ATR
0259    REF   2  LAST  850  30,2626    27053 1                   100CS
0260                        30,2627    43205 1            DMP    DAD
0261    REF   5  LAST  849  30,2630    02344 0                   YRATE
0262    REF   3  LAST  850  30,2631    02340 1                   YCONS           (C+D(T-TO))*2(-9)
0263                        30,2632    72471 0            DDV    SL1
0264    REF  14  LAST  850  30,2633    02262 0                   TBUP
0265    REF   4  LAST  841  30,2634    02346 1            STORE  ATY             ATY*2(9)
0266                        30,2635    65361 0            VXSC   PDDL            ATY UY*2(8)                        (6)
0267    REF   4  LAST  847  30,2636    02274 1                   LAXIS
0268    REF   3  LAST  850  30,2637    02350 0                   ATR
0269                        30,2640    53361 0            VXSC   VAD                                                (0)
0270    REF  19  LAST  847  30,2641    03537 0                   UNIT/R/
0271                        30,2642    41572 1            VSL1   PUSH            AH*2(9) IN PDL(0)                  (6)
0272                        30,2643    65246 1            ABVAL  PDDL            AH(2) IN PDL(34)
0273    REF   6  LAST  844  30,2644    02254 0                   AT              AHMAG IN PDL(6)                    (8)
0274                        30,2645    45316 1            DSQ    DSU             (AT(2)-AH(2))*2(18)
0275                        30,2646    00043 0                   34D             =ATP2*2(18)
0276                        30,2647    41525 0            PDDL   PUSH                                               (12)
0277    REF   7  LAST  850  30,2650    02254 0                   AT
0278                        30,2651    45316 1            DSQ    DSU             (AT(2)KR(2)-AH(2))*2(18)           (10)
0279                        30,2652    00043 0                   34D             =ATP3*2(18)
0280                        30,2653    71240 1            BMN    DLOAD           IF ATP3 NEG,GO TO NO-ATP
0281    REF   1             30,2654    60660 1                   NO-ATP          LOAD ATP2,IF ATP3 POS
0282                        30,2655    00011 1                   3D
0283                        30,2656    52166 1            SQRT   GOTO            ATP*2(9)
0284    REF   1             30,2657    60666 1                   AIMER
0285                        30,2660    55345 0  NO-ATP    DLOAD  BDDV            KR AT/AH = KH                      (8)
0286                        30,2661    00007 0                    6D
0287                        30,2662    77761 1            VXSC                   KH AH*2(9)
0288                        30,2663    00001 0                   00D
0289                        30,2664    14001 0            STODL  00D             STORE NEW AH IN PDL(0)
0290    REF  11  LAST  849  30,2665    06505 1                   HI6ZEROS
0291                        30,2666    77765 0  AIMER     SIGN
0292    REF   3  LAST  846  30,2667    02334 1                   DZDOT
```

```
0293   REF   3  LAST  841   30,2670   02352 1               STORE  ATP
0294                        30,2671   77761 1               VXSC
0295   REF   4  LAST  846   30,2672   02606 0                      ZAXIS1          ATP ZAXIS *2(8).
0296                        30,2673   53372 1               VSL1   VAD             AT*2(9)
0297                        30,2674   00001 0                      00D
0298   REF  18  LAST  841   30,2675   03252 1               STORE  UNFC/2          WILL BE OVERWRITTEN IF IN VERT. RISE.
0299                        30,2676   43001 1               SETPD  BON
0300                        30,2677   00001 0                      00D
0301   REF   3  LAST  841   30,2700   04704 0                      FLPI
0302   REF   1              30,2701   60210 1                      P12RET
0303                        30,2702   77614 1               BON
0304   REF   3  LAST  839   30,2703   04701 0                      FLVR
0305   REF   1              30,2704   60755 0                      CHECKALT
0306                        30,2705   57575 1     MAINLINE  VLOAD  VCOMP
0307   REF  20  LAST  850   30,2706   03537 0                      UNIT/R/
0308   REF   7  LAST  810   30,2707   17260 0               STODL  UNWC/2
0309   REF   2  LAST  842   30,2710   03654 0                      TXO
0310                        30,2711   51025 1               DSU    BPL
0311   REF  17  LAST  818   30,2712   01234 0                      PIPTIME
0312   REF   1              30,2713   60721 0                      ASCTERM
0313                        30,2714   77614 1               BON
0314   REF   2  LAST  836   30,2715   04711 1                      ROTFLAG
0315   REF   1              30,2716   57275 0                      ANG1CHEK
0316                        30,2717   77614 1     CLRXFLAG  CLEAR
0317   REF   4  LAST  798   30,2720   06666 1                      XOVINFLG           (XOVINFLG)
0322                        30,2721   77776 1     ASCTERM   EXIT
0323   REF   6  LAST  837   30,2722  3 0105 0               CA     FLAGWRD9
0324   REF   1              30,2723  7 4733 0               MASK   FLRCSBIT
0325   REF 235  LAST  837   30,2724  10 000 0               CCS    A
0326   REF   1              30,2725  1 2747 0               TCF    ASCTERM3
0327   REF 143  LAST  844   30,2726  0 6060 1               TC     INTPRET
0328                        30,2727   77624 1               CALL
0329   REF   4  LAST  816   30,2730   61072 0                      FINDCDUW -2
0330                        30,2731   77776 1     ASCTERM1  EXIT
0331   REF   7  LAST  851   30,2732  3 0105 0       +1      CA     FLAGWRD9        INSURE THAT THE NOUN 63 DISPLAY IS
0332   REF   2  LAST  851   30,2733  7 4733 0               MASK   FLRCSBIT        BYPASSED IF WE ARE IN THE RCS TRIMMING
0333   REF 236  LAST  851   30,2734  10 000 0               CCS    A               MODE OF OPERATION
0334   REF   2  LAST  851   30,2735  1 2747 0               TCF    ASCTERM3
0335   REF  13  LAST  811   30,2736  3 0104 1               CA     FLAGWRD8        BYPASS DISPLAYS IF ENGINE FAILURE IS
0336   REF   3  LAST  811   30,2737  7 4733 0               MASK   FLUNDBIT        INDICATED.
0337   REF 237  LAST  851   30,2740  10 000 0               CCS    A
0338   REF   3  LAST  851   30,2741  1 2747 0               TCF    ASCTERM3
03385  REF   5  LAST  812   30,2742  0 5156 0               TC     VACRLEAS
0339   REF   1              30,2743  3 3012 1               CAF    V06N94
0340   REF 230  LAST  840   30,2744  0 4607 1               TC     BANKCALL
0341   REF   1              30,2745   20436 1               CADR   GODSP
0342                        30,2746   77776 1     ASCTERM2  EXIT
0343   REF 129  LAST  836   30,2747  1 5146 0     ASCTERM3  TCF    ENDOFJOB
0344                        30,2750   77776 1     ASCTERM4  EXIT
0345                        30,2751  0 0004 0               INHINT
```

```
 0346   REF  42  LAST  841   30,2752  0 4665 0            TC      IBNKCALL        NO GUIDANCE THIS CYCLE -- HENCE ZERO
 0347   REF   7  LAST  828   30,2753   40166 1            CADR    STOPRATE        THE DAP COMMANDED RATES.
 0348   REF   1              30,2754  1 2732 1            TCF     ASCTERM1 +1

 0349                        30,2755   45345 1  CHECKALT  DLOAD   DSU
 0350   REF   5  LAST  848   30,2756   02272 1                    /R/MAG
 0351   REF   8  LAST  842   30,2757   02324 0                    /LAND/
 0352                        30,2760   50025 0            DSU     BMN             IF H LT 25K CHECK Z AXIS ORIENTATION.
 0353   REF   1              30,2761   26120 0                    25KFT
 0354   REF   1              30,2762   46453 1                    CHECKYAW
 0355                        30,2763   43014 0  EXITVR    CLEAR   BON
 0356   REF   4  LAST  851   30,2764   04661 1                    FLVR
 0357   REF   3  LAST  851   30,2765   04711 1                    ROTFLAG
 0358   REF   1              30,2766   60705 0                    MAINLINE
 0359                        30,2767   43345 1            DLOAD   DAD
 0360   REF  18  LAST  851   30,2770   01234 0                    PIPTIME
 0361   REF   1              30,2771   25644 0                    10SECS
 0362   REF   3  LAST  851   30,2772   37654 1            STCALL  TXO
 0363   REF   2  LAST  852   30,2773   60705 0                    MAINLINE
 0364                        30,2774   77614 1  EXITVR1   CLRGO
 0365   REF   4  LAST  852   30,2775   04631 1                    ROTFLAG
 0366   REF   1              30,2776   60763 0                    EXITVR

 0367   REF   3  LAST   46   27,2000                      SETLOC  ASENT1
 0368                        27,3275                      BANK
 0369   REF   1                                           COUNT*  $$/ASENT

 0370                        27,3275   53575 0  ANGICHEK  VLOAD   UNIT
 0371   REF  19  LAST  851   27,3276   03252 1                    UNFC/2
 03715                       27,3277   77641 1            DOT
 0372   REF   5  LAST  847   27,3300   02137 0                    XNBPIP
 0373                        27,3301   51025 1            DSU     BPL
 0374   REF   2  LAST  127   27,3302   02566 0                    COSTHET1
 0375   REF   1              27,3303   57312 0                    OFFROT
 0376                        27,3304   50375 0            VLOAD   DOT
 0377   REF   6  LAST  852   27,3305   02137 0                    XNBPIP
 0378   REF  21  LAST  851   27,3306   03537 0                    UNIT/R/
 0379                        27,3307   50025 0            DSU     BMN
 0380   REF   2  LAST  127   27,3310   02570 1                    COSTHET2
 0381   REF   1              27,3311   71453 0                    KEEPVR1
 0382                        27,3312   77614 1  OFFROT    CLRGO
 0383   REF   5  LAST  852   27,3313   04631 1                    ROTFLAG
 0384   REF   1              27,3314   60717 0                    CLRXFLAG

 0386   REF   1              23,2000                      SETLOC  ASENT7
 0387                        23,2453                      BANK
 0388   REF   1                                           COUNT*  $$/ASENT

 0389   REF   2  LAST  852   23,2453            SETXFLAG  =       CHECKYAW
```

```
0390                           23,2453   77614 1  CHECKYAW SET
0391   REF    5  LAST   851    23,2454   06466 0                    XOVINFLG            PROHIBIT X-AXIS OVERRIDE
0392                           23,2455   74345 0           DLOAD    VXSC
0393   REF    5  LAST   850    23,2456   02346 1                    ATY
0394   REF    5  LAST   850    23,2457   02274 1                    LAXIS
0395                           23,2460   74325 0           PDDL     VXSC
0396   REF    4  LAST   851    23,2461   02352 1                    ATP
0397   REF    5  LAST   851    23,2462   02606 0                    ZAXIS1
0398                           23,2463   53455 0           VAD      UNIT
0399                           23,2464   45325 1           PDDL     DSU
0400   REF    4  LAST   848    23,2465   03474 0                    RDOT
0401   REF    1                23,2466   06473 1                    40FPS
0402                           23,2467   52044 0           BPL      GOTO
0403   REF    1                23,2470   60774 0                    EXITVR1
0404   REF    1                23,2471   71451 1                    KEEPVR

0409                         . 23,2472   00017 1  40FPS    2DEC     0.12192 B-7
0409                           23,2473   23305 0
0410                           34,3451                     BANK     34
0411   REF    2  LAST   842    34,2000                     SETLOC   ASENT8
0412                           34,3451                     BANK
0413   REF    2 LAST   844 TO   846:      44      44*      COUNT*   $$/ASENT

0414                           34,3451   45575 1  KEEPVR   VLOAD    STADR               RECALL LOSVEC FROM PUSHLIST
0415   REF    8  LAST   851    34,3452   74517 1           STORE    UNWC/2
0416                           34,3453   77775 1  KEEPVR1  VLOAD
0417   REF   22  LAST   852    34,3454   03537 0                    UNIT/R/
0418   REF   20  LAST   852    34,3455   37252 0           STCALL   UNFC/2
0419   REF    2  LAST   851    34,3456   60721 0                    ASCTERM


0424                           34,3457   77634 0  ENGOFF   RTB
0425   REF   26  LAST   842    34,3460   21603 1                    LOADTIME
0426                           34,3461   43225 0           DSU      DAD
0427   REF   19  LAST   852    34,3462   01234 0                    PIPTIME
0428   REF   28  LAST   847    34,3463   03454 1                    TTOGO
0429                           34,3464   77476 1           DCOMP    EXIT
0430   REF   11  LAST   793    34,3465  0 7300 0           TC       TPAGREE             FORCE SIGN AGREEMENT ON MPAC, MPAC +1.
0431   REF   12  LAST   815    34,3466  3 5007 0           CAF      EBANK7
0432   REF   43  LAST   829    34,3467  54 003 0           TS       EBANK
0433   REF   33  LAST   849    E7,1516                     EBANK=   TGO
0434                           34,3470  0 0004 0           INHINT
0435   REF  328  LAST   844    34,3471  10 155 1           CCS      MPAC +1
0436                           34,3472  1 3475 0           TCF      +3                  C(A) = DT - 1 BIT
0437                           34,3473  1 3475 0           TCF      +2                  C(A) = 0
0438   REF  160  LAST   832    34,3474  3 4746 0           CAF      ZERO                C(A) = 0
0439   REF   42  LAST   832    34,3475  6 4744 1           AD       BIT1                C(A) = 1 BIT OR DT.
0440   REF    2  LAST   160    34,3476  55'644 1           TS       ENGOFFDT
0441   REF   25  LAST   831    34,3477  0 5175 1           TC       TWIDDLE
0442   REF    1                34,3500   03512 1           ADRES    ENGOFF1
```

```
0443  REF  71  LAST  844   34,3501  0 5355 1              TC       PHASCHNG
0444                       34,3502   47014 1              OCT      47014
0445  REF   3  LAST  853   34,3503   76133 1             -GENADR   ENGOFFDT
0446  REF  34  LAST  853   E7,1516                        EBANK=   TGO
0447  REF   2  LAST  853   34,3504   03512 1              2CADR    ENGOFF1
0447                       34,3505   70067 1
0448  REF 144  LAST  851   34,3506  0 6060 1              TC       INTPRET
0449                       34,3507   52014 0              SET      GOTO
0450  REF   7  LAST  848   34,3510   03470 1                       IDLEFLAG         DISABLE DELTA-V MONITOR
0451  REF   2  LAST  848   34,3511   60447 0                       T2TEST

0452  REF  43  LAST  852   34,3512  0 4665 0  ENGOFF1     TC       IBNKCALL         SHUT OFF THE ENGINE.
0453  REF   1              34,3513   75552 1              CADR     ENGINOF2

0454  REF   5  LAST  836   34,3514  3 5020 0              CAF      PRIO17           SET UP A JOB FOR THE ASCENT GUIDANCE
0455  REF  21  LAST  777   34,3515  0 5063 1              TC       NOVAC
0456  REF  29  LAST  840   E7,1455                        EBANK=   WHICH
0457  REF   3  LAST  742   34,3516   03526 0              2CADR    CUTOFF
0457                       34,3517   70067 1
0458  REF  72  LAST  854   34,3520  0 5355 1              TC       PHASCHNG
0459                       34,3521   07024 0              OCT      07024
0460                       34,3522   17000 1              OCT      17000
0461  REF  35  LAST  854   E7,1516                        EBANK=   TGO
0462  REF   4  LAST  854   34,3523   03526 0              2CADR    CUTOFF
0462                       34,3524   70067 1
0463  REF  57  LAST  831   34,3525  1 5263 1              TCF      TASKOVER

0464  REF  58  LAST  836   34,3526  0 5506 1  CUTOFF      TC       UPFLAG           SET FLRCS FLAG.
0465  REF   5  LAST  847   34,3527   00214 0              ADRES    FLRCS

0466  REF   1              34,3530  3 3547 1   -5         CAF      V16N94
0467  REF 231  LAST  851   34,3531  0 4607 1              TC       BANKCALL
0468  REF  24  LAST  840   34,3532   20471 1              CADR     GOFLASH
0469                       34,3533  1 3536 0              TCF      +3
0470  REF   1              34,3534  1 3540 1              TCF      CUTOFF1
0471                       34,3535  1 3530 0              TCF      -5

0472  REF  53  LAST  841   34,3536  0 4626 1   +3         TC       POSTJUMP
0473  REF   1              34,3537   71560 1              CADR     TERMASC

0474                       34,3540  0 0004 0  CUTOFF1     INHINT
0475  REF  44  LAST  854   34,3541  0 4665 0              TC       IBNKCALL         ZERO ATTITUDE ERRORS BEFORE REDUCING DB.
0476  REF   7  LAST  787   34,3542   40154 0              CADR     ZATTEROR
0477  REF  45  LAST  854   34,3543  0 4665 0              TC       IBNKCALL
0478  REF   5  LAST  751   34,3544   40141 1              CADR     SETMINDB
0479  REF  54  LAST  854   34,3545  0 4626 1              TC       POSTJUMP
0480  REF   1              34,3546   71550 1              CADR     CUTOFF2

0481                       34,3547   04136 1  V16N94      VN       1694
0486  REF  73  LAST  854   34,3550  0 5355 1  CUTOFF2     TC       PHASCHNG
```

```
0487                          34,3551    04024 0             OCT      04024

0488   REF   1                34,3552   3 3570 0             CAF      V16N85C
0489   REF 232  LAST   854    34,3553   C 4607 1             TC       BANKCALL
0490   REF  25  LAST   854    34,3554    20471 1             CADR     GOFLASH
0491   REF   2  LAST   854    34,3555   1 3560 0             TCF      TERMASC
0492                          34,3556   1 3560 0             TCF      +2                  PROCEED
0493   REF   2  LAST   854    34,3557   1 3550 0             TCF      CUTOFF2

0494   REF  74  LAST   854    34,3560   0 5355 1  TERMASC    TC       PHASCHNG
0495                          34,3561    04024 0             OCT      04024

0496                          34,3562   0 0004 0             INHINT                       RESTORE DEADBAND DESIRED BY ASTRONAUT.
0497   REF  46  LAST   854    34,3563   0 4665 0             TC       IBNKCALL
0498   REF   7  LAST   750    34,3564    40115 0             CADR     RESTORDB
0499   REF  80  LAST   841    34,3565   0 5520 0             TC       DOWNFLAG            DISALLOW ABORTS AT THIS TIME.
0500   REF   3  LAST   836    34,3566    00215 1             ADRES    LETABORT
0501   REF  33  LAST   840    34,3567   1 6001 1             TCF      GOTOPOOH

0502                          34,3570    04125 0  V16N85C    VN       1685

0503                          34,3571    77745 1  RPCOMP1    DLOAD                        FLRCS = 1 (TRIM MODE)
0504   REF  12  LAST   850    34,3572    06505 1                      HI6ZEROS
0505   REF   4  LAST   850    34,3573    02336 0             STORE    PCONS               SET PCONS = PRATE = 0 SO THAT
0506   REF   8  LAST   850    34,3574    02342 0             STORE    PRATE                   RP = R + RDOT TGO
0507                          34,3575    41345 0  RPCOMP2    DLOAD    DMP                 FLRCS = 0 (GUIDANCE MODE)
0508   REF   9  LAST   855    34,3576    02342 0                      PRATE               LEAVE PCONS AND PRATE ALONE SO THAT
0509   REF  36  LAST   854    34,3577    03517 1                      TGO                     RP = R + RDOT TGO + (PCONS*TGO**2)/
0510                          34,3600    43205 1             DMP      DAD                     (2 TBUP) + (PRATE*TGO**3)/(6 TBUP)
0511   REF   2  LAST   672    34,3601    33646 0                      THIRD
0512   REF   5  LAST   855    34,3602    02336 0                      PCONS
0513                          34,3603    41205 0             DMP      DMP
0514   REF  37  LAST   855    34,3604    03517 1                      TGO
0515   REF  38  LAST   855    34,3605    03517 1                      TGO
0516                          34,3606    72471 0             DDV      SL1
0517   REF  15  LAST   850    34,3607    02262 0                      TBUP
0518                          34,3610    65215 1             DAD      PDDL
0519   REF   6  LAST   852    34,3611    02272 1                      /R/MAG
0520   REF   5  LAST   853    34,3612    03474 0                      RDOT
0521                          34,3613    43205 1             DMP      DAD
0522   REF  39  LAST   855    34,3614    03517 1                      TGO
0523                          34,3615    77626 0             STADR
0524   REF   3  LAST   836    34,3616    75201 0             STORE    RP
0525                          34,3617    77616 0             PVQ

0526                          34,3620    45020 1  ZDOTDCMP   STQ      CALL                COMPUTE CENTRAL ANGLE              (0)
0527   REF   1                34,3621    02637 1                      ASCSAVE
0528   REF   2  LAST   835    34,3622    71650 1                      THETCOMP
0529                          34,3623    43205 1             DMP      DAD                 CENTRAL ANGLE IN MPAC
0530   REF   2  LAST   127    34,3624    02574 0                      KPARM
```

```
 0531   REF   3  LAST  836   34,3625   02572 0                      JPARM
 0532                        34,3626   41425 1            DSU       PUSH         RA IN MPAC AND IN PUSHLIST        (2)
 0533   REF   4  LAST  855   34,3627   02576 1                      RP
 0534                        34,3630   51025 1            DSU       BPL
 0535   REF   2  LAST  126   34,3631   02560 0                      RAMIN
 0536                        34,3632   71635 1                      +3
 0537                        34,3633   65345 0            DLOAD     PDDL         RA < RAMIN.  SET RA = RAMIN.      (2)
 0538   REF   3  LAST  856   34,3634   02560 0                      RAMIN
 0539                        34,3635   41345 0   +3       DLOAD     DMP
 0540                        34,3636   00001 0                      0D
 0541   REF   1              34,3637   16025 1                      MUM(-37)
 0542                        34,3640   77725 1            PDDL
 0543                        34,3641   41215 1            DAD       DMP
 0544   REF   5  LAST  856   34,3642   02576 1                      RP
 0545   REF   6  LAST  856   34,3643   02576 1                      RP
 0546                        34,3644   75465 1            BDDV      SQRT                                           (0)
 0547                        34,3645   77626 0            STADR
 0548   REF   6  LAST  846   34,3646   41507 0            STCALL    ZDOTD        UPDATE ZDOTD FOR GUIDANCE AND DOWNLINK.
 0549   REF   2  LAST  855   34,3647   02637 1                      ASCSAVE

 0550                        34,3650   53575 0   THETCOMP VLOAD     UNIT
 0551   REF  18  LAST  846   34,3651   03521 1                      R
 0552                        34,3652   53515 0            PDVL      UNIT                                           (6)
 0553   REF   3  LAST  729   34,3653   01716 0                      R(CSM)
 0554                        34,3654   47206 0            PUSH      VXV                                            (12)
 0555                        34,3655   00001 0                      0D
 0556                        34,3656   77641 1            DOT
 0557   REF   6  LAST  842   34,3657   02316 1                      WM
 0558                        34,3660   24037 0            STOVL     30D                                            (6)
 0559                        34,3661   72441 0            DOT       SL1                                            (0)
 0560                        34,3662   75326 1            ARCCOS    SIGN
 0561                        34,3663   00037 0                      30D
 0562                        34,3664   77616 0            RVQ

 0564                        27,3315                      BANK      27
 0565   REF   4  LAST  852   27,2000                      SETLOC    ASENT1
 0566                        27,3315                      BANK
 0567   REF   2 LAST  852 TO  852:   16    16*            COUNT*    $$/ASENT

 0568                        27,3315   50375 0   YCOMP    VLOAD     DOT
 0569   REF  23  LAST  853   27,3316   03537 0                      UNIT/R/
 0570   REF   4  LAST  846   27,3317   02600 0                      QAXIS
 0571                        27,3320   41312 1            SL2       DMP
 0572   REF   5  LAST  848   27,3321   03631 0                      RC0
 0573   REF   6  LAST  849   27,3322   02326 1            STORE     Y
 0574                        27,3323   77616 0            RVQ

R0575
 0576                        30,2777                      BANK      30
 0577   REF   3  LAST  846   30,2000                      SETLOC    ASENT
 0578                          30,2777                        BANK
```

```
P0579   ASCENT GUIDANCE CONSTANTS

 0580   REF   2  LAST  846   33,3052                100CS      EQUALS 2SEC(18)
 0581   REF   1              30,3001                T2A        EQUALS 2SEC(17)
 0582                        30,2777   00062 0      4SEC(17)   2DEC    400 B-17
 0582                        30,3000   00000 1
 0583                        30,3001   00031 0      2SEC(17)   2DEC    200 B-17
 0583                        30,3002   00000 1
 0584                        30,3003   00175 1      T3         2DEC    1000 B-17
 0584                        30,3004   00000 1
 0585                        30,3005   00045 0      6SEC(18)   2DEC    600 B-18
 0585                        30,3006   20000 0
 0586                        30,3007   00010 0      BIT4H      OCT     10

 0587                        30,3010   14400 0      2SEC(9)    2DEC    200 B-9
 0587                        30,3011   00000 1
 0588                        30,3012   01536 0      V06N94     VN      0694
 0589                        30,3013   01514 0      V06N76     VN      0676
 0590                        30,3014   01441 1      V06N33A    VN      0633

 0591                        33,2113                           BANK    33
 0592   REF   1              33,2000                           SETLOC  ASENT6
 0593                        33,2113                           BANK
 0594   REF   1                                                COUNT*  $$/ASENT

 0595                        33,2113   75751 0      PRLIMIT    2DEC    -.0639             (B/TBUP)MIN=-.1FT.SEC(-3)
 0595                        33,2114   41775 1
 0596                        33,2115   00022 1      MINABDV    2DEC    .0356 B-5          10 PERCENT BIGGER THAN GRAVITY
 0596                        33,2116   07212 1
 0597                        33,2117   00007 0      25KFT      2DEC    7620 B-24
 0597                        33,2120   16100 1
```

```
P0599   THE LOGARITHM SUBROUTINE

 0600                         24,3644                        BANK     24
 0601   REF    1              30,2000                        SETLOC FLOGSUB
 0602                         30,3015                        BANK

R0603   INPUT ..... X IN MPAC
R0604   OUTPUT ..... -LOG(X) IN MPAC

 0605                         30,3015   44301 0  LOGSUB      NORM     BDSU
 0606   REF 329  LAST  853    30,3016   00163 0                       MPAC +6
 0607   REF   2  LAST  847    30,3017   17774 0                       NEARONE
 0608                         30,3020   77776 1              EXIT
 0609   REF   1               30,3021  0 7243 0              TC       POLY
 0610                         30,3022   00006 1              DEC      6
 0611                         30,3023   00000 1              2DEC     .0000000060
 0611                         30,3024   00C02 0
 0612                         30,3025   76777 1              2DEC     -.0312514377
 0612                         30,3026   77175 1
 0613                         30,3027   77400 0              2DEC     -.0155686771
 0613                         30,3030   75416 0
 0614                         30,3031   77507 0              2DEC     -.0112502068
 0614                         30,3032   65515 0
 0615                         30,3033   77741 0              2DEC     -.0018545108
 0615                         30,3034   63547 1
 0616                         30,3035   77052 0              2DEC     -.0286607906
 0616                         30,3036   55373 0
 0617                         30,3037   01167 0              2DEC     .0385598563
 0617                         30,3040   30361 0
 0618                         30,3041   76520 1              2DEC     -.0419361902
 0618                         30,3042   75267 0
 0619   REF 161  LAST  853    30,3043  3 4746 0              CAF      ZERO
 0620   REF 330  LAST  859    30,3044  54 156 1              TS       MPAC +2
 0621                         30,3045  0 0006 1              EXTEND
 0622   REF   1               30,3046  3 3062 0              DCA      CLOG2/32
 0623   REF 331  LAST  859    30,3047  52 155 1              DXCH     MPAC
 0624   REF  76  LAST  826    30,3050  52 132 0              DXCH     BUF +1
 0625   REF 332  LAST  859    30,3051  3 0162 1              CA       MPAC +6
 0626   REF   9  LAST  825    30,3052  0 7330 0              TC       SHORTMP
 0627   REF 333  LAST  859    30,3053  52 156 1              DXCH     MPAC +1
 0628   REF 334  LAST  859    30,3054  52 155 1              DXCH     MPAC
 0629   REF  77  LAST  859    30,3055  52 132 0              DXCH     BUF +1
 0630   REF 335  LAST  859    30,3056  20 155 1              DAS      MPAC
 0631   REF 145  LAST  854    30,3057  C 6060 1              TC       INTPRET
 0632                         30,3060   43476 0              DCOMP    RVQ

 0633                         30,3061   0C542 1  CLOG2/32    2DEC     .0216608494
 0633                         30,3062   34414 1
 0001                       37,3401                           BANK    37
 0002    REF   1            37,2000                           SETLOC  SERV1
 0003                       37,3401                           BANK

 0004    REF  40  LAST  844  E7,1515                          EBANK=  DVCNTR
R0005    ***********************************  PREREAD   *************************************************************
R0007

 0008    REF   1                                              COUNT*  $$/SERV

 0009    REF  13  LAST  822  37,3401  3 4750 1  PREREAD   CAF     SEVEN            5.7 SPOT TO SKIP LASTBIAS AFTER
 0010    REF   1             37,3402  0 3530 1            TC      GNUFAZE5         RESTART.
 0011    REF   3  LAST  815  37,3403  3 5022 1            CAF     PRIO21
 0012    REF  22  LAST  854  37,3404  0 5063 1            TC      NOVAC
 0013    REF   5  LAST  346  E3,1460                      EBANK=  NBDX
 0014    REF   1             37,3405   03733 0            2CADR   LASTBIAS         DO LAST GYRO COMPENSATION IN FREE FALL
 0014    REF   1             37,3406   14063 1

 0015    REF   2  LAST  346  37,3407  0 3543 0  BIBIBIAS  TC      PIPASR +3        CLEAR + READ PIPS LAST TIME IN FREE FALL
A0016                                                                              DO NOT DESTROY VALUE OF PIPTIME1

 0017    REF  18  LAST  837  37,3410  4 0103 1            CS      FLAGWRD7
 0018    REF   1             37,3411  7 4764 1            MASK    SUPER011         SET V37FLAG AND AVEGFLAG (BITS 5 AND 6
 0019    REF  19  LAST  860  37,3412  26 103 1            ADS     FLAGWRD7            OF FLAGWRD7)

 0020    REF   2  LAST  175  37,3413  4 4726 1            CS      DRFTBIT
 0021    REF  15  LAST  810  37,3414  7 0076 1            MASK    FLAGWRD2         START POWERED FLITE GYRO COMPENSATION
 0022    REF  16  LAST  860  37,3415  54 076 1            TS      FLAGWRD2         BY T3RUPT

 0023    REF  17  LAST  839  37,3416  3 4742 1            CAF     FOUR             NO LONGER NEEDED
 0024    REF   2  LAST  111  37,3417  55'256 0            TS      PIPAGE

 0025    REF   6  LAST  816  37,3420  3 7731 0            CAF     PRIO22           INITIALIZE NAVIGATED STATE VECTOR(SM COO
 0026    REF  36  LAST  816  37,3421  0 5076 0            TC      FINDVAC          RD) FROM MIDTOAVE OUTPUTS PRIOR TO FIRST
 0027    REF  41  LAST  860  F7,1515                      EBANK=  DVCNTR           AVERAGE G.
 0028    REF   2  LAST  253  37,3422   03661 0            2CADR   NORMLIZE
 0028                        37,3423   64067 1

 0029    REF  58  LAST  832  37,3424  3 4743 0            CA      TWO              5.2SPOT FOR REREADAC AND NORMLIZE
 0030    REF   1             37,3425  0 3524 1  GOREADAX  TC      GNUTFAZ5
 0031    REF   3  LAST  792  37,3426  3 4771 1            CA      2SECS            WAIT TWO SECONDS FOR READACCS
 0032    REF   6  LAST  822  37,3427  0 5226 1            TC      VARDELAY
```

```
L         SERVICER                                                                                  USER'S PAGE NO.   2       E7 S3

P0033     *************************************     READACCS  ******************************************************************
 0035     REF    1                  37,3430  4 3537 1  READACCS CS       OCT37771          THIS PIECE OF CODING ATTEMPTS TO
 0036     REF    2  LAST   230      37,3431  6 0030 1           AD       TIME5             SYNCHRONIZE READACCS WITH THE DIGITAL
 0037     REF  238  LAST   851      37,3432 10 000  0           CCS      A                 AUTOPILOT SO THAT A PAXIS RUPT WILL
 0038     REF   82  LAST   825      37,3433  4 4744 0           CS       ONE               OCCUR APPROXIMATELY 70 MILLISECONDS
 0039                               37,3434  1 3436 1           TCF      +2                FOLLOWING THE READACCS RUPT.  THE 70 MS
 0040     REF   83  LAST   861      37,3435  3 4744 1           CA       ONE               OFFSET WAS CHOSEN SO THAT THE PAXIS
 0041     REF    3  LAST   861      37,3436 26 030  0     +2    ADS      TIME5             RUPT WOULD NOT OCCUR SIMULTANEOUSLY
A0042                                                                                      WITH ANY OF THE 8 SUBSEQUENT R10,R11
A0043                                                                                      INTERRUPTS -- THUS MINIMIZING THE POSS-
A0044                                                                                      IBILITY OF LOSING DOWNRUPTS.

 0045     REF    3  LAST   860      37,3437  0 3540 0           TC       PIPASR            READ THE PIPAS AND THEN ZERO THEM.

 0046     REF   14  LAST   822      37,3440  3 4747 1  PIPSDONE CA       FIVE
 0047     REF    2  LAST   860      37,3441  0 3530 1           TC       GNUFAZE5
 0048     REF   84  LAST   861      37,3442  3 4744 1  REDO5.5  CAF      ONE               SHOWS THAT PIPAREAD HAD NOT STARTED
 0049     REF    3  LAST   860      37,3443 55'256  0           TS       PIPAGE            SO THAT RESTART BEGINS AT READACCS.

 0050     REF    8  LAST   801      37,3444  3 4727 1           CA       PRIO20
 0051     REF   37  LAST   860      37,3445  0 5076 0           TC       FINDVAC
 0052     REF   42  LAST   860      E7,1515                     EBANK=   DVCNTR
 0053     REF    2  LAST   253      37,3446   02121 1           2CADR    SERVICER          SET UP SERVICER JOB
 0053                               37,3447   66067 0

 0054     REF   19  LAST   740      37,3450  3 4734 0           CA       BIT9
 0055                               37,3451  0 0006 1           EXTEND
 0056     REF   28  LAST   833      37,3452 05 011  1           WOR      DSALMOUT          TURN ON TEST CONNECTOR OUTBIT,AVE G ON.

 0057     REF   20  LAST   860      37,3453  3 0103 0           CA       FLAGWRD7          WAS AVERAGE G ASKED TO BE TERMINATED?
 0058     REF    8  LAST   837      37,3454  7 4740 1           MASK     AVEGFBIT
 0059                               37,3455  0 0006 1           EXTEND
 0060     REF    1                  37,3456  1 3516 1           BZF      AVEGOUT           YES: SET UP FINAL EXIT.

 0061     REF    6  LAST   812      37,3457  3 0102 1           CA       FLAGWRD6          NO: IS THIS P6X OR P12?
 0062     REF    3  LAST   710      37,3460  7 4735 0           MASK     MUNFLBIT
 0063                               37,3461  0 0006 1           EXTEND
 0064     REF    1                  37,3462  1 3514 0           BZF      MAKEACCS          NO: BYPASS LR READ AND DISPLAYS

 0065     REF   23  LAST   833      37,3463  4 0107 0           CS       FLGWRD11          YES: DOES SOMEONE WANT TO BYPASS LR UPDT
 0066     REF    6  LAST   833      37,3464  7 4726 1           MASK     LRBYBIT
 0067                               37,3465  0 0006 1           EXTEND
 0068     REF    1                  37,3466  1 3473 0           BZF      R10CALL           YES: BYPASS LR READINGS

 0069     REF    1                  37,3467  3 3536 1           CA       1.75SEC           CALL R12 0.25 SEC PRIOR TO NEXT READACCS
 0070     REF   30  LAST   755      37,3470  0 5205 0           TC       WAITLIST          VELOCITY LANDING RADAR READINGS ARE CENT
 0071     REF    6  LAST   785      E7,1462                     EBANK=   VSELECT           EPED AROUND PIPTIME. 2 VELOCITY AND 1 AL
 0072     REF    1                  37,3471   03142 0           2CADR    R12READ           TITUDE READINGS BEFORE PIPTIME,3 V AFTER
 0072     REF    1                  37,3472   52067 1
 0073    REF   2  LAST  756    37,3473  10 754 0  R10CALL  CCS     PHASE2
 0074    REF   2  LAST  861    37,3474  1 3514 0           TCF     MAKEACCS        PHASE 2 ACTIVATED - AVOID MULTIPLE R10.

 0075    REF  14  LAST  860    37,3475  3 4750 1           CAF     SEVEN           SET PIPCTR FOR 4X/SEC RATE.
 0076    REF   2  LAST  831    37,3476  55'055 1           TS      PIPCTR

 0077    REF  17  LAST  792    37,3477  4 0025 1           CS      TIME1           SET TBASE2 .05 SECONDS IN THE PAST.
 0078    REF  15  LAST  861    37,3500  6 4747 1           AD      FIVE
 0079    REF   2  LAST  231    37,3501  6 4725 0           AD      NEG1/2
 0080    REF   3  LAST  862    37,3502  6 4725 0           AD      NEG1/2
 0081    REF   4  LAST  490    37,3503  57'054 1           XCH     TBASE2

 0082    REF   3  LAST  337    37,3504  3 4352 1           CAF     DEC17           2.21SPOT FOR R10,R11
 0083    REF 130  LAST  834    37,3505  54 001 1           TS      L
 0084                          37,3506  4 0000 0           COM
 0085    REF   6  LAST  831    37,3507  52 754 0           DXCH    -PHASE2

 0086    REF   5  LAST  513    37,3510  3 6007 0           CAF     OCT24           FIRST R10,R11 IN .200 SECONDS.
 0087    REF  31  LAST  861    37,3511  0 5205 0           TC      WAITLIST
 0088    REF  24  LAST  856    E7,1536                     EBANK=  UNIT/R/
 0089    REF   3  LAST  831    37,3512   02042 0           2CADR   R10,R11
 0089                          37,3513   42067 0

 0090    REF  18  LAST  860    37,3514  3 4742 1  MAKEACCS CA      FOUR
 0091    REF   1               37,3515  1 3425 0           TCF     GOREADAX        DO PHASE CHANGE AND RECALL READACCS


 0092                          37,3516  0 0006 1  AVEGOUT  EXTEND
 0093    REF   1               37,3517  3 3535 1           DCA     AVOUTCAD        SET UP FINAL SERVICER EXIT
 0094    REF   5  LAST  836    37,3520  53'252 1           DXCH    AVGEXIT

 0095    REF  19  LAST  862    37,3521  3 4742 1           CA      FOUR            SET 5.4 SPOT FOR REREADAC AND SERVICER
 0096    REF   2  LAST  860    37,3522  0 3524 1           TC      GNUTFAZ5        IF REREADAC IS CALLED, IT WILL EXIT
 0097    REF  58  LAST  854    37,3523  0 5263 0           TC      TASKOVER        END TASK WITHOUT CALLING READACCS


 0098    REF 131  LAST  862    37,3524  54 001 1  GNUTFAZ5 TS      L               SAVE INPUT IN L
 0099    REF  18  LAST  862    37,3525  4 0025 1           CS      TIME1
 0100    REF   1               37,3526  55'062 0           TS      TBASE5          SET TBASE5
 0101                          37,3527  1 3531 1           TCF     +2

 0102    REF 132  LAST  862    37,3530  54 001 1  GNUFAZE5 TS      L               SAVE INPUT IN L
 0103    REF 133  LAST  862    37,3531  4 0001 1           CS      L               -PHASE IN A, PHASE IN L
 0104    REF   2  LAST  225    37,3532  52 762 0           DXCH    -PHASE5         SET -PHASE5,PHASE5
 0105    REF 203  LAST  838    37,3533  0 0002 0           TC      Q


 0106    REF  43  LAST  861    E7,1515                     EBANK=  DVCNTR
 0107    REF   1               37,3534   03663 1  AVOUTCAD 2CADR   AVGEND
 0107    REF   1               37,3535   44067 0
 0108                          37,3536   00257 1  1.75SEC  DEC     175
 0109                          37,3537   37771 1  OCT37771 OCT     37771

 0110                          33,2121                     BANK    33
 0111   REF   4  LAST    46    33,2000                     SETLOC SERVICES
 0112                          33,2121                     BANK

 0113   REF   4 LAST    46 TO   47:     12     75*         COUNT* $$/SERV
```

```
P0114    ************************************   SERVICER   ****************************************************************
R0116

 0117    REF  75  LAST  855     33,2121  0 5355 1  SERVICER TC       PHASCHNG         RESTART REREADAC + SERVICER
 0118                           33,2122   16035 0           OCT      16035
 0119                           33,2123   20000 0           OCT      20000
 0120    REF  44  LAST  862     E7,1515                     EBANK=   DVCNTR
 0121    REF   1                33,2124   02132 0           2CADR    GETABVAL
 0121    REF   1                33,2125   66067 0
 0122    REF   3  LAST  800     33,2126  3 7737 0           CAF      PRIO31           INITIALIZE 1/PIPADT IN CASE RESTART HAS
 0123    REF   7  LAST  348     33,2127  55'074 1           TS       1/PIPADT         CAUSED LASTBIAS TO BE SKIPPED.


 0124    REF 233  LAST  855     33,2130  0 4607 1           TC       BANKCALL         PIPA COMPENSATION CALL
 0125    REF   2  LAST  397     33,2131   15333 0           CADR     1/PIPA

 0126    REF 146  LAST  859     33,2132  0 6060 1  GETABVAL TC       INTPRET
 0127                           33,2133   51575 1           VLOAD    ABVAL
 0128    REF   8  LAST  206     33,2134   00325 0                    DELV
 0129                           33,2135   77776 1           EXIT
 0130    REF 336  LAST  859     33,2136  3 0154 1           CA       MPAC
 0131    REF   5  LAST  789     33,2137  55'245 1           TS       ABDELV           ABDELV = CM/SEC*2(-14).
 0132                           33,2140  0 0006 1           EXTEND
 0133    REF   1                33,2141  7 2072 1           MP       KPIP
 0134    REF   4  LAST  844     33,2142  53'514 1           DXCH     ABDVCONV         ABDVCONV = M/CS *2(-5).
 0135                           33,2143  0 0006 1           EXTEND
 0136    REF  12  LAST  835     33,2144  3 1244 1           DCA      MASS
 0137    REF   4  LAST  160     33,2145  53'571 1           DXCH     MASS1            NO MASS MONITOR ON SURFACE.

 0138    REF  14  LAST  851     33,2146  4 0104 0  MASSMON  CS       FLAGWRD8         ARE WE ON THE SURFACE?
 0139    REF   8  LAST  707     33,2147  7 4735 0           MASK     SUREFBIT
 0140                           33,2150  0 0006 1           EXTEND
 0141    REF   1                33,2151  1 2202 1           BZF      MOONSPOT         YES:  BYPASS MASS MESS

 0142    REF  21  LAST  833     33,2152  3 0106 0           CA       FLGWRD10         NO:   WHICH VEX SHOULD BE USED?
 0143    REF  12  LAST  833     33,2153  7 4730 0           MASK     APSFLBIT
 0144    REF 239  LAST  861     33,2154  10 000 0           CCS      A
 0145                           33,2155  0 0006 1           EXTEND                    IF EXTEND IS EXECUTED, APSVEX --> A,
 0146    REF   3  LAST  841     33,2156  3 2001 1           DCA      APSVEX             OTHERWISE DPSVEX --> A
 0147    REF 204  LAST  862     33,2157  54 002 1           TS       Q

 0148                           33,2160  0 0006 1           EXTEND
 0149    REF   5  LAST  864     33,2161  3 1514 0           DCA      ABDVCONV
 0150                           33,2162  0 0006 1           EXTEND
 0151    REF 205  LAST  864     33,2163  10 002 1           DV       Q                WHERE APPROPRIATE VEX RESIDES
 0152                           33,2164  0 0006 1           EXTEND
 0153    REF  13  LAST  864     33,2165  7 1243 1           MP       MASS
 0154    REF   5  LAST  864     33,2166  21'571 1           DAS      MASS1

 0155    REF  18  LAST  793     33,2167  0 7124 1           TC       DMP              TP MPAC = ABDELV AT 2(14) CM/SEC
 0156   REF   3  LAST  819   33,2170   02073 1             ADRES   KPIP1          DMP BY  DP KPIP1 TO GET
 0157                        33,2171  0 0006 1             EXTEND
 01572  REF   9  LAST  750   33,2172  3 1510 1             DCA     DVTOTAL
 01574  REF 337  LAST  864   33,2173  20 155 1             DAS     MPAC           MPAC = ABDELV AT 2(7) M/CS
 01576  REF 338  LAST  865   33,2174  52 155 1             DXCH    MPAC
 01578  REF   1              33,2175  53'174 0             DXCH    DVTEMP         SAVE NEW DVTOTAL FOR RESTARTS

 0158   REF   1              33,2176  0 3473 1             TC      QUIKFAZ5

 01582                       33,2177  0 0006 1             EXTEND
 01584  REF   2  LAST  865   33,2200  3 1174 1             DCA     DVTEMP
 01586  REF  10  LAST  865   33,2201  53'510 0             DXCH    DVTOTAL

 0159   REF   1              33,2202  0 2367 1  MOONSPOT   TC      TMPTOSPT       CDUS AT PIPTIME LOADED INTO CDUSPOT CELL
 0160   REF 234  LAST  864   33,2203  0 4607 1             TC      BANKCALL       SINES AND COSINES OF CDUSPOT.
 0161   REF   1              33,2204   47607 0             CADR    QUICTRIG

 0162.  REF   1              33,2205  3 2343 1             CAF     XNBPIPAD
 0163   REF 235  LAST  865   33,2206  0 4607 1             TC      BANKCALL       COMPUTE BOD-TO-SM MATRIX (XNB),AND
 0164   REF   1              33,2207   20037 1             CADR    FLESHPOT       STORE INTO XNBPIPAD.

 0165   REF 147  LAST  864   33,2210  0 6060 1             TC      INTPRET
 0166                        33,2211   45014 0  AVERAGEG   BON     CALL
 0167   REF   6  LAST  839   33,2212   03307 0                     MUNFLAG        COMPUTE LM & CM STATE VECTORS IN LUNAR G
 0168   REF   1              33,2213   66744 0                     RVBOTH         ,DO R12 , DO COPYCYCL1, RETURN AT COPYCL
 0169   REF   1              33,2214   66710 1                     CALCRVG        UPDATE LM STATE VECTOR.
 0170                        33,2215   77776 1             EXIT
 0171   REF   2  LAST  865   33,2216  0 3473 1  GOSERV     TC      QUIKFAZ5

 0172   REF   1              33,2217  0 2352 1  COPYCYCL   TC      COPYCYC        RN1,VN1,MASS1 => RN,VN,MASS.

A0173                                                      CA      ZERO           A IS ZERO ON RETURN FROM COPYCYC
 0174   REF   2  LAST  817   33,2220  55'157 1             TS      PIPATMPX       STILL UNDER INHINT
 0175   REF   2  LAST  817   33,2221  55'160 0             TS      PIPATMPY
 0176   REF   2  LAST  817   33,2222  55'161 1             TS      PIPATMPZ

 0177   REF   2  LAST  810   33,2223  4 4732 1             CS      STEERBIT       CLEAR STEERSW PRIOR TO DVMON.
 0178   REF  17  LAST  860   33,2224  7 0076 1             MASK    FLAGWRD2
 0179   REF  18  LAST  865   33,2225  54 076 1             TS      FLAGWRD2

 0180   REF   3, LAST  757   33,2226  3 4736 1             CAF     IDLEFBIT       IS DV MONITOR TO BE TURNED ON?
 0181   REF  21  LAST  861   33,2227  7 0103 1             MASK    FLAGWRD7
 0182   REF 240  LAST  864   33,2230  10 000 0             CCS     A
 0183   REF   1              33,2231  1 2264 1             TCF     NODVMON1       NO: SET AUXFLAG TO 0

 0184   REF   7  LAST  861   33,2232  4 0102 0             CS      FLAGWRD6       ALLOW ANOTHER PASS WITHOUT DVMON?
 0185   REF   1              33,2233  7 4743 1             MASK    AUXFLBIT
 0186   REF 241  LAST  865   33,2234  10 000 0             CCS     A
 0187   REF   1              33,2235  1 2270 1             TCF     NODVMON2       YES: SET AUXFLAG TO 0
 0188   REF   7  LAST  839   33,2236   4 1250 0  DVMON     CS      DVTHRUSH        SUFFICIENT THRUST TO STEER WITH?
 0189   REF   6  LAST  864   33,2237   6 1245 0            AD      ABDELV
 0190                        33,2240   0 0006 1            EXTEND
 0191   REF   1              33,2241   6 2274 1            BZMF    LOTHRUST        NO: THRUST TOO LO, DECREMENT DVCNTR

 0192   REF  19  LAST  865   33,2242   4 0076 1            CS      FLAGWRD2        YES: SET STEERSW TO ALLOW GUIDANCE.
 0193   REF   3  LAST  865   33,2243   7 4732 1            MASK    STEERBIT
 0194   REF  20  LAST  866   33,2244  26 076 1             ADS     FLAGWRD2

 0195   REF  65  LAST  861   33,2245   3 4744 1  DVCNTSET  CAF     ONE             ALLOW TWO PASSES MAXIMUM NOW THAT
 0196   REF  45  LAST  864   33,2246  55'515 0             TS      DVCNTR          THRUST HAS BEEN DETECTED.

 0197   REF  22  LAST  864   33,2247   3 0106 0            CA      FLGWRD10        IS APSFLAG SET?
 0198   REF  13  LAST  864   33,2250   7 4730 0            MASK    APSFLBIT
 0199   REF 242  LAST  865   33,2251  10 000 0             CCS     A
 0200   REF   1              33,2252   1 2317 1            TCF     USEJETS         YES: USE RCS TO STEER ASCENT STAGE.

 0201   REF  20  LAST  861   33,2253   3 4734 0            CA      BIT9            NO: PITCH GIMBAL FAILURE?
 0202                        33,2254   0 0006 1            EXTEND
 0203   REF   3  LAST  202   33,2255  02 032 1             RAND    CHAN32
 0204                        33,2256   0 0006 1            EXTEND
 0205   REF   2  LAST  866   33,2257   1 2317 1            BZF     USEJETS         YES: USE RCS TO STEER DESCENT STAGE.

 0206   REF   2  LAST  756   33,2260   4 4727 0  USEGTS    CS      USEQRJTS        NO: USE GTS TO STEER DESCENT STAGE.
 0207   REF  27  LAST  833   33,2261   7 0111 1            MASK    DAPBOOLS
 0208   REF  28  LAST  866   33,2262  54 111 1             TS      DAPBOOLS
 0209   REF   1              33,2263   1 2322 1            TCF     SERVOUT

 0210   REF   2  LAST  865   33,2264   4 4743 1  NODVMON1  CS      AUXFLBIT        SET AUXFLAG TO 0.
 0211   REF   8  LAST  865   33,2265   7 0102 0            MASK    FLAGWRD6
 0212   REF   9  LAST  866   33,2266  54 102 0             TS      FLAGWRD6
 0213   REF   3  LAST  866   33,2267   1 2317 1            TCF     USEJETS
 0214   REF  10  LAST  866   33,2270   4 0102 0  NODVMON2  CS      FLAGWRD6        SET AUXFLAG TO 1.
 0215   REF   3  LAST  866   33,2271   7 4743 1            MASK    AUXFLBIT
 0216   REF  11  LAST  866   33,2272  26 102 0             ADS     FLAGWRD6
 0217   REF   4  LAST  866   33,2273   1 2317 1            TCF     USEJETS

 0218   REF   3  LAST  865   33,2274   0 3473 1  LOTHRUST  TC      QUIKFAZ5
 0219   REF  46  LAST  866   33,2275  11'515 0             CCS     DVCNTR          TWO PASSES OF LO THRUST?
 0220   REF   1              33,2276   1 2310 0            TCF     DECCNTR         NO: DECREMENT DVCNTR.

 0221   REF   1              33,2277  10 760 1             CCS     PHASE4          COMFAIL JOB ACTIVE?
 0222   REF   2  LAST  866   33,2300   1 2322 1            TCF     SERVOUT         YES   WON'T NEED ANOTHER.

 0223   REF  76  LAST  864   33,2301   0 5355 1            TC      PHASCHNG        4.37SPOT FOR COMFAIL.
 0224                        33,2302    00374 1            OCT     00374

 0225   REF   4  LAST  719   33,2303   3 7734 0            CAF     PRIO25
 0226   REF  23  LAST  860   33,2304   0 5063 1            TC      NOVAC
 0227   REF  30  LAST  854   E7,1455                       EBANK=  WHICH
```

```
0228  REF   2  LAST  253   33,2305   02570 1             2CADR   COMFAIL         ESTABLISH JOB COMFAIL FOR
0228                       33,2306   74067 0
0229  REF   3  LAST  866   33,2307   1 2322 1            TCF     SERVOUT         THRUST FAIL LOGIC.

0230  REF   1              33,2310   55'570 0  DECCNTR   TS      DVCNTR1
0231  REF   4  LAST  866   33,2311   0 3473 1            TC      QUIKFAZ5
0232  REF   2  LAST  867   33,2312   3 1570 1            CA      DVCNTR1
0233  REF  47  LAST  866   33,2313   55'515 0            TS      DVCNTR
0234                       33,2314   0 0004 0            INHINT
0235  REF  47  LAST  855   33,2315   0 4665 0            TC      IBNKCALL        IF THRUST IS LOW, NO STEERING IS DONE
0236  REF   8  LAST  852   33,2316    40166 1            CADR    STOPRATE        AND THE DESIRED RATES ARE SET TO ZERO.
0237  REF  29  LAST  866   33,2317   4 0111 1  USEJETS   CS      DAPBOOLS
0238  REF   3  LAST  866   33,2320   7 4727 0            MASK    USEQRJTS
0239  REF  30  LAST  867   33,2321   26 111 1            ADS     DAPBOOLS        TELL DAP TO USE RCS TO STEER.

0240                       33,2322   0 0003 1  SERVOUT   RELINT
0241  REF 236  LAST  865   33,2323   0 4607 1            TC      BANKCALL        COMPUTE VEHICLE MOMENTS OF INERTIA.
0242  REF   1              33,2324    40463 1            CADR    1/ACCS

0243  REF  11  LAST  283   33,2325   3 0167 1            CA      PRIORITY
0244  REF   9  LAST  445   33,2326   7 4775 1            MASK    LOW9
0245  REF   4  LAST  804   33,2327   54 166 1            TS      PUSHLOC
0246                       33,2330   22 007 0            ZL
0247  REF  24  LAST  827   33,2331   52 121 1            DXCH    FIXLOC          FIXLOC AND OVFIND

0248  REF   5  LAST  867   33,2332   0 3473 1            TC      QUIKFAZ5
0249  REF  20  LAST  853   33,2333   4 1234 1            CS      PIPTIME +1
0250  REF  19  LAST  862   33,2334   6 0025 0            AD      TIME1
0251  REF   9  LAST  577   33,2335   6 4727 1            AD      HALF
0252  REF  10  LAST  867   33,2336   6 4727 1            AD      HALF
0253  REF   7  LAST  216   33,2337   57'355 0            XCH     SERVDURN        SERVICER DURATION FOR DOWNLINK
0254                       33,2340   0 0006 1            EXTEND                  EXIT TO SELECTED ROUTINE WHETHER THERE
0255  REF   6  LAST  862   33,2341   3 1252 0            DCA     AVGEXIT         IS THRUST OR NOT.  THE STATE OF STEERSW
0256  REF  21  LAST  750   33,2342   52 006 0            DXCH    Z               WILL CONVEY THIS INFORMATION.

0257  REF   7  LAST  852   33,2343   02136 1   XNBPIPAD  ECADR   XNBPIP

0258                       32,3656                       BANK    32
0259  REF   1              22,2000                       SETLOC  SERV2
0260                       22,3663                       BANK
0261  REF   1                                            COUNT*  $$/SERV

0262  REF  21  LAST  867   22,3663   3 1234 0  AVGEND    CA      PIPTIME +1      FINAL AVERAGE G EXIT,AVEGFLAG SET.
0263  REF   8  LAST  864   22,3664   55'074 1            TS      1/PIPADT        SET UP COASTING FLIGHT GYRO COMPENSATION

0264  REF  59  LAST  854   22,3665   0 5506 1            TC      UPFLAG          SET DRIFT FLAG, TERMINATE POWERED FLITE
0265  REF   1              22,3666   00036 1             ADRES   DRIFTFLG        GYRO COMPENSATION.

0266  REF 237  LAST  867   22,3667   0 4607 1            TC      BANKCALL
0267  REF   1              22,3670   17275 1             CADR    PIPFREE
```

```
 0268   REF  21  LAST  866   22,3671  4 4734 1              CS      BIT9
 0269                        22,3672  0 0006 1              EXTEND
 0270   REF  29  LAST  861   22,3673  03 011 1              WAND    DSALMOUT        TELL WORLD THAT AVERAGEG IS NOW OFF.

 0271   REF  11  LAST  758   22,3674  0 5331 0              TC      2PHSCHNG
 0272                        22,3675   00005 1              OCT     5               GROUP 5 OFF
 0273                        22,3676   05022 1              OCT     05022           GROUP 2 ON
 0274                        22,3677   20000 0              OCT     20000

 0275   REF 148  LAST  865   22,3700  0 6060 1              TC      INTPRET
 0276                        22,3701   77614 1              CLEAR
 0277   REF   1              22,3702   03664 0                      SWANDISP        SHUT OFF R10 WHEN SERVICER ENDS.
 0278                        22,3703   45014 0              CLEAR   CALL            RESET MUNFLAG.
 0279   REF   7  LAST  865   22,3704   03267 1                      MUNFLAG
 0280   REF   1              22,3705   27522 1                      AVETOMID        BRING CM STATE VECTOR UP TO PIPTIME.
 0281                        22,3706   77414 0              CLEAR   EXIT
 0282   REF   1              22,3707   03671 1                      V37FLAG

 0283   REF  55  LAST  854   22,3710  0 4626 1    AVERTRN   TC      POSTJUMP
 0284   REF   1              22,3711   10144 1              CADR    V37RET          GO TO V37 LOGIC.

 0285   REF   1              22,3710              OUTGOAVE =        AVERTRN
```

```
P0287   SERVIDLE IS ENTERED AFTER A POODOO SOFTWARE RESTART. SERVICER CONTINUES,BUT GUIDANCE AND R12 ( IF RUNNING) ARE
R02877  TERMINATED. ABORTS MONITOR CONTINUES TO RUN.

 0288   REF   1              27,2000                         SETLOC SERV3
 0289                        27,3324                         BANK
 0290   REF   1                                              COUNT* $$/SERV

 0291                        27,3324  0 0006 1  SERVIDLE EXTEND                  DISCONNECT SERVICER FROM ALL GUIDANCE
 0292   REF   1              27,3325  3 3362 0           DCA     SVEXTADR
 0293   REF   7  LAST  867   27,3326  53'252 1           DXCH    AVGEXIT

 0294   REF  22  LAST  865   27,3327  4 0103 1           CS      FLAGWRD7        DISCONNECT THE DELTA-V MONITOR
 0295   REF   4  LAST  865   27,3330  7 4736 0           MASK    IDLEFBIT
 0296   REF  23  LAST  869   27,3331  26 103 1           ADS     FLAGWRD7

 0297   REF   7  LAST  861   27,3332  3 4726 0           CAF     LRBYBIT         TERMINATE R12 IF RUNNING.
 0298   REF  24  LAST  861   27,3333  54 107 0           TS      FLGWRD11

 0299                        27,3334  0 0006 1           EXTEND
 0300   REF  16  LAST  831   27,3335  3 4746 0           DCA     NEGO
 0301   REF   4  LAST  731   27,3336  52 752 0           DXCH    -PHASE1

 0302   REF  12  LAST  866   27,3337  3 0102 1           CA      FLAGWRD6        DO NOT TURN OFF PHASE 2 IF MUNFLAG SET.
 0303   REF   4  LAST  861   27,3340  7 4735 0           MASK    MUNFLBIT
 0304   REF 243  LAST  866   27,3341  10 000 0           CCS     A
 0305                        27,3342  1 3346 1           TCF     +4

 0306                        27,3343  0 0006 1           EXTEND
 0307   REF  17  LAST  869   27,3344  3 4746 0           DCA     NEGO
 0308   REF   7  LAST  862   27,3345  52 754 0           DXCH    -PHASE2

 0309                        27,3346  0 0006 1     +4    EXTEND
 0310   REF  18  LAST  869   27,3347  3 4746 0           DCA     NEGO
 0311   REF   4  LAST  811   27,3350  52 756 1           DXCH    -PHASE3

 0312                        27,3351  0 0006 1           EXTEND
 0313   REF  19  LAST  869   27,3352  3 4746 0           DCA     NEGO
 0314   REF   3  LAST  739   27,3353  52 764 0           DXCH    -PHASE6

 0315   REF   2  LAST  235   27,3354  3 4755 1           CAF     OCT33           4.33SPOT FOR GOPOOFIX
 0316   REF 134  LAST  862   27,3355  54 001 1           TS      L
 0317                        27,3356  4 0000 0           COM
 0318   REF   8  LAST  834   27,3357  52 760 1           DXCH    -PHASE4

 0319   REF   1              27,3360  1 5636 0           TCF     WHIMPER         PERFORM A SOFTWARE RESTART AND PROCEED
A0320                                                                            TO GOTOPOOH WHILE SERVICER CONTINUES TO
A0321                                                                            RUN, ALBEIT IN A GROUND STATE WHERE
A0322                                                                            ONLY STATE-VECTOR DEPENDENT FUNCTIONS
A0323                                                                            ARE MAINTAINED.
```

```
 0324   REF  48  LAST  867   E7,1515                       EBANK= DVCNTR
 0325   REF   7  LAST  834   27,3361   03656 1  SVEXTADR 2CADR  SERVEXIT
 0325                        27,3362   64067 1


 0326                        32,3656                       BANK   32
 0327   REF   1              32,2000                       SETLOC SERV
 0328                        32,3656                       BANK
 0329   REF   1                                            COUNT* $$/SERV

 0330   REF  77  LAST  866   32,3656  0 5355 1  SERVEXIT TC     PHASCHNG
 0331                        32,3657   00035 1           OCT    00035

 0332   REF 130  LAST  851   32,3660  1 5146 0           TCF    ENDOFJOB
```

```
P0337   NCRMLIZE AND COPYCYCL

 0338   REF 149  LAST  868    32,3661  0 6060 1  NCRMLIZE TC      INTPRET
 0339                         32,3662   43175 0           VLOAD   BOFF
 0340   REF   3  LAST  156    32,3663   03545 0                   RN1
 0341   RFF   8  LAST  868    32,3664   03347 1                   MUNFLAG
 0342   REF   1               32,3665   66344 1                   NORMLIZ1          DO NOT USE LUNAR LANDING AVERAGE G
 0343                         32,3666   64252 0           VSL6    MXV
 0344   REF  35  LAST  842    32,3667   01732 0                   REFSMMAT
 0345   REF  19  LAST  856    32,3670   37521 0           STCALL  R                 LM POS VECTOR IN SM COORD AT 2(+24)M.
 0346   REF   4  LAST  840    32,3671   67037 1                   MUNGRAV           USE LUNAR LANDING AVERAGE G ROUTINE.
 0347                         32,3672   76575 1           VLOAD   VSL1
 0348   REF   4  LAST  775    32,3673   03553 1                   VN1
 0349                         32,3674   77721 0           MXV
 0350   REF  36  LAST  871    32,3675   01732 0                   REFSMMAT
 0351   REF  11  LAST  846    32,3676   03527 1           STORE   V                 LM VEL VECTOR IN SM COORD AT 2(+7)M/CS.
 0352                         32,3677   41535 1           SLOAD   PUSH              COMPUTE PIPA BIAS VECTOR FOR USE BY
 03521  REF   1               32,3700   01457 0                   PBIASZ              P66ROD AND LANDING ANALOG DISPLAYS
 03522                        32,3701   41535 1           SLOAD   PUSH
 0353   REF   1               32,3702   01455 1                   PBIASY
 03531                        32,3703   55535 1           SLOAD   VDEF
 0354   REF   2  LAST  114    32,3704   01453 1                   PBIASX
 03541                        32,3705   77761 1           VXSC
 0355   REF   1               32,3706   26641 0                   BIASFACT
 03551  REF   4  LAST  819    32,3707   02616 1           STORE   VBIAS             ONE SECOND'S BIAS IN UNITS OF 2(7) M/CS
 0356                         32,3710   77776 1  ASCSPOT  EXIT
 0357                         32,3711  0 0006 1           EXTEND                    MAKE SURE GOUP 2 IS OFF.
 0358   REF  20  LAST  869    32,3712  3 4746 0           DCA     NEGO
 0359   REF   8  LAST  869    32,3713  52 754 0           DXCH    -PHASE2

 0360   REF  56  LAST  868    32,3714  0 4626 1           TC      POSTJUMP
 0361   REF   1               32,3715   66347 1           CADR    NORMLIZ2

 0362                         33,2344                     BANK    33
 0363   REF   5  LAST  863    33,2000                     SETLOC  SERVICES
 0364                         33,2344                     BANK
 0365   REF   5 LAST  863 TO  867:    147   222*          COUNT*  $$/SERV

 0366                         33,2344   77624 1  NORMLIZ1 CALL
 0367   REF   1               33,2345   66642 1                   CALCGRAV
 0368                         33,2346   77776 1           EXIT

 0369   REF   1               33,2347  3 2366 0  NCRMLIZ2 CA      EIGHTEEN
 0370   REF   2  LAST  865    33,2350  0 2353 0           TC      COPYCYC +1        DO NOT COPY MASS IN NORMLIZE
 0371   REF 131  LAST  870    33,2351  0 5146 1           TC      ENDOFJOB

R03715   COPYCYC PLACES NEWLY NAVIGATED STATE VECTORS AND MASS INTO DOWNLIST REG

 0372   REF   6  LAST  862    33,2352  3 6007 0  COPYCYC  CA      OCT24             DEC 20
 0373                          33,2353  0 0004 0  +1       INHINT
 0374  REF   4  LAST  345      33,2354  7 7770 1  +2       MASK   NEG1              REDUCE BY 1 IF ODD
 0375  REF  28  LAST  746      33,2355  54 061 1           TS     ITEMP1
 0376                          33,2356  0 0006 1           EXTEND
 0377  REF  29  LAST  872      33,2357  5 0061 0           INDEX  ITEMP1
 0378  REF   4  LAST  871      33,2360  3 1545 1           DCA    RN1
 0379  REF  30  LAST  872      33,2361  50 061 0           INDEX  ITEMP1
 0380  REF  14  LAST  788      33,2362  53 220 1           DXCH   RN
 0381  REF  31  LAST  872      33,2363  10 061 1           CCS    ITEMP1
 0382  REF   3  LAST  871      33,2364  1 2354 0           TCF    COPYCYC +2
 0383  REF 206  LAST  864      33,2365  0 0002 0           TC     Q                 RETURN UNDER INHINT


 0384                          33,2366   00022 1  EIGHTEEN DEC    18
```

```
P0385    ****************** PIPA READER ******************

R0386                      MOD NO. 00  BY D. LICKLY  DEC.9 1966

R0387    FUNCTIONAL DESCRIPTION

R0388       SUBROUTINE TO READ PIPA COUNTERS, TRYING TO BE VERY CAREFUL SO THAT IT WILL BE RESTARTABLE.
R0390       PIPA READINGS ARE STORED IN THE VECTOR DELV. THE HIGH ORDER PART OF EACH COMPONENT CONTAINS THE PIPA READING,
R0392       RESTARTS BEGIN AT REREADAC.

R0393       AT THE END OF THE PIPA READER THE CDUS ARE READ AND STORED AS A
R0394    VECTOR IN CDUTEMP.  THE HIGH ORDER PART OF EACH COMPONENT CONTAINS
R0395    THE CDU READING IN 2S COMP IN THE ORDER CDUX,Y,Z.  THE THRUST
R0396    VECTOR ESTIMATOR IN FINDCDUD REQUIRES THE CDUS BE READ AT PIPTIME.

R0397    CALLING SEQUENCE AND EXIT

R0398       CALL VIA TC, ISWCALL, ETC.

R0399       EXIT IS VIA Q.

R0400

R0401    INPUT

R0402       INPUT IS THROUGH THE COUNTERS PIPAX, PIPAY, PIPAZ, AND TIME2.

R0403    OUTPUT

R0404       HIGH ORDER COMPONENTS OF THE VECTOR DELV CONTAIN THE PIPA READINGS.
R0405       PIPTIME CONTAINS TIME OF PIPA READING.

R0406    DEBRIS (ERASABLE LOCATIONS DESTROYED BY PROGRAM)

R0407             TEMX    TEMY    TEMZ    PIPAGE

 0408                          37,3540                       BANK    37
 0409    REF    2  LAST   860  37,2000                       SETLOC  SERV1
 0410                          37,3540                       BANK

 0411    REF    2 LAST   860 TO  863:     95     95*         COUNT*  $$/SERV

 0412                          37,3540  0 0006 1  PIPASR     EXTEND
 0413  REF  27  LAST  833   37,3541  3 0025 0               DCA     TIME2
 0414  REF   9  LAST  799   37,3542  53'561 0               DXCH    PIPTIME1       CURRENT TIME  POSITIVE VALUE
 0415  REF 162  LAST  859   37,3543  4 4746 1            +3 CS      ZERO           INITIALIZE THESE AT NEG. ZERO.
 0416  REF   5  LAST  818   37,3544  55'253 0               TS      TEMX
 0417  REF   4  LAST  818   37,3545  55'254 1               TS      TEMY
 0418  REF   4  LAST  818   37,3546  55'255 0               TS      TEMZ

 0419  REF 163  LAST  874   37,3547  3 4746 0               CA      ZERO
 0420  REF   4  LAST  396   37,3550  54 330 0               TS      DELVZ
 0421  REF   5  LAST  874   37,3551  54 331 1               TS      DELVZ +1
 0422  REF   5  LAST  396   37,3552  54 326 1               TS      DELVY
 0423  REF   6  LAST  874   37,3553  54 327 0               TS      DELVY +1
 0424  REF   9  LAST  397   37,3554  54 325 1               TS      DELVX +1
 0425  REF   4  LAST  861   37,3555  55'256 0               TS      PIPAGE         SHOW PIPA READING IN PROGRESS

 0426                       37,3556  0 0006 1   REPIP1      EXTEND
 0427  REF  12  LAST  817   37,3557  4 0040 1               DCS     PIPAX          X AND Y PIPS READ
 0428  REF   6  LAST  874   37,3560  53'254 1               DXCH    TEMX
 0429  REF  13  LAST  874   37,3561  52 040 1               DXCH    PIPAX          PIPAS SET TO NEG ZERO AS READ.
 0430  REF  10  LAST  874   37,3562  54 324 0               TS      DELVX
 0431  REF   7  LAST  874   37,3563  22 326 0               LXCH    DELVY

 0432  REF   6  LAST  817   37,3564  4 0041 0   REPIP3      CS      PIPAZ          REPEAT PROCESS FOR Z PIP
 0433  REF   5  LAST  874   37,3565  57'255 1               XCH     TEMZ
 0434  REF   7  LAST  874   37,3566  56 041 1               XCH     PIPAZ
 0435  REF   6  LAST  874   37,3567  54 330 0   DCDELVZ     TS      DELVZ

 0436                       37,3570  0 0006 1   REPIP4      EXTEND                 COMPUTE GUIDANCE PERIOD
 0437  REF  10  LAST  874   37,3571  3 1561 1               DCA     PIPTIME1
 0438  REF   2  LAST  108   37,3572  53'247 0               DXCH    PGUIDE
 0439                       37,3573  0 0006 1               EXTEND
 0440  REF  22  LAST  867   37,3574  4 1234 1               DCS     PIPTIME
 0441  REF   3  LAST  874   37,3575  21'247 0               DAS     PGUIDE

 0442  REF  13  LAST  598   37,3576  3 0032 0               CA      CDUX           READ CDUS INTO HIGH ORDER CDUTEMPS
 0443  REF   2  LAST  576   37,3577  55'154 1               TS      CDUTEMPX
 0444  REF   7  LAST  588   37,3600  3 0033 1               CA      CDUY
 0445  REF   2  LAST  576   37,3601  55'155 0               TS      CDUTEMPY
 0446  REF  10  LAST  369   37,3602  3 0034 0               CA      CDUZ
 0447  REF   1              37,3603  55'156 0               TS      CDUTEMPZ
 0448  REF  11  LAST  874   37,3604  3 0324 1               CA      DELVX
 0449  REF   3  LAST  865   37,3605  55'157 1               TS      PIPATMPX
 0450  REF   8  LAST  874   37,3606  3 0326 0               CA      DELVY
 0451  REF   3  LAST  865   37,3607  55'160 0               TS      PIPATMPY
 0452  REF   7  LAST  874   37,3610  3 0330 1               CA      DELVZ
 0453  REF   3  LAST  865   37,3611  55'161 1               TS      PIPATMPZ

 0454  REF 207  LAST  872   37,3612  0 0002 0               TC      Q
```

```
 0455  REF   5  LAST  874   37,3613  11'256 0  REREADAC CCS     PIPAGE
 0456  REF   1              37,3614  1 3430 1           TCF     READACCS          PIP READING NOT STARTED. GO TO BEGINNING

 0457  REF   1              37,3615  3 3653 1           CAF     DONEADR           SET UP RETURN FROM PIPASR
 0458  REF 208  LAST  874   37,3616  54 002 1           TS      Q

 0459  REF   8  LAST  874   37,3617  10 330 0           CCS     DELVZ
 0460  REF   1              37,3620  1 3570 1           TCF     REPIP4            Z DONE, GO DO CDUS
 0461                       37,3621  1 3624 0           TCF     +3                Z NOT DONE, CHECK Y.
 0462  REF   2  LAST  875   37,3622  1 3570 1           TCF     REPIP4
 0463  REF   3  LAST  875   37,3623  1 3570 1           TCF     REPIP4

 0464                       37,3624  22 007 0           ZL
 0465  REF   9  LAST  874   37,3625  10 326 1           CCS     DELVY
 0466                       37,3626  1 3631 1           TCF     +3
 0467  REF   1              37,3627  1 3640 1           TCF     CHKTEMX           Y NOT DONE, CHECK X.
 0468                       37,3630  1 3631 1           TCF     +1
 0469  REF   8  LAST  874   37,3631  22 041 1           LXCH    PIPAZ             Y DONE, ZERO Z PIP.

 0470  REF   6  LAST  874   37,3632  11'255 0           CCS     TEMZ
 0471  REF   7  LAST  875   37,3633  4 1255 0           CS      TEMZ              TEMZ NOT = -0, CONTAINS -PIPAZ VALUE.
 0472  REF   1              37,3634  1 3567 1           TCF     DODELVZ
 0473                       37,3635  1 3633 0           TCF     -2
 0474  REF   9  LAST  875   37,3636  22 330 1           LXCH    DELVZ             TEMZ = -0, L HAS ZPIP VALUE.
 0475  REF   4  LAST  875   37,3637  1 3570 1           TCF     REPIP4

 0476  REF   7  LAST  874   37,3640  11'253 0  CHKTEMX  CCS     TEMX              HAS THIS CHANGED
 0477  REF   8  LAST  875   37,3641  4 1253 0           CS      TEMX              YES
 0478                       37,3642  1 3645 1           TCF     +3                YES
 0479                       37,3643  1 3641 0           TCF     -2                YES
 0480  REF   1              37,3644  1 3556 0           TCF     REPIP1            NO
 0481  REF  12  LAST  874   37,3645  54 324 0           TS      DELVX

 0482  REF   5  LAST  874   37,3646  4 1254 1           CS      TEMY
 0483  REF  10  LAST  875   37,3647  54 326 1           TS      DELVY

 0484  REF 164  LAST  874   37,3650  4 4746 1           CS      ZERO              ZERO X AND Y PIPS
 0485  REF  14  LAST  874   37,3651  52 040 1           DXCH    PIPAX             L STILL ZERO FROM ABOVE

 0486  REF   1              37,3652  1 3564 1           TCF     REPIP3

 0487  REF   1              37,3653   03440 1  DONEADR  GENADR  PIPSDONE
 0488                          33,2367                           BANK    33
 0489    REF    6  LAST   871  33,2000                           SETLOC  SERVICES
 0490                          33,2367                           BANK

 0491    REF    6 LAST   871 TO  873:     19    241*             COUNT*  $$/SERV

 0492    REF    3  LAST   874  33,2367  3 1155 1  TMPTOSPT CA      CDUTEMPY          THIS SUBROUTINE, CALLED BY AN RTB FROM
 0493    REF    1              33,2370  54 765 1           TS      CDUSPOTY          INTERPRETIVE, LOADS THE CDUS CORRESPON-
 0494    REF    2  LAST   874  33,2371  3 1156 1           CA      CDUTEMPZ          DING TO PIPTIME INTO THE CDUSPOT VECTOR.
 0495    REF    1              33,2372  54 767 0           TS      CDUSPOTZ
 0496    REF    3  LAST   874  33,2373  3 1154 0           CA      CDUTEMPX
 0497    REF    1              33,2374  54 771 1           TS      CDUSPOTX
 0498    REF 209  LAST   875   33,2375  0 0002 0           TC      Q

 0499                          33,2376                     BANK    33
 0500    REF    7  LAST   876  33,2000                     SETLOC  SERVICES
 0501                          33,2376                     BANK

 0502    REF    7 LAST   876 TO  876:      7    248*       COUNT*  $$/SERV

R0503    HIGATASK IS ENTERED APPROXIMATELY 6 SECS PRIOR TO HIGATE DURING THE
R0504    DESCENT PHASE.  HIGATASK SETS THE HIGATE FLAG (BIT11) AND THE LR INHIBIT
R0505    FLAG (BIT10) IN LRSTAT.  THE HIGATJOB IS SET UP TO REPOSITION THE LR
R0506    ANTENNA FROM POSITION 1 TO POSITION 2.  IF THE REPOSITIONING IS
R0507    SUCCESSFUL THE ALT BEAM AND VELOCITY BEAMS ARE TRANSFORMED TO THE NEW
R0508    ORIENTATION IN NB COORDINATES AND STORED IN ERASABLE.

 0509    REF   78  LAST   870  33,2376  0 5355 1  HIGATASK TC      PHASCHNG
 0510                          33,2377   00051 0           OCT     51

 0511    REF    1              33,2400  3 7741 1           CA      PRIO32
 0512    REF   38  LAST   861  33,2401  0 5076 0           TC      FINDVAC
 0513    REF    5  LAST   576  E7,1654                     FBANK=  HMEAS
 0514    REF    1              33,2402   03561 0           2CADR   HIGATJOB
 0514    REF    1              33,2403   66067 0
 0515    REF   25  LAST   869  33,2404  4 0107 0           CS      FLGWRD11
 0516    REF    3  LAST   709  33,2405  7 5006 0           MASK    PRIO3
 0517    REF   26  LAST   876  33,2406  26 107 0           ADS     FLGWRD11
 0518    REF    1              33,2407  1 2502 0           TCF     CONTSERV +1
```

```
P0519      MUNRETRN IS THE RETURN LOC FROM SPECIAL AVE G ROUTINE (MUNRVG)

 0520                            33,2410   77776 1  MUNRETRN EXIT

 0521   REF  27  LAST  876     33,2411  4 0107 0           CS      FLGWRD11
 0522   REF   8  LAST  869     33,2412  7 4726 1           MASK    LRBYBIT
 0523                          33,2413  0 0006 1           EXTEND
 0524   REF   1                33,2414  1 2505 1           BZF     COPYCYC1         BYPASS LR LOGIC IF BIT15 IS SET.

 0525   REF  28  LAST  877     33,2415  4 0107 0           CS      FLGWRD11         CHECK IF AT 30000 FT
 0526   REF   1                33,2416  7 4734 1           MASK    XORFLBIT
 0527                          33,2417  0 0006 1           EXTEND
 0528   REF   1                33,2420  1 2432 1           BZF     LROFF?

 0529                          33,2421  0 0006 1  30KCHK   EXTEND
 0530   REF   1                33,2422  3 3062 0           DCA     1-30KFT
 0531   REF 339  LAST  865     33,2423  20 155 1           DAS     MPAC             HCALC IS STILL IN MPAC FROM RVBOTH

 0532   REF 244  LAST  869     33,2424  10 000 0           CCS     A
 0533   REF   1                33,2425  1 2444 0           TCF     R12              ALTITUDE > 30KFT
 0534   REF  60  LAST  867     33,2426  0 5506 1           TC      UPFLAG           ALTITUDE < 30KFT SET X-AXIS OVERRIDE
 0535   REF   6  LAST  853     33,2427   00311 1           ADRES   XOVINFLG
 0536   REF  61  LAST  877     33,2430  0 5506 1           TC      UPFLAG
 0537   REF   1                33,2431   00253 0           ADRES   XORFLG

 0538   REF   4  LAST  329     33,2432  3 1534 1  LROFF?   CA      HCALC
 0539                          33,2433  0 0006 1           EXTEND                   IF HIGH ORDER PART ZERO, H < 3000 FT,
 0540                          33,2434  1 2436 0           BZF     +2                 SO MAKE CUTOFF TEST
 0541   REF   2  LAST  877     33,2435  1 2444 0           TCF     R12
 0542   REF   5  LAST  877     33,2436  4 1535 1           CS      HCALC +1
 0543   REF   2  LAST  782     33,2437  6 1451 0           AD      HLROFF
 0544                          33,2440  0 0006 1           EXTEND
 0545   REF   3  LAST  877     33,2441  6 2444 1           BZMF    R12              IF H < HLROFF, RESET LR PERMIT FLAG
 0546   REF  81  LAST  855     33,2442  0 5520 0           TC      DOWNFLAG
 0547   REF   3  LAST  284     33,2443   00254 1           ADRES   LRINH

 0548   REF  29  LAST  877     33,2444  4 0107 0  R12      CS      FLGWRD11
 0549   REF   2  LAST  570     33,2445  7 4733 0           MASK    NOLRRBIT
 0550                          33,2446  0 0006 1           EXTEND
 0551   REF   2  LAST  876     33,2447  1 2501 0           BZF     CONTSERV

 0552   REF   1                33,2450  3 4767 0  POSTST   CA      BITS6+7          TEST LANDING RADAR POSITION DISCRETES
 0553                          33,2451  0 0006 1           EXTEND
 0554   REF  21  LAST  785     33,2452  02 033 0           RAND    CHAN33
 0555                          33,2453  0 0006 1           EXTEND
 0556   REF  28  LAST  778     33,2454  7 4733 0           MP      BIT10            SHIFT BITS 6+7 TO BITS 1+2

 0557   REF 245  LAST  877     33,2455  50 000 1           INDEX   A
 0558                          33,2456  1 2457 1           TCF     +1
 0559   REF   1                33,2457  1 2462 1           TCF     511?             A = 0 - BOTH DISCRETES PRESENT
```

```
0560  REF   1                33,2460  1 2471 0            TCF     POSCHNG?     A = 1 - POSITION 2
0561  REF   2  LAST  878     33,2461  1 2471 0            TCF     POSCHNG?     A = 2 - POSITION 1
0562  REF   3  LAST  785     33,2462  11'622 1  511?      CCS     511CTR       IF CONDITION PERSISTS FOR FIVE
0563  REF   1                33,2463  1 2467 1            TCF     ST511CTR     CONSECUTIVE PASSES,ISSUE 511 ALARM
0564  REF  33  LAST  828     33,2464  0 5571 1            TC      ALARM
0565                         33,2465   00511 1            OCT     511
0566  REF 165  LAST  875     33,2466  4 4746 1            CS      ZERO         SET CTR TO -0 TO BYPASS ALARM
0567  REF   4  LAST  878     33,2467  55'622 1  ST511CTR  TS      511CTR
0568  REF   3  LAST  877     33,2470  1 2501 0            TCF     CONTSERV
0569  REF 135  LAST  869     33,2471  54 001 1  POSCHNG?  TS      L
0570  REF  20  LAST  862     33,2472  3 4742 1            CA      FOUR         SET 511CTR TO RE-ENABLE 511 ALARM
0571  REF   5  LAST  878     33,2473  55'622 1            TS      511CTR
0572  REF   2  LAST  157     33,2474  23'650 0            LXCH    LRPOS        UPDATE LRPOS
0573  REF   3  LAST  878     33,2475  4 1650 1            CS      LRPOS        COMPARE OLD AND NEW POSITIONS
0574  REF 136  LAST  878     33,2476  6 0001 0            AD      L
0575                         33,2477  0 0006 1            EXTEND               IF OLDPOS = NEWPOS,
0576  REF   1                33,2500  1 3064 1            BZF     UPDATCHK     TRY TO UPDATE WITH LR DATA

0577                         33,2501  0 0004 0  CONTSERV  INHINT
0578  REF   1                33,2502  4 3060 0            CS      BITS4-7
0579  REF  30  LAST  877     33,2503  7 0107 0            MASK    FLGWRD11     CLEAR LR MEASUREMENT MADE DISCRETES.
0580  REF  31  LAST  878     33,2504  54 107 0            TS      FLGWRD11
```

```
P0581
 0582   REF   6  LAST  867   33,2505  0 3473 1  COPYCYC1 TC      QUIKFAZ5

 0583   REF  25  LAST  867   33,2506  3 0120 1           CA      FIXLOC           BATTEN DOWN THE HATCHES
 0584   REF   5  LAST  867   33,2507  54 166 1           TS      PUSHLOC

 0585   REF 150  LAST  871   33,2510  0 6060 1           TC      INTPRET
 0586                        33,2511   51575 1           VLOAD   ABVAL
 0587   REF   2  LAST  154   33,2512   03573 0                   R1S
 0588                        33,2513   45206 1           PUSH    DSU
 0589   REF   9  LAST  852   33,2514   02324 0                   /LAND/
 0590   REF   6  LAST  877   33,2515   03535 1           STORE   HCALC            ALTITUDE IN UNITS OF 2(24) METERS
 0591   REF   6  LAST  818   33,2516   03775 1           STORE   HCALC1
 0592                        33,2517   63261 1           SL      PDVL             STORE HCALCLAD AT PD 2
 0593                        33,2520   20212 1                   9D
 0594   REF  25  LAST  862   33,2521   03537 0                   UNIT/R/
 0595                        33,2522   51435 1           VXV     ABVAL
 0596   REF   4  LAST  840   33,2523   03601 0                   V1S
 0597                        33,2524   56316 0           DSQ     DDV
 0598                        33,2525   00001 0                   0
 0599                        33,2526   63352 0           SL1     PDVL             STORE DALTRATE AT PD 4
 0600   REF  26  LAST  879   33,2527   03537 0                   UNIT/R/
 0601                        33,2530   72441 0           DOT     SL1
 0602   REF   5  LAST  879   33,2531   03601 0                   V1S
 0603   REF  13  LAST  819   33,2532   03474 0           STORE   HDOTDISP         HDOT IN UNITS OF 2(7) M/CS
 0604                        33,2533   63312 1           SL2     PDVL             STORE HDOTLAD AT PD 6
 0605   REF   3  LAST  879   33,2534   03573 0                   R1S
 0606                        33,2535   60505 1           VXM     VSR4
 0607   REF  37  LAST  871   33,2536   01732 0                   REFSMMAT
 0608   REF   5  LAST  872   33,2537   27545 0           STOVL   RN1              POSITION IN REFERENCE COORDINATES
 0609   REF   6  LAST  879   33,2540   03601 0                   V1S
 0610                        33,2541   76505 0           VXM     VSL1
 0611   REF  38  LAST  879   33,2542   01732 0                   REFSMMAT
 0612   REF   5  LAST  871   33,2543   27553 1           STOVL   VN1              VELOCITY IN REFERENCE COORDINATES
 0617   REF   3  LAST  846   33,2544   03563 1                   GDT1/2
 0618                        33,2545   70251 0           VSU     V/SC
 0619   REF   5  LAST  871   33,2546   02616 1                   VBIAS
 0620   REF   1              33,2547   26637 1                   GSCALE1
 0621                        33,2550   77776 1           EXIT                     G-VBIAS IN MPAC UNITS OF 2(-9) M/CS/CS

 0622                        33,2551  0 0004 0           INHINT

 0623   REF  26  LAST  879   33,2552  50 120 1           INDEX   FIXLOC           FETCH HCALCLAD FROM PD 2
 0624                        33,2553  52 003 0           DXCH    2
 0625   REF   2  LAST  157   33,2554  53'710 1           DXCH    HCALCLAD         ALTITUDE IN UNITS OF 2(15) METERS

 0626   REF  27  LAST  879   33,2555  50 120 1           INDEX   FIXLOC           FETCH DALTRATE FROM PD 4
 0627                        33,2556  3 0004 0           CA      4
 0628   REF   2  LAST  157   33,2557  55'713 1           TS      DALTRATE         DALTRATE IN UNITS OF 2(-9) M/CS/CS
 0629   REF  28  LAST  879    33,2560  50 120 1           INDEX  FIXLOC         FETCH HDOTLAD FROM PD 6
 0630                         33,2561  52 007 1           DXCH   6
 0631   REF   2  LAST  157    33,2562  53'712 0           DXCH   HDOTLAD        HDOTLAD IN UNITS OF 2(5) M/CS

 0632   REF 340  LAST  877    33,2563  3 0154 1           CA     MPAC           FETCH G-VBIAS FROM MPAC
 0633   REF   2  LAST  157    33,2564  55'676 0           TS     G-VBIASX
 0634   REF 341  LAST  880    33,2565  3 0157 1           CA     MPAC      +3
 0635   REF   2  LAST  157    33,2566  55'677 1           TS     G-VBIASY
 0636   REF 342  LAST  880    33,2567  3 0161 1           CA     MPAC      +5
 0637   REF   2  LAST  157    33,2570  55'700 0           TS     G-VBIASZ       G-VBIAS IN UNITS OF 2(-9) M/CS/CS

 0638                         33,2571  0 0006 1           EXTEND
 0639   REF  27  LAST  879    33,2572  3 1537 1           DCA    UNIT/R/
 0640                         33,2573  20 001 1           DDOUBL                SCALE FULL-SIZE BUT WATCH FOR OVERFLOW
 0641                         33,2574  54 000 0           OVSK
 0642                         33,2575  1 2577 1           TCF    +2
 0643   REF  23  LAST  827    33,2576  3 4724 1           CAF    POSMAX
 0644   REF   2  LAST  157    33,2577  57'714 1   +2      XCH    RUNITX

 0645                         33,2600  0 0006 1           EXTEND
 0646   REF  28  LAST  880    33,2601  3 1541 0           DCA    UNIT/R/   +2
 0647                         33,2602  20 001 1           DDOUBL                SCALE FULL-SIZE, OVERFLOW MOST UNLIKELY
 0648   REF   2  LAST  157    33,2603  57'715 0           XCH    RUNITY

 0649                         33,2604  0 0006 1           EXTEND
 0650   REF  29  LAST  880    33,2605  3 1543 1           DCA    UNIT/R/   +4
 0651                         33,2606  20 001 1           DDOUBL                SCALE FULL-SIZE, OVERFLOW MOST UNLIKELY
 0652   REF   2  LAST  157    33,2607  57'716 0           XCH    RUNITZ

 0653   REF  24  LAST  869    33,2610  4 0103 1           CS     FLAGWRD7       INDICATE TO LANADISP THAT THE NUMBERS IT
 0654   REF   1               33,2611  7 4732 1           MASK   SWANDBIT         NEEDS FROM SERVICER HAVE BEEN PROVIDED
 0655   REF  25  LAST  880    33,2612  26 103 1           ADS    FLAGWRD7

 0656                         33,2613  0 0006 1           EXTEND
 0657   REF   4  LAST  879    33,2614  3 1573 1           DCA    R1S            LOAD NEW NAVIGATED STATE VECTOR INTO R,V
A06575                                                                          VECTORS, FOR GUIDANCE.
 0658   REF  20  LAST  871    33,2615  53'521 1           DXCH   R
 0659                         33,2616  0 0006 1           EXTEND
 0660   REF   5  LAST  880    33,2617  3 1575 1           DCA    R1S +2
 0661   REF  21  LAST  880    33,2620  53'523 0           DXCH   R +2
 0662                         33,2621  0 0006 1           EXTEND
 0663   REF   6  LAST  880    33,2622  3 1577 0           DCA    R1S +4
 0664   REF  22  LAST  880    33,2623  53'525 0           DXCH   R +4
 0665                         33,2624  0 0006 1           EXTEND
 0666   REF   7  LAST  879    33,2625  3 1601 1           DCA    V1S
 0667   REF  12  LAST  871    33,2626  53'527 1           DXCH   V
 0668                         33,2627  0 0006 1           EXTEND
 0669   REF   8  LAST  880    33,2630  3 1603 0           DCA    V1S +2
 0670   REF  13  LAST  880    33,2631  53'531 0           DXCH   V +2
 0671                         33,2632  0 0006 1           EXTEND
 0672   REF   9  LAST  880   33,2633  3 1605 0             DCA     V1S +4
 0673   REF  14  LAST  880   33,2634  53'533 1             DXCH    V +4

 0674   REF   1              33,2635  1 2217 0             TCF     COPYCYCL        COMPLETF THE COYPCYCL.

R0675   COPYCYC1 CONSTANTS:

 0676                        33,2636   00031 0  GSCALE1   2DEC    100 B-16
 0676                        33,2637   00000 1

 0677                        33,2640   00000 1  BIASFACT  2DEC    .01 B-10
 0677                        33,2641   05075 0
```

```
P0678   ************************************************************************************************************************
R0681

 0682                          33,2642   41456 0  CALCGRAV UNIT     PUSH             SAVE UNIT/R/ IN PUSHLIST            (18)
 0683   REF  30  LAST  880     33,2643   03537 0           STORE    UNIT/R/
 0684                          33,2644   67340 1           LXC,1    SLOAD            RTX2 = 0 IF EARTH ORBIT, =2 IF LUNAR.
 0685   REF  15  LAST  775     33,2645   02777 1                    RTX2
 0686   REF  16  LAST  882     33,2646   03000 1                    RTX2
 0687                          33,2647   50076 0           DCOMP    BMN
 0688   REF   1                33,2650   66677 1                    CALCGRV1
 0689                          33,2651   50375 0           VLOAD    DOT                                                  (12)
 0690   REF   9  LAST  842     33,2652   06477 0                    UNITZ
 0691   REF  31  LAST  882     33,2653   03537 0                    UNIT/R/
 0692                          33,2654   41552 0           SL1      PUSH                                                 (14)
 0693                          33,2655   44316 0           DSQ      BDSU
 0694   REF   1                33,2656   26741 1                    DP1/20
 0695                          33,2657   56325 0           PDDL     DDV
 0696   REF   1                33,2660   26106 1                    RESQ
 0697                          33,2661   00043 0                    34D              (RN)SQ
 0698                          33,2662   00041 1           STORE    32D              TEMP FOR (RE/RN)SQ
 0699                          33,2663   41205 0           DMP      DMP
 0700   REF   1                33,2664   26110 0                    20J
 0701                          33,2665   65361 0           VXSC     PDDL
 0702   REF  32  LAST  882     33,2666   03537 0                    UNIT/R/
 0703                          33,2667   41205 0           DMP      DMP
 0704   REF   1                33,2670   26112 1                    2J
 0705                          33,2671   00041 1                    32D
 0706                          33,2672   76561 1           VXSC     VSL1
 0707   REF  10  LAST  882     33,2673   06477 0                    UNITZ
 0708                          33,2674   45455 1           VAD      STADR
 0709   REF   2  LAST  776     33,2675   74256 0           STORE    UNITGOBL
 0710                          33,2676   41455 0           VAD      PUSH             MPAC = UNIT GRAVITY VECTOR.         (18)
 0711                          33,2677   60345 0  CALCGRV1 DLOAD    NORM             PERFORM A NORMALIZATION ON RMAGSQ IN
 0712                          33,2700   00043 0                    34D              ORDER TO BE ABLE TO SCALE THE MU FOR
 0713   REF  14  LAST  772     33,2701   00050 1                    X2               MAXIMUM PRECISION.
 0714                          33,2702   53663 1           BDDV*    SLR*
 0715   REF   1                33,2703   26100 1                    -MUDT,1
 0716                          33,2704   56623 0                    0 -21D,2
 0717                          33,2705   45561 1           VXSC     STADR
 0718   REF   4  LAST  879     33,2706   74214 0           STORE    GDT1/2           SCALED AT 2(+7) M/CS
 0719                          33,2707   77616 0           RVQ

 0720                          33,2710   61375 1  CALCRVG  VLOAD    VXM
 0721   REF   9  LAST  864     33,2711   00325 0                    DELV
 0722   REF  39  LAST  879     33,2712   01732 0                    REFSMMAT
 0723                          33,2713   76561 1           VXSC     VSL1
 0724   REF   4  LAST  865     33,2714   26074 0                    KPIP1
 0725   REF   5  LAST  766     33,2715   03527 1           STORE    DELVREF
 0726                          33,2716   41562 0           VSR1     PUSH
 0727                          33,2717   41455 0           VAD      PUSH             (DV-OLDGDT)/2 TO PD SCALED AT 2(+7)M/CS
```

```
0728  REF   9  LAST  819  33,2720  01236 1                  GDT/2
0729                      33,2721  65255 0          VAD     PDDL                                  (18)
0730  REF   8  LAST  757  33,2722  01226 0                  VN
0731  REF   4  LAST  874  33,2723  01247 1                  PGUIDE
0732                      33,2724  74261 1          SL      VXSC
0733                      33,2725  20207 0                  6D
0734                      33,2726  44055 1          VAD     STQ
0735  REF  15  LAST  872  33,2727  01220 0                  RN
0736                      33,2730  00037 0                  31D
0737  REF   6  LAST  879  33,2731  37545 1          STCALL  RN1        TEMP STORAGE OF RN SCALED 2(+29)M
0738  REF   2  LAST  871  33,2732  66642 1                  CALCGRAV

0739                      33,2733  53255 0          VAD     VAD
0740                      33,2734  77655 1          VAD
0741  REF   9  LAST  883  33,2735  01226 0                  VN
0742  REF   6  LAST  879  33,2736  37553 0          STCALL  VN1        TEMP STORAGE OF VN SCALED 2(+7)M/CS
0743                      33,2737  00037 0                  31D

0744                      33,2740  01463 1  DP1/20  2DEC    0.05
0744                      33,2741  06315 0
0745                      33,2742  00010 0  SHIFT11 2DEC    1 B-11
0745                      33,2743  00000 1
```

```
P0746   ******************************************************************************************************

R0748   MUNRVG IS A SPECIAL AVERAGE G INTEGRATION ROUTINE USED BY THRUSTING
R0749   PROGRAMS WHICH FUNCTION IN THE VICINITY OF AN ASSUMED SPHERICAL MOON.
R0750   THE INPUT AND OUTPUT QUANTITIES ARE REFERENCED TO THE STABLE MEMBER
R0751   COORDINATE SYSTEM.

 0752                           33,2744    41575 0  RVBOTH    VLOAD   PUSH
 0753   REF   3  LAST  729      33,2745    02310 1                    G(CSM)           CSM GDT1/2 FOR LAST PASS.
 0754                           33,2746    65255 0            VAD     PDDL
 0755   REF   3  LAST  729      33,2747    01724 1                    V(CSM)
 0756   REF   5  LAST  883      33,2750    01247 1                    PGUIDE
 0757                           33,2751    74271 0            DDV     VXSC
 0758   REF   1                 33,2752    26743 0                    SHIFT11
 0759                           33,2753    77655 1            VAD
 0760   REF   4  LAST  856      33,2754    01716 0                    R(CSM)
 0761   REF   7  LAST  880      33,2755    37573 1            STCALL  R1S              = RCSM + PGUIDE(VCSM + GCSM) AT 2(+24)M.
 0762   REF   5  LAST  871      33,2756    67037 1                    MUNGRAV          COMPUTE LUNAR GRAVITY AT CSM ALTITUDE.
 0763                           33,2757    53255 0            VAD     VAD
 0764   REF   4  LAST  884      33,2760    01724 1                    V(CSM)
 0765                           33,2761    77626 0            STADR
 0766   REF  10  LAST  881      33,2762    74176 1            STORE   V1S              = VCSM + GCSM + GDT1/2 AT 2(+7)M/CS.
 0767                           33,2763    77776 1            EXIT
 0768   REF   7  LAST  879      33,2764    0 3473 1           TC      QUIKFAZ5
 0769   REF 151  LAST  879      33,2765    0 6060 1           TC      INTPRET
 0770                           33,2766    77775 1            VLOAD                    FOR RESTART PURPOSES.
 0771   REF   5  LAST  882      33,2767    03563 1                    GDT1/2
 0772   REF   4  LAST  884      33,2770    26310 1            STOVL   G(CSM)
 0773   REF   8  LAST  884      33,2771    03573 0                    R1S
 0774   REF   5  LAST  884      33,2772    25716 0            STOVL   R(CSM)
 0775   REF  11  LAST  884      33,2773    03601 0                    V1S
 0776   REF   5  LAST  884      33,2774    01724 1            STORE   V(CSM)
 0777                           33,2775    77776 1            EXIT
 0778   REF   8  LAST  884      33,2776    0 3473 1           TC      QUIKFAZ5
 0779   REF 152  LAST  884      33,2777    0 6060 1           TC      INTPRET
 0780                           33,3000    74375 0  MUNRVG    VLOAD   VXSC
 0781   REF  10  LAST  882      33,3001    00325 0                    DELV
 0782   REF   1                 33,3002    26076 1                    KPIP2
 0783                           33,3003    53206 0            PUSH    VAD              1ST PUSH: DELV IN UNITS OF 2(8) M/CS
 0784   REF  10  LAST  883      33,3004    01236 1                    GDT/2
 0785                           33,3005    53206 0            PUSH    VAD              2ND PUSH: (DELV + GDT)/2, UNITS OF 2(7)
 0786   REF  15  LAST  881      33,3006    03527 1                    V                                                     (12)
 0787                           33,3007    56325 0            PDDL    DDV
 0788   REF   6  LAST  884      33,3010    01247 1                    PGUIDE
 0789   REF   2  LAST  884      33,3011    26743 0                    SHIFT11
 0790                           33,3012    77761 1            VXSC
 0791                           33,3013    77655 1            VAD
 0792   REF  23  LAST  880      33,3014    03521 1                    R                LM POSITION VECTOR AT 2(24)M.
 0793   REF   9  LAST  884      33,3015    37573 1            STCALL  R1S              = R + PGUIDE(V + DELV + GDT1/2).
 0794   REF   6  LAST  884      33,3016    67037 1                    MUNGRAV
 0795                          33,3017   53255 0            VAD     VAD
 0796                          33,3020   77655 1            VAD                                                     (0)
 0797  REF  16  LAST  884      33,3021   03527 1                    V               LM VELOCITY VECTOR AT 2(+7)M/CS.
 0798  REF  12  LAST  884      33,3022   03601 0            STORE   V1S             = V + GDT1/2 + DELV
 0799                          33,3023   77646 0            A8VAL
 0800  REF   6  LAST  730      33,3024   27472 0            STOVL   A8VEL           STORE SPEED FOR LR AND DISPLAYS.
 08001 REF   7  LAST  856      33,3025   02316 1                    WM
 08002                         33,3026   72435 0            VXV     VSL2
 08003 REF  10  LAST  884      33,3027   03573 0                    R1S
 08004 REF   2  LAST  157      33,3030   17702 1            STODL   VSURFACE        SURFACE VELOCITY IN UNITS OF 2(5) M/CS
 0801                          33,3031   00045 0                    36D
 0802                          33,3032   47025 0            DSU     RT8
 0803  REF  10  LAST  879      33,3033   02324 0                    /LAND/
 0804  REF   2  LAST  388      33,3034   21622 1                    SGNAGREE
 0805  REF   7  LAST  879      33,3035   37535 0            STCALL  HCALC           FOR NOW, DISPLAY WHETHER POS OR NEG
 0806  REF   1                 33,3036   66410 1                    MUNRETRN        GO TO LR UPDATES ROUTINE, R12.

 0807                          33,3037   77656 1  MUNGRAV   UNIT                    AT 36D HAVE A8VAL(R), AT 34D R.R
 0808  REF  33  LAST  882      33,3040   17537 0            STODL   UNIT/R/
 0809                          33,3041   00043 0                    34D
 0810                          33,3042   55261 1            SL      BDDV
 0811                          33,3043   20207 0                    6D
 0812  REF   1                 33,3044   26104 0                    -MUDTMUN
 0813                          33,3045   74205 0            DMP     VXSC
 0814  REF   3  LAST  884      33,3046   26743 0                    SHIFT11
 0815  REF  34  LAST  885      33,3047   03537 0                    UNIT/R/
 0816  REF   6  LAST  884      33,3050   03563 1            STORE   GDT1/2          1/2GDT SCALED AT 2(7)M/CS.
 0817                          33,3051   77616 0            RVQ

 0818  REF   1                    4767            8ITS6+7   EQUALS  SUPER110        LR POSITION DISCRETES
 0819                          33,3052   00014 1  2SEC(18)  2DEC    200 B-18
 0819                          33,3053   20000 0
 0820                          33,3054   00000 1  2SEC(28)  2OCT    00000 00310     2SFC AT 2(28)
 0820                          33,3055   00310 0
 0821                          33,3056   00000 1  4SEC(28)  2DEC    400 B-28
 0821                          33,3057   00620 0
 0822                          33,3060   00110 1  8ITS4-7   OCT     110
 0823                          33,3061   37767 0  1-30KFT   2DEC    16768072 8-24   DPPOSMAX-30KFT
 0823                          33,3062   02200 1
 0824                          33,3063   00102 1  66DEC     DEC     66
```

```
P0825
 0826   REF   2  LAST  575   33,3064  3 4741 1  UPDATCHK CA      RNGEDBIT          SEE IF ALT READING MADE
 0827   REF  32  LAST  878   33,3065  7 0107 0           MASK    FLGWRD11
 0828                        33,3066  0 0006 1           EXTEND
 0829   REF   1              33,3067  1 3261 0           BZF     VMEASCHK          NO ALT MEAS THIS CYCLE-CHECK FOR VEL

 0830   REF   9  LAST  884   33,3070  0 3473 1  POSUPDAT TC      QUIKFAZ5
 0831   REF   1              33,3071  0 3501 0           TC      POSINDEX          SET X1 TO PROPER POSITION AND ZERO PLIST
 0832   REF 153  LAST  884   33,3072  0 6060 1           TC      INTPRET
 0833                        33,3073   61373 1           VLOAD*  VXM
 0834   REF   1              33,3074   26003 0                   HBEAMNB,1
 0835   REF   8  LAST  867   33,3075   02137 0                   XNBPIP            HBEAM SM AT 2(1)
 0836                        33,3076   54325 1           PDDL    SL                STORE IN PUSHLIST AND SCALE HMEAS
 0837   REF   6  LAST  876   33,3077   03655 1                   HMEAS
 0838                        33,3100   20207 0                   6D
 0839                        33,3101   74205 0           DMP     VXSC              SLANT RANGE AT 2(22),PUSH UP FOR HBEAM
 0840   REF   1              33,3102   26063 0                   HSCAL             TO GET SLANT RANGE VECTOR AT 2(23) M
 0841                        33,3103   50206 0           PUSH    DOT               PUSH NEG OF RADAR ALTITUDE BEAM VECTOR
 0842   REF  35  LAST  885   33,3104   03537 0                   UNIT/R/           ALTITUDE AT 2(24) METERS
 0843                        33,3105   77625 0           DSU
 08431  REF   8  LAST  885   33,3106   03535 1                   HCALC
 08432  REF   1              33,3107   03767 1           STORE   TEMDELH           STORE PARTIAL(TRUE) DELTA H, AND
 0844                        33,3110   77725 1           PDDL                      LOAD NEG OF BEAM Z

R0845   =================================================================
R0846   TERRAIN MODEL
R0847   =================================================================

 0848                        33,3111   43342 0           SR1     DAD
 0849   REF  18  LAST  809   33,3112   03641 1                   LAND       +4
 0850                        33,3113   54221 1           BDSU    SL                SCALE RANGE TO UNITS OF 2(18) METERS
 0851   REF  11  LAST  885   33,3114   03577 1                   R1S        +4
 0852                        33,3115   20207 0                   6D
 0853                        33,3116   77404 1           BOVB    EXIT
 0854   REF  13  LAST  374   33,3117   31765 1                   SIGNMPAC          PICK UP NEGMAX UPON OVERFLOW

 0855   REF  29  LAST  798   33,3120  4 0075 1           CS      FLAGWRD1          IS NOTERFLG SET (BY P66 OR V68)?
 0856   REF   1              33,3121  7 4732 1           MASK    NOTERBIT
 0857                        33,3122  0 0006 1           EXTEND
 0858   REF   1              33,3123  1 3161 0           BZF     TERSKIP           Y: SKIP TERRAIN BUT TRANSFER DELTA H

 0859   REF  10  LAST  827   33,3124  3 5005 1           CA      EBANK5            N: PREPARE TO ACCESS TERRAIN TABLE
 0860   REF  44  LAST  853   33,3125  54 003 0           TS      EBANK
 0861   REF   2  LAST  815   E5,1777                     EBANK=  END-E5

 0862   REF 166  LAST  878   33,3126  3 4746 0           CA      ZERO              INITIALIZE MINUS LAST ABSCISSA FOR
 0863   REF   3  LAST   99   33,3127  54 142 1           TS      TEM2              TERLOOP WHICH ADDS THE CONTRIBUTIONS
 0864   REF  21  LAST  878   33,3130  3 4742 1           CA      FOUR              OF FIVE TERRAIN SEGMENTS TO DELTA H
 0865   REF   3  LAST  100   33,3131  54 145 0  TERLOOP  TS      TEM5
 0866    REF 343  LAST  880    33,3132  3 C154 1               CA      MPAC              PICK UP CURRENT RANGE (NEG BEFORE SITE)
 0867    REF 137  LAST  878    33,3133  54 001 1               TS      L
 0868    REF   4  LAST  886    33,3134  50 145 1               INDEX   TEM5
 0869    REF   2  LAST  126    33,3135  4 1522 1               CS      ABSCO             TERRAIN ABSCISSAE UNITS: 2(18) METERS
 0870    REF 238  LAST  867    33,3136  0 4607 1               TC      BANKCALL          LIMIT GIVEN LIMITSUB MUST BE POSITIVE
 0871    REF   3  LAST  815    33,3137   61713 0               FCADR   LIMITSUB          LIMIT |RANGE| <= |CURRENT ABSCISSA|
 0872    REF   8  LAST  434    33,3140  54 144 1               TS      TEM4              SAVE TO COMPARE WITH CURRENT ABSCISSA

 0873    REF   4  LAST  886    33,3141  6 0142 0               AD      TEM2              SUBTRACT LAST ABSCISSA
 0874                          33,3142  0 0006 1               EXTEND
 0875    REF   5  LAST  887    33,3143  5 0145 1               INDEX   TEM5
 0876    REF   2  LAST  126    33,3144  7 1527 1               MP      SLOPEO            SLOPE UNITS: 2(6) RADIANS. RESOL: 3.9 MR

 0877    REF  29  LAST  880    33,3145  50 120 1               INDEX   FIXLOC            ADD CONTRIBUTION OF SEGMENT TO YIELD
 0878                          33,3146  20 005 0               DAS     4                 CORRECTED DELTA H IN UNITS 2(24) METERS

 0879    REF   9  LAST  348    33,3147  3 0141 0               CA      TEM1              RETRIEVE MINUS CURR ABSC FROM LIMITSUB*
 0880    REF   5  LAST  887    33,3150  54 142 1               TS      TEM2              STORE AS MINUS LAST ABSC FOR NEXT SEG

R0881    * NOTE:  IF WE HAVE FLOWN BEYOND THE LANDING SITE BY MORE THAN THE
R0882             LENGTH OF THE SEGMENT ADJACENT TO THE LANDING SITE, CA TEM1
R0883             WILL RETRIEVE - INSTEAD OF MINUS THE CURRENT ABSCISSA -
R0884             A ZERO OR POSITIVE REMAINDER OF THE DIVISION DONE BY LIMITSUB.
R0885             THIS RETRIEVAL WILL CAUSE AN IMMEDIATE BRANCH TO TEREND,
R0886             WHICH IS THE DESIRED RESULT.  HOWEVER, FLYING PAST THE LANDING
R0887             SITE IS IMPOSSIBLE EXCEPT IN P66 WHEN THE TERRAIN MODEL IS OFF.

 0888    REF   9  LAST  887    33,3151  6 0144 0               AD      TEM4              HAS LM FLOWN PAST CURRENT ABSCISSA?
 0889                          33,3152  0 0006 1               EXTEND
 0890                          33,3153  1 3155 1               BZF     +2
 0891    REF   1               33,3154  1 3157 0               TCF     TEREND            Y: IGNORE FURTHER ABSCISSAE
 0892    REF   6  LAST  887    33,3155  10 145 0               CCS     TEM5              N: IS CURRENT ABSCISSA THE LAST?
 0893    REF   1               33,3156  1 3131 0               TCF     TERLOOP           N: REPEAT TERRAIN LOOP

 0894    REF  13  LAST  853    33,3157  3 5007 0    TEREND     CA      EBANK7            Y: RESTORE EBANK AND DEPART
 0895    REF  45  LAST  886    33,3160  54 003 0               TS      EBANK
 0896    REF   3  LAST  820    E7,1777                         EBANK=  END-E7

 0897                          33,3161  0 0004 0    TERSKIP    INHINT                    SO DOWNLINK DATA WILL BE TIME HOMOGENEOU
 08971   REF  30  LAST  887    33,3162  50 120 1               INDEX   FIXLOC            TRANSFER COMPLETED DELTA H HOME
 0898                          33,3163  52 005 0               DXCH    4                 TO BE ACCESSED BY DISPLAYS, TELEMETRY,
 0899    REF   5  LAST  782    33,3164  53'665 1               DXCH    DELTAH            AND POSITION UPDATE.

 08991   REF   2  LAST  886    33,3165  53'767 1               DXCH    TEMDELH           TRANSFER TRUE DELTA H TO TRUDELH
 08992   REF   2  LAST  213    33,3166  53'737 1               DXCH    TRUDELH            FOR DOWNLINK
 08993                         33,3167  0 0003 1               RELINT

 0900    REF  31  LAST  887    33,3170  3 0120 1               CA      FIXLOC            RESTORE PUSHDOWN POINTER TO ZERO
 0901    REF   6  LAST  879    33,3171  54 166 1               TS      PUSHLOC
 0902   REF  33  LAST  886   33,3172  3 0107 1            CA      FLGWRD11       IS PSTHIBIT SET (BY HIGATASK)?
 0903   REF   1              33,3173  7 4732 1            MASK    PSTHIBIT
 0904                        33,3174  0 0006 1            EXTEND                 DO NOT PERFORM DATA REASONABLENESS TEST
 0905   REF   1              33,3175  1 3215 0            BZF     NOREASON       UNTIL AFTER HIGATE

 0906   REF 154  LAST  886   33,3176  0 6060 1            TC      INTPRET
 0907                        33,3177   51545 1            DLOAD   ABS
 0908   REF   6  LAST  887   33,3200   03665 1                    DELTAH
 0909                        33,3201   62425 0            DSU     SL2            (ABS(DELTAH) - DQFIX) 2(24)
 0910   REF   2  LAST  126   33,3202   02504 1                    DELQFIX        SCALE TO 2(22)
 0911                        33,3203   77425 1            DSU     EXIT           (ABS(DELTAH) -(DQFIX + HCALC/4)) 2(22)
 0912   REF   9  LAST  886   33,3204   03535 1                    HCALC

 0913   REF   3  LAST  765   33,3205  25'670 1            INCR    LRLCTR
 0914   REF   1              33,3206  0 6744 0            TC      BRANCH
 0915   REF   1              33,3207  1 3513 1            TCF     HFAIL          DELTA H TOO LARGE
 0916   REF   2  LAST  888   33,3210  1 3513 1            TCF     HFAIL          DELTA H TOO LARGE
 0917   REF  82  LAST  877   33,3211  0 5520 0            TC      DOWNFLAG       RESET HFAIL FLAG
 0918   REF   1              33,3212   00247 0            ADRES   HFAILFLG
 0919   REF  83  LAST  888   33,3213  0 5520 0            TC      DOWNFLAG       TURN OFF ALT FAIL LAMP
 0920   REF   1              33,3214   00263 0            ADRES   HFLSHFLG

 0921   REF  34  LAST  888   33,3215  4 0107 0  NOREASON  CS      FLGWRD11
 0922   REF   2  LAST  811   33,3216  7 4735 0            MASK    LRINHBIT
 0923   REF 246  LAST  877   33,3217  10 000 0            CCS     A
 0924   REF   2  LAST  886   33,3220  1 3261 0            TCF     VMEASCHK       UPDATE INHIBITED - TEST VELOCITY ANYWAY

 0925   REF 155  LAST  888   33,3221  0 6060 1            TC      INTPRET
 0926                        33,3222   40545 1  POSUP     DLOAD   SR4
 0927   REF  10  LAST  888   33,3223   03535 1                    HCALC          RESCALE H TO 2(28)M
 0928                        33,3224   77776 1            EXIT
 0929                        33,3225  0 0006 1            EXTEND
 0930   REF   7  LAST  888   33,3226  3 1665 0            DCA     DELTAH         STORE DELTAH IN MPAC AND
 0931   REF 344  LAST  887   33,3227  52 155 1            DXCH    MPAC           BRING HCALC INTO A,L
 0932   REF   1              33,3230  0 7565 0            TC      ALSIGNAG
 0933                        33,3231  0 0006 1            EXTEND                 IF HIGH PART OF HCALC IS NON ZERO, THEN
 0934                        33,3232  1 3234 0            BZF     +2             HCALC > HMAX,
 0935   REF   3  LAST  888   33,3233  1 3261 0            TCF     VMEASCHK       SO UPDATE IS BYPASSED
 0936   REF 345  LAST  888   33,3234  54 156 1            TS      MPAC +2          FOR LATER SHORTMP

 0937   REF 138  LAST  887   33,3235  4 0001 1            CS      L              -H AT 2(14)M
 0938   REF   1              33,3236  6 1420 0            AD      LRHMAX         HMAX - H
 0939                        33,3237  0 0006 1            EXTEND
 0940   REF   4  LAST  888   33,3240  6 3261 1            BZMF    VMEASCHK       IF H >HMAX, BYPASS UPDATE
 0941                        33,3241  0 0006 1            EXTEND
 0942   REF   2  LAST  799   33,3242  7 1421 0            MP      LRWH           WH(HMAX - H)
 0943                        33,3243  0 0006 1            EXTEND
 0944   REF   2  LAST  888   33,3244  11'420 1            DV      LRHMAX         WH(1 - H/HMAX)
 0945   REF   4  LAST  477   33,3245  54 135 1            TS      MPTEMP
 0946   REF   1              33,3246  0 7334 1            TC      SHORTMP2       DELTAH (WH)(1 - H/HMAX) IN MPAC
 0947   REF 156  LAST  888    33,3247  0 6060 1               TC       INTPRET            MODE IS DP FROM A8OVE
 0948                         33,3250   77752 1               SL1
 0949                         33,3251   53361 0               VXSC     VAD
 0950   REF  36  LAST  886    33,3252   03537 0                        UNIT/R/            DELTAR = DH(WH)(1 - H/HMAX) UNIT/R/
 0951   REF  12  LAST  886    33,3253   C3573 0                        R1S
 0952   REF   1               33,3254   C3657 0               STORE    GNUR
 0953                         33,3255   77776 1               EXIT

 0954   REF  10  LAST  886    33,3256  0 3473 1               TC       QUIKFAZ5

 0955   REF 167  LAST  886    33,3257  3 4746 0               CA       ZFRO
 0956   REF   1               33,3260  0 3455 0    RUPDATED   TC       GNURVST

 0957   REF  11  LAST  889    33,3261  0 3473 1    VMEASCHK   TC       QUIKFAZ5           RFSTART AT NEXT LOCATION
 0958   REF  35  LAST  888    33,3262  4 C107 0    R12THRU?   CS       FLGWRD11           IS RADAREAD THROUGH ?
 0959   REF   4  LAST  576    33,3263  7 4742 0               MASK     R12RDBIT
 0960   REF 247  LAST  888    33,3264  10 C00 0               CCS      A
 0961   REF   1               33,3265  1 3271 1               TCF      VELDATA?           YES;GO ON WITH UPDATF
 0962   REF   6  LAST  720    33,3266  10 C67 1               CCS      NEWJ08             NO-WAIT
 0963   REF   5  LAST  720    33,3267  0 5113 1               TC       CHANG1
 0964   REF   1               33,3270  1 3262 0               TCF      R12THRU?
 0965   REF  36  LAST  889    33,3271  4 0107 0    VELDATA?   CS       FLGWRD11
 0966   REF   2  LAST  576    33,3272  7 4736 0               MASK     VELDA8IT           IS V READING AVAILA8LE?
 0967   REF 248  LAST  889    33,3273  10 000 0               CCS      A
 0968   REF   1               33,3274  1 3433 1               TCF      VALTCHK            NO   SEE IF V READING TO 8F TAKEN

 0969   REF   2  LAST  886    33,3275  0 3501 0    VELUPDAT   TC       POSINDEX           SET X1 AND X2 AND ZFRO PUSHLIST
 0970   REF   7  LAST  861    33,3276  4 1462 1               CS       VSELECT
 0971   REF 139  LAST  888    33,3277  54 C01 1               TS       L
 0972   REF 140  LAST  889    33,3300  26 001 1               ADS      L                  -2 VSELECT IN L
 0973   REF 141  LAST  889    33,3301  6 0001 0               AD       L
 0974   REF 142  LAST  889    33,3302  6 0C01 0               AD       L                  -6 VSELECT IN A
 0975   REF  32  LAST  887    33,3303  50 120 1               INDEX    FIXLOC
 0976   REF  23  LAST  827    33,3304  20 047 0               DAS      X1                 X1 = -6 VSELECT(POS),X2 = -2 VSELECT

 0977   REF 157  LAST  889    33,3305  0 6060 1               TC       INTPRET
 0978                         33,3306   61373 1               VLOAD*   VXM
 0979   REF   1               33,3307   26011 0                        VZBEAMNB,1         CONVERT PROPER VBEAM FROM NB TO SM
 0980   REF   9  LAST  886    33,3310   02137 0                        XNBPIP             SCALED AT 2(1)
 0981                         33,3311   54325 1               PDDL     SL                 STORE IN PD 0-5
 0982   REF   4  LAST  576    33,3312   03653 1                        VMEAS              LOAD VELOCITY MEASUREMENT
 0983                         33,3313   20215 0                        12D
 0984                         33,3314   63203 0               DMP*     PDVL               SCALE TO M/CS AT 2(6)
 0985   REF   1               33,3315   51712 1                        VZSCAL,2           AND STORE IN PD 6-7
 0986   REF  13  LAST  885    33,3316   03601 0                        V1S                VELOCITY AT TIME OF READING
 0987                         33,3317   52352 1               VSL2     VSU                SCALE TO 2(5) M/CS AND SU8TRACT
 0988   REF   3  LAST  885    33,3320   03702 1                        VSURFACE                     MOON ROTATION.
 0989                         33,3321   51406 1               PUSH     ABVAL              STORE IN PD
 0990                         33,3322   43202 0               SR4      DAD                A8S(VM)/8 + VELBIAS AT 2(6)
 0991   REF   2  LAST  125    33,3323   02401 0                        VEL8IAS
```

```
0992                        33,3324   24025 0          STOVL   20D            STORE IN 20D AND PICK UP VM
0993                        33,3325   44241 0          DOT     BDSU
0994                        33,3326   00C01 0                  0              DELTAV = VMEAS - V(EST)
0995                        33,3327   51406 1          PUSH    ABS
0996                        33,3330   77425 1          DSU     EXIT           ABS(DV) - (7.5 + ABS(VM)/8))
0997                        33,3331   0CC25 0                  20D

0998  REF   3  LAST  785    33,3332   25'672 0         INCR    LRMCTR
0999  REF   2  LAST  888    33,3333   0 6744 0         TC      BRANCH
1000  REF   1               33,3334   1 3532 1         TCF     VFAIL          DELTA V TOO LARGE      ALARM
1001  REF   2  LAST  890    33,3335   1 3532 1         TCF     VFAIL          DELTA V TOO LARGE      ALARM

1002  REF  84  LAST  888    33,3336   0 5520 0         TC      DOWNFLAG       RESET HFAIL FLAG
1003  REF   1               33,3337   00246 1          ADRES   VFAILFLG
1004  REF  85  LAST  890    33,3340   0 5520 0         TC      DOWNFLAG       TURN OFF VEL FAIL LAMP
1005  REF   1               33,3341   00262 1          ADRES   VFLSHFLG

1006  REF  37  LAST  889    33,3342   3 0107 1         CA      FLGWRD11
1007  REF   1               33,3343   7 4731 1         MASK    VXINHBIT
1008                        33,3344   0 C006 1         EXTEND
1009  REF   1               33,3345   1 3354 1         BZF     VUPDAT         IF VX INHIBIT RESET, INCORPORATE DATA.

1010  REF  86  LAST  890    33,3346   0 5520 0         TC      DOWNFLAG
1011  REF   1               33,3347   0C250 0          ADRES   VXINH          RESET VX INHIBIT

1012  REF   8  LAST  889    33,3350   3 1462 0         CA      VSELECT
1013  REF   5  LAST  577    33,3351   6 7767 0         AD      NEG2           IF VSELECT = 2 (X AXIS),
1014                        33,3352   0 0006 1         EXTEND                 BYPASS UPDATE
1015  REF   1               33,3353   1 3433 1         BZF     ENDVDAT

1016  REF  38  LAST  890    33,3354   4 0107 0  VUPDAT CS      FLGWRD11
1017  REF   3  LAST  888    33,3355   7 4735 0         MASK    LRINHBIT
1018  REF 249  LAST  889    33,3356   10 000 0         CCS     A
1019  REF   2  LAST  889    33,3357   1 3433 1         TCF     VALTCHK        UPDATE INHIBITED

1020  REF 346  LAST  888    33,3360   54 155 1         TS      MPAC +1

1021  REF   7  LAST  885    33,3361   3 1471 1         CA      ABVEL          STORE E7 ERASABLES NEEDED IN TEMPS
1022  REF   1               33,3362   54 130 1         TS      ABVEL*
1023  REF   9  LAST  890    33,3363   3 1462 0         CA      VSELECT
1024  REF   1               33,3364   54 131 0         TS      VSELECT*
1025  REF  11  LAST  886    33,3365   3 5005 1         CA      EBANK5
1026  REF  46  LAST  887    33,3366   54 003 0         TS      EBANK          CHANGE EBANKS

1027  REF   2  LAST  126    E5,1512                    EBANK=  LRVF
1028  REF   3  LAST  890    33,3367   4 1512 1         CS      LRVF
1029  REF   2  LAST  890    33,3370   6 0130 0         AD      ABVEL*         IF V < VF, USE WVF
1030                        33,3371   0 0006 1         EXTEND
1031  REF   1               33,3372   6 3405 0         BZMF    USEVF
```

```
 1032   REF   3  LAST  890   33,3373   4 0130 1              CS       ABVEL*
 1033   REF   2  LAST  126   33,3374   6 1511 0              AD       LRVMAX           VMAX - V
 1034                        33,3375   0 0006 1              EXTEND
 1035   REF   1              33,3376   6 3410 1              BZMF     WSTOR -1         IF V > VMAX, W = 0

 1036                        33,3377   0 0006 1              EXTEND
 1037   REF   2  LAST  890   33,3400   5 0131 1              INDEX    VSELECT*
 1038   REF   2  LAST  126   33,3401   7 1513 0              MP       LRWVZ            WV(VMAX - V)

 1039                        33,3402   0 0006 1              EXTEND
 1040   REF   3  LAST  891   33,3403   11'511 1              DV       LRVMAX           WV( 1 - V/VMAX )
 1041   REF   2  LAST  891   33,3404   1 3411 1              TCF      WSTOR

 1042   REF   3  LAST  891   33,3405   50 131 1   USEVF      INDEX    VSELECT*
 1043   REF   2  LAST  126   33,3406   3 1516 1              CA       LRWVFZ           USE APPROPRIATE CONSTANT WEIGHT
 1044   REF   3  LAST  891   33,3407   1 3411 1              TCF      WSTOR

 1045   REF 168  LAST  889   33,3410   3 4746 0   -1         CA       ZERO
 1046   REF 347  LAST  890   33,3411   54 154 0   WSTOR      TS       MPAC
 1047   REF  26  LAST  579   33,3412   4 4736 0              CS       BIT7             (=64D)
 1048   REF  18  LAST  837   33,3413   6 1010 1              AD       MODREG
 1049                        33,3414   0 0006 1              EXTEND
 1050   REF   1              33,3415   6 3420 1              BZMF     GETGNUV          IF IN P66 USE ANOTHER CONSTANT
 1051   REF   2  LAST  126   33,3416   3 1521 0              CA       LRWVFF
 1052   REF 348  LAST  891   33,3417   54 154 0              TS       MPAC

 1053   REF  14  LAST  887   33,3420   3 5007 0   GETGNUV    CA       EBANK7
 1054   REF  47  LAST  890   33,3421   54 003 0              TS       EBANK            CHANGE EBANKS

 1055   REF   8  LAST  890   E7,1471                         EBANK=   ABVEL
 1056   REF 158  LAST  889   33,3422   0 6060 1              TC       INTPRET
 1057                        33,3423    74205 0              DMP      VXSC             W(DELTA V)(VBEAMSM)  UP 6-7, 0-5
 1058                        33,3424    77655 1              VAD
 1059   REF  14  LAST  889   33,3425    03601 0                       V1S              ADD WEIGHTED DELTA V TO VELOCITY
 1060   REF   1              33,3426    03657 0              STORE    GNUV
 1061                        33,3427    77776 1              EXIT

 1062   REF  12  LAST  889   33,3430   0 3473 1              TC       QUIKFAZ5         DO NOT RE-UPDATE

 1063   REF  15  LAST  810   33,3431   3 6263 0              CA       SIX
 1064   REF   2  LAST  889   33,3432   0 3455 0   VUPDATED   TC       GNURVST          STORE NEW VELOCITY VECTOR
 1065   REF   3  LAST  890   33,3433              ENDVDAT    =        VALTCHK

 1066   REF  13  LAST  891   33,3433   0 3473 1   VALTCHK    TC       QUIKFAZ5         DO NOT REPEAT ABOVE

 1067   REF  39  LAST  890   33,3434   4 0107 0   HIGATCHK   CS       FLGWRD11         IS PSTHIBIT SET (BY HIGATASK)?
 1068   REF   2  LAST  888   33,3435   7 4732 1              MASK     PSTHIBIT
 1069                        33,3436   0 0006 1              EXTEND
 1070   REF   4  LAST  878   33,3437   1 2501 0              BZF      CONTSERV         YES:  BYPASS HIGATE CHECK
 1071    REF  18  LAST  827   33,3440  3 1642 0             CA      TTF/8
 1072    REF   3  LAST  580   33,3441  6 1427 1             AD      RPCRTIME
 1073                         33,3442  0 0006 1             EXTEND
 1074    REF   5  LAST  891   33,3443  6 2501 1             BZMF    CONTSERV

 1075    REF   6  LAST  664   33,3444  3 4732 0             CA      EBANK4
 1076    REF  48  LAST  891   33,3445  56 003 1             XCH     EBANK
 1077    REF 143  LAST  889   33,3446  54 001 1             TS      L

 1078    REF  10  LAST  889   E4,1536                       EBANK=  XNBPIP
 1079    REF  11  LAST  892   33,3447  4 1536 1             CS      XNBPIP
 1080    REF  49  LAST  870   E7,1515                       EBANK=  DVCNTR
 1081    REF  49  LAST  892   33,3450  22 003 1             LXCH    EBANK
 1082    REF   2  LAST  580   33,3451  6 1430 1             AD      RPCRTQSW
 1083                         33,3452  0 0006 1             EXTEND
 1084    REF   1              33,3453  6 2376 1             BZMF    HIGATASK
 1085    REF   6  LAST  892   33,3454  1 2501 0             TCF     CONTSERV


 1086    REF  78  LAST  859   33,3455  54 130 1  GNURVST   TS      BUF                   STORE GNUR (=GNUV) IN R1S OR V1S
 1087                         33,3456  0 0006 1             EXTEND                        A = 0 FOR R, A = 6 FOR V
 1088    REF   2  LAST  889   33,3457  3 1657 1             DCA     GNUR
 1089    REF  75  LAST  892   33,3460  50 130 0             INDEX   BUF
 1090    REF  13  LAST  889   33,3461  53'573 0             DXCH    R1S
 1091                         33,3462  0 0006 1             EXTEND
 1092    REF   3  LAST  892   33,3463  3 1661 1             DCA     GNUR +2
 1093    REF  80  LAST  892   33,3464  50 130 0             INDEX   BUF
 1094    REF  14  LAST  892   33,3465  53'575 0             DXCH    R1S   +2
 1095                         33,3466  0 0006 1             EXTEND
 1096    REF   4  LAST  892   33,3467  3 1663 0             DCA     GNUR +4
 1097    REF  81  LAST  892   33,3470  50 130 0             INDEX   BUF
 1098    REF  15  LAST  892   33,3471  53'577 1             DXCH    R1S   +4
 1099    REF 210  LAST  876   33,3472  0 0002 0             TC      Q


 1100    REF   3  LAST  829   33,3473  3 5000 1  QUIKFAZ5  CA      EBANK3
 1101    REF  50  LAST  892   33,3474  56 003 1             XCH     EBANK                 SET EBANK 3
 1102    REF 144  LAST  892   33,3475  52 002 1             DXCH    L                     Q TO A, A TO L
 1103    REF   1              E3,1446                       EBANK=  PHSNAME5
 1104    REF   2  LAST  892   33,3476  55'446 1             TS      PHSNAME5
 1105    REF  51  LAST  892   33,3477  22 003 1             LXCH    EBANK
 1106    REF  50  LAST  892   E7,1515                       EBANK=  DVCNTR
 1107    REF 250  LAST  890   33,3500  0 0000 1             TC      A


 1108    REF  33  LAST  889   33,3501  3 0120 1  POSINDEX  CA      FIXLOC                SET PUSHLIST TO ZERO
 1109    REF   7  LAST  887   33,3502  54 166 1             TS      PUSHLOC

 1110    REF  43  LAST  853   33,3503  3 4744 1             CA      BIT1
 1111    REF   4  LAST  876   33,3504  7 1650 1             MASK    LRPOS                 *NOTE - LRPOS = 1 FOR POS 2 & VICE VERSA
 1112  REF 251  LAST  892   33,3505  10 000 0              CCS     A
 1113  REF   2  LAST  440   33,3506  4 4754 1              CS      OCT30           POS 2 , INDEX = -24D
 1114                       33,3507  22 007 0              ZL                      POS 1 , INDEX = 0 , X2 = 0 FOR BOTH
 1115  REF  34  LAST  892   33,3510  50 120 1              INDEX   FIXLOC
 1116  REF  24  LAST  889   33,3511  52 C47 0              DXCH    X1              SET X1,X2
 1117  REF 211  LAST  892   33,3512  0 0002 0              TC      Q
 1118  REF  62  LAST  877   33,3513  0 5506 1   HFAIL      TC      UPFLAG          SET HFAIL FLAG FOR DOWNLINK
 1119  REF   2  LAST  888   33,3514   00247 0              ADRES   HFAILFLG
 1120  REF   3  LAST  785   33,3515  4 1671 1              CS      LRRCTR
 1121                       33,3516  0 0006 1              EXTEND
 1122  REF   1                33,3517  1 3527 0              BZF     NORLITE         IF R = 0, DO NOT TURN ON TRK FAIL
 1123  REF   4  LAST  888   33,3520  6 1670 1              AD      LRLCTR
 1124  REF   2  LAST  575   33,3521  7 7766 0              MASK    NEG3
 1125                       33,3522  0 0006 1              EXTEND                  IF L-R LT 4, DO NOT TURN ON TRK FAIL
 1126                       33,3523  1 3525 1              BZF     +2
 1127  REF   2  LAST  893   33,3524  1 3527 0              TCF     NORLITE

 1128  REF  63  LAST  893   33,3525  0 5506 1              TC      UPFLAG          AND SET BIT TO TURN ON TRACKFR FAIL LITE
 1129  REF   2  LAST  888   33,3526   00263 0              ADRES   HFLSHFLG

 1130  REF   5  LAST  893   33,3527  3 1670 1   NCRLITE    CA      LRLCTR
 1131  REF   4  LAST  893   33,3530  55'671 1              TS      LRRCTR          SET R = L

 1132  REF   5  LAST  888   33,3531  1 3261 0              TCF     VMEASCHK


 1133  REF  64  LAST  893   33,3532  0 5506 1   VFAIL      TC      UPFLAG          SET VFAIL FLAG FOR DOWNLINK
 1134  REF   2  LAST  890   33,3533   00246 1              ADRES   VFAILFLG
 1135  REF   3  LAST  785   33,3534  4 1673 0              CS      LRSCTR
 1136                       33,3535  0 0006 1              EXTEND                   IF S = 0, DO NOT TURN ON TRACKER FAIL
 1137  REF   1                33,3536  1 3546 1              BZF     NOLITE
 1138  REF   4  LAST  890   33,3537  6 1672 0              AD      LRMCTR           M-S
 1139  REF   3  LAST  893   33,3540  7 7766 0              MASK    NEG3             TEST FOR M-S > 3
 1140                       33,3541  0 C006 1              EXTEND                   IF M-S > 3, THEN ~~TWO OR MORE OF THE~~
 1141                       33,3542  1 3544 0              BZF     +2                 LAST FOUR V READINGS WERF ~~BAD~~ GOOD,
 1142  REF   2  LAST  893   33,3543  1 3546 1              TCF     NOLITE             SO TURN ON VELOCITY FAIL LIGHT
                                                                                        DON'T
 1143  REF  65  LAST  893   33,3544  0 5506 1              TC      UPFLAG          AND SET BIT TO TURN ON TRACKER FAIL LITE
 1144  REF   2  LAST  890   33,3545   00262 1              ADRES   VFLSHFLG

 1145  REF   5  LAST  893   33,3546  3 1672 0   NOLITE     CA      LRMCTR          SET S = M
 1146  REF   4  LAST  893   33,3547  55'673 0              TS      LRSCTR

 1147  REF  10  LAST  890   33,3550  11'462 1              CCS     VSELECT         TEST FOR Z COMPONENT
 1148  REF   2  LAST  890   33,3551  1 3433 1              TCF     ENDVDAT         NOT Z, DC NOT SET VX INHIBIT

 1149  REF  66  LAST  893   33,3552  C 5506 1              TC      UPFLAG          Z COMPONENT - SET FLAG TO SKIP X
 1150  REF   2  LAST  890   33,3553   00250 0              ADRES   VXINH           COMPONENT,AS ERRCR MAY BE DUE TC CROSS
 1151  REF   3  LAST  893   33,3554  1 3433 1              TCF     ENDVDAT         LOBE LOCK UP NOT DETFCTED ON X AXIS.
```

```
P1152    ************************************************************************************************
 1154                                   33,3555                      BANK    33
 1155    REF    8  LAST   876   33,2000                      SETLOC SERVICES
 1156                                   33,3555                      BANK

 1157    REF    8 LAST  876 TO  894:   623    871*           COUNT* $$/SERV

 1158    REF   51  LAST   892    E7,1515                     EBANK= DVCNTR


R1159    HIGATJOB IS BEGUN WHEN BOTH THE TIME AND ANGLE CRITERIA FOR ANTENNA REPOSITIONING ARE MET. THE JOB INITIATES THE
R1161    LANDING RADAR ANTENNA REPOSITIONING ROUTINE. DURING THE REPOSITIONING, R12 IS INHIBITTED BY THE NOLRREAD FLAG.
R1163    UPON COMPLETION OF THE REPOSITIONING,(SUCCESSFUL OR NOT),THE NOLRREAD    FLAG IS CLEARED AND R12 CONTINUES.


 1165                              33,3555  0 0004 0  REREPOS   INHINT                      ON RESTART, SET FLAGS AGAIN
 1166    REF   40  LAST  891   33,3556  4 0107 0            CS       FLGWRD11
 1167    REF    4  LAST  876   33,3557  7 5006 0            MASK     PRIO3
 1168    REF   41  LAST  894   33,3560  26 107 0            ADS      FLGWRD11

 1169    REF  239  LAST  887   33,3561  0 4607 1  HIGATJOB TC       BANKCALL          INITIATE REPOSITIONING ROUTINE
 1170    REF    2  LAST  580   33,3562   53511 1            CADR     LRPOS2
 1171    REF  240  LAST  894   33,3563  0 4607 1            TC       BANKCALL          DELAY UNTIL FINISHED
 1172    REF   12  LAST  589   33,3564   17733 0            CADR     RADSTALL

 1173                              33,3565  1 3566 0            TCF      +1                IF UNSUCCESSFUL, R12 WILL HANDLE THINGS
 1174    REF   86  LAST  666   33,3566  3 4744 1            CA       ONE               INDICATE POS 2 IS EXPECTED
 1175    REF    5  LAST  892   33,3567  55'650 1            TS       LRPOS

 1176    REF   87  LAST  890   33,3570  0 5520 0            TC       DOWNFLAG          RE-ENABLE R12.
 1177    REF    1                  33,3571   00252 1            ADRES    NOLRREAD

 1178    REF   79  LAST  876   33,3572  0 5355 1            TC       PHASCHNG          CLEAR RESTART PROTECTION
 1179                              33,3573   00001 0            OCT      1
 1180    REF  132  LAST  371   33,3574  0 5146 1            TC       ENDOFJOB
```

NEG3 = 77774

```
 0001                          21,2170                      BANK    21
 0002    REF   2  LAST    43   21,2000                      SETLOC  R10
 0003                          21,2170                      BANK

 0004    REF   4  LAST   887   E7,1777                      EBANK=  END-E7
 0005    REF   2 LAST    44 TO   44:     6      6*          COUNT*  $$/R10

R0006    **********************************************************************************************************************
R0008    LANADISP:  DISPLAY INERTIAL DATA ROUTINE FOR DESCENT AND ABORTS                                THIS VERSION BY EYLES
R0010    **********************************************************************************************************************

 0012    REF   2  LAST   831   21,2170  23'722 1  LANADISP LXCH    PIPCTR1         UPDATE TBASE2 AND PIPCTR SIMULTANEOUSLY
 0013    REF  20  LAST   867   21,2171  4 0025 1           CS      TIME1
 0014    REF   5  LAST   862   21,2172  53'055 1           DXCH    TBASE2

 0015    REF  26  LAST   880   21,2173  4 0103 1           CS      FLAGWRD7        IS LANDING ANALOG DISPLAYS FLAG SET?
 0016    REF   2  LAST   880   21,2174  7 4732 1           MASK    SWANDBIT
 0017    REF 252  LAST   893   21,2175  10 000 0           CCS     A
 0018    REF   1               21,2176  1 2654 0           TCF     DISPRSET +1     NO:   GO RESET

R0019    ******************************************************************************
R0020    COMPUTE VELOCITY VECTOR
R0021    ******************************************************************************

R0022    DO EVERYTHING POSSIBLE BEFORE READING PIPAS.

 0023                          21,2177  0 0006 1           EXTEND
 0024    REF   4  LAST   889   21,2200  4 1702 1           DCS     VSURFACE
 0025    REF   2  LAST   158   21,2201  53'721 0           DXCH    VVECTX
 0026                          21,2202  0 0006 1           EXTEND
 0027    REF  17  LAST   885   21,2203  3 1527 0           DCA     V
 0028                          21,2204  20 001 1           DDOUBL
 0029                          21,2205  20 001 1           DDOUBL
 0030    REF   3  LAST   895   21,2206  21'721 0           DAS     VVECTX

 0031                          21,2207  0 0006 1           EXTEND
 0032    REF   5  LAST   895   21,2210  4 1704 1           DCS     VSURFACE +2
 0033    REF   3  LAST   158   21,2211  53'723 1           DXCH    VVECTY
 0034                          21,2212  0 0006 1           EXTEND
 0035    REF  18  LAST   895   21,2213  3 1531 1           DCA     V        +2
 0036                          21,2214  20 001 1           DDOUBL
 0037                          21,2215  20 001 1           DDOUBL
 0038    REF   4  LAST   895   21,2216  21'723 1           DAS     VVECTY

 0039                          21,2217  0 0006 1           EXTEND
 0040    REF   6  LAST   895   21,2220  4 1706 0           DCS     VSURFACE +4
 0041    REF   2  LAST   158   21,2221  53'725 1           DXCH    VVECTZ
 0042                          21,2222  0 0006 1           EXTEND
 0043    REF  19  LAST   895   21,2223  3 1533 0           DCA     V        +4
 0044                          21,2224  20 001 1           DDOUBL
 0045                            21,2225  20 001 1            DDOUBL
 0046    REF   3  LAST  895      21,2226  21'725 1            DAS      VVECTZ

R0047    COMPUTE TIME SINCE PIPTIME.

 0048    REF  23  LAST  874      21,2227  4 1234 1            CS       PIPTIME   +1
 0049    REF  21  LAST  895      21,2230  6 0025 0            AD       TIME1
 0050    REF  11  LAST  867      21,2231  6 4727 1            AD       HALF
 0051    REF  12  LAST  896      21,2232  6 4727 1            AD       HALF
 0052    REF   2  LAST  157      21,2233  57'717 1            XCH      DT                DT SINCE PIPTIME IN UNITS OF 2(14) CS

R0053    ADD IN PIPA PULSES.

 0054    REF   4  LAST  874      21,2234  3 1157 0            CA       PIPATMPX
 0055    REF  15  LAST  875      21,2235  6 0037 0            AD       PIPAX
 0056                            21,2236  0 0006 1            EXTEND
 0057    REF   1                 21,2237  7 2000 1            MP       LANAKPIP
 0058    REF   4  LAST  895      21,2240  21'721 0            DAS      VVECTX

 0059    REF   4  LAST  874      21,2241  3 1160 1            CA       PIPATMPY
 0060    REF   6  LAST  896      21,2242  6 0040 0            AD       PIPAY
 0061                            21,2243  0 0006 1            EXTEND
 0062    REF   2  LAST  896      21,2244  7 2000 1            MP       LANAKPIP
 0063    REF   5  LAST  895      21,2245  21'723 1            DAS      VVECTY

 0064    REF   4  LAST  874      21,2246  3 1161 0            CA       PIPATMPZ
 0065    REF   9  LAST  875      21,2247  6 0041 1            AD       PIPAZ
 0066                            21,2250  0 0006 1            EXTEND
 0067    REF   3  LAST  896      21,2251  7 2000 1            MP       LANAKPIP
 0068    REF   4  LAST  896      21,2252  21'725 1  QUARDUMP  DAS      VVECTZ            TAG IS FOR EDITS

R0069    FINALLY, ADD IN CONTRIBUTIONS OF GRAVITY AND PIPA BIAS.

 0070    REF   3  LAST  880      21,2253  3 1676 1            CA       G-VBIASX          G-VBIASX IS IN UNITS OF 2(-9) M/CS/CS
 0071                            21,2254  0 0006 1            EXTEND
 0072    REF   3  LAST  896      21,2255  7 1717 0            MP       DT
 0073    REF   5  LAST  896      21,2256  21'721 0            DAS      VVECTX            VVECTX IN UNITS OF 2(5) M/CS

 0074    REF   3  LAST  880      21,2257  3 1677 0            CA       G-VBIASY          G-VBIASY IS IN UNITS OF 2(-9) M/CS/CS
 0075                            21,2260  0 0006 1            EXTEND
 0076    REF   4  LAST  896      21,2261  7 1717 0            MP       DT
 0077    REF   6  LAST  896      21,2262  21'723 1            DAS      VVECTY            VVECTY IN UNITS OF 2(5) M/CS

 0078    REF   3  LAST  880      21,2263  3 1700 1            CA       G-VBIASZ          G-VBIASZ IS IN UNITS OF 2(-9) M/CS/CS
 0079                            21,2264  0 0006 1            EXTEND
 0080    REF   5  LAST  896      21,2265  7 1717 0            MP       DT
 0081    REF   5  LAST  896      21,2266  21'725 1            DAS      VVECTZ            VVECTZ IN UNITS OF 2(5) M/CS

R0082    ************************************************************************
R0083    COMPUTE ALTITUDE AND ALTITUDE-RATE
```

```
R0084    ************************************************************************

 0085    REF   3  LAST  880    21,2267  3 1714 1  ALTSTUFF CA      RUNITX          COMPUTE RADIAL VELOCITY
 0086                          21,2270  0 0006 1           EXTEND
 0087    REF   6  LAST  896    21,2271  7 1720 1           MP      VVECTX
 0088    REF   2  LAST  158    21,2272  53'727 0           DXCH    ALTRATE
 0089    REF   4  LAST  897    21,2273  3 1714 1           CA      RUNITX          COMPUTE THE MORE SENSITIVE TERM IN DP
 0090                          21,2274  0 0006 1           EXTEND
 0091    REF   7  LAST  897    21,2275  7 1721 0           MP      VVECTX   +1
 0092    REF 145  LAST  892    21,2276  54 001 1           TS      L
 0093    REF 169  LAST  891    21,2277  3 4746 0           CAF     ZERO
 0094    REF   3  LAST  897    21,2300  21'727 0           DAS     ALTRATE
 0095    REF   3  LAST  880    21,2301  3 1715 0           CA      RUNITY          NOTE:  WITH NORMAL DESCENT IMU ALIGNMENT
 0096                          21,2302  0 0006 1           EXTEND                    THIS TERM IS ALWAYS ZERO, BUT ALTRATE
 0097    REF   7  LAST  896    21,2303  7 1722 0           MP      VVECTY            CAN BE DISPLAYED DURING ASCENT TOO
 0098    REF   4  LAST  897    21,2304  21'727 0           DAS     ALTRATE
 0099    REF   3  LAST  880    21,2305  3 1716 0           CA      RUNITZ
 0100                          21,2306  0 0006 1           EXTEND
 0101    REF   6  LAST  896    21,2307  7 1724 0           MP      VVECTZ
 0102    REF   5  LAST  897    21,2310  21'727 0           DAS     ALTRATE

 0103    REF   3  LAST  879    21,2311  3 1713 0           CA      DALTRATE        COMPENSATE FOR CHANGE IN DIRECTION OF R
 0104                          21,2312  0 0006 1           EXTEND
 0105    REF   6  LAST  896    21,2313  7 1717 0           MP      DT
 0106    REF   6  LAST  897    21,2314  21'727 0           DAS     ALTRATE         ALTRATE IN UNITS OF 2(5) M/CS

 0107                          21,2315  0 0006 1           EXTEND
 0108    REF   7  LAST  897    21,2316  3 1727 1           DCA     ALTRATE
 0109    REF   1               21,2317  52 064 1           DXCH    ALTRTEMP
 0110                          21,2320  0 0006 1           EXTEND
 0111    REF   3  LAST  880    21,2321  3 1712 1           DCA     HDOTLAD
 0112    REF   2  LAST  897    21,2322  20 064 1           DAS     ALTRTEMP        AVERAGE ALTRATE IN UNITS OF 2(4) M/CS
R0113    THE FOLLOWING COMPUTATION FAILS IF DT EXCEEDS 20.47 SECONDS (UNLIKELY).

 0114    REF   7  LAST  897    21,2323  3 1717 1           CA      DT
 0115                          21,2324  0 0006 1           EXTEND
 0116    REF  40  LAST  838    21,2325  7 4741 0           MP      BIT4
 0117    REF 146  LAST  897    21,2326  3 0001 0           CA      L               FETCH DT FROM L IN UNITS OF 2(11) CS
 0118                          21,2327  0 0006 1           EXTEND
 0119    REF   3  LAST  897    21,2330  7 0063 0           MP      ALTRTEMP
 0120    REF   2  LAST  158    21,2331  53'731 1           DXCH    ALTITUDE
 0121                          21,2332  0 0006 1           EXTEND
 0122    REF   3  LAST  879    21,2333  3 1710 0           DCA     HCALCLAD
 0123    REF   3  LAST  897    21,2334  21'731 1           DAS     ALTITUDE        ALTITUDE IN UNITS OF 2(15) METERS

R0124    ************************************************************************
R0125    SEND OUT ALTITUDE-RATE IF POSSIBLE
R0126    ************************************************************************
```

```
 0132    REF  30  LAST  886   21,2335  4 0075 1             CS      FLAGWRD1        IS INITIALIZATION IN ORDER?
 0133    REF   2  LAST  228   21,2336  7 4727 0             MASK    DIDFLBIT
 0134    REF 253  LAST  895   21,2337  10 000 0             CCS     A
 0135    REF   1              21,2340  1 2626 0             TCF     DISPINIT        YES:  THEN GO DO IT

 01351   REF  39  LAST  823   21,2341  3 4743 0             CAF     BIT2            NO:   ARE RR ERROR COUNTERS ENABLED?
 01352                        21,2342  0 0006 1             EXTEND
 01353   REF  47  LAST  761   21,2343  02 012 0             RAND    CHAN12
 01354                        21,2344  0 0006 1             EXTEND
 01355   REF   2  LAST  895   21,2345  1 2653 1             BZF     DISPRSET        NO:   REINITIALIZE DISPLAYS
 0137                         21,2346  0 0006 1   ALTRROUT  EXTEND                  YES:  SIGNIFY ALTITUDE-RATE (BIT2 IN A)
 0138    REF  12  LAST  838   21,2347  05 014 1             WOR     CHAN14

 0139                         21,2350  0 0006 1             EXTEND
 0140    REF   8  LAST  897   21,2351  3 1727 1             DCA     ALTRATE
 0141                         21,2352  20 001 1             DDOUBL                  RESCALE ALTRATE TO UNITS OF 2(2) M/CS
 0142                         21,2353  20 001 1             DDOUBL
 0143                         21,2354  20 001 1             DDOUBL
 0144                         21,2355  0 0006 1             EXTEND
 0145    REF   1              21,2356  7 2004 0             MP      ALTRCONV        RESCALE TO UNITS OF .5 F/S/BIT

 0146    REF 147  LAST  897   21,2357  56 001 0             XCH     L               ROUND TO NEAREST .5 F/S
 0147                         21,2360  6 0000 1             DOUBLE
 0148    REF 212  LAST  893   21,2361  54 002 1             TS      Q
 0149    REF 170  LAST  897   21,2362  3 4746 0             CAF     ZERO
 0150    REF 148  LAST  898   21,2363  26 001 1             ADS     L

 0151    REF   3  LAST  827   21,2364  6 4726 0             AD      NEGMAX
 0152    REF 149  LAST  898   21,2365  54 001 1             TS      L
 0153                         21,2366  1 2371 1             TCF     +3
 0154    REF 150  LAST  898   21,2367  6 0001 0             AD      L
 0155                         21,2370  4 0000 0             COM
 0156    REF   1              21,2371  56 060 1   +3        XCH     ALTM

 0157    REF  33  LAST  816   21,2372  3 4742 1             CAF     BIT3
 0158                         21,2373  0 0006 1             EXTEND
 0159    REF  13  LAST  898   21,2374  05 014 1             WOR     CHAN14

 0160    REF   1              21,2375  3 5745 1             CA      TWELVE          DELAY 120 MS FOR DATA OUTPUT
A01601                                                                              NOTE - THIS DELAY MUST BE GREATER THAN
A01602                                                                              100 MS FOR COMPATIBILITY WITH THE LMS
 0161    REF   7  LAST  860   21,2376  0 5226 1             TC      VARDELAY

 0162    REF  40  LAST  898   21,2377  4 4743 1   ALTROUT   CS      BIT2            SIGNIFY ALTITUDE
 0163                         21,2400  0 0006 1             EXTEND
 0164    REF  14  LAST  898   21,2401  03 014 1             WAND    CHAN14

 0165    REF   4  LAST  897   21,2402  3 1731 0             CA      ALTITUDE +1
 0166                         21,2403  0 0006 1             EXTEND
 0167    REF   1              21,2404  7 2005 1             MP      ALTCONV
 0168    REF 151  LAST  898   21,2405  54 001 1           TS      L
 0169    REF 171  LAST  898   21,2406  3 4746 0           CAF     ZERO
 0170    REF   1              21,2407  52 064 1           DXCH    ALTTEMP
 0171    REF   5  LAST  898   21,2410  3 1730 1           CA      ALTITUDE
 0172                         21,2411  0 0006 1           EXTEND
 0173    REF   2  LAST  898   21,2412  7 2005 1           MP      ALTCONV
 0174    REF   2  LAST  899   21,2413  20 064 1           DAS     ALTTEMP          ALTITUDE IN UNITS OF 9.380 FEET/BIT

 0175    REF   3  LAST  899   21,2414  52 064 1           DXCH    ALTTEMP
 0176                         21,2415  20 001 1           DDOUBL
 0177                         21,2416  20 001 1           DDOUBL                   RESCALE TO UNITS OF 2.345 FEET/BIT
 0178                         21,2417  54 000 0           OVSK
 0179                         21,2420  1 2424 0           TCF     +4               NO OVERFLOW:  -38420 < ALTITUDE < +38420

 0180    REF  24  LAST  880   21,2421  7 4724 0           MASK    POSMAX           RESET OVERFLOW
 0181    REF  36  LAST  548   21,2422  6 4726 0           AD      BIT15
 0182                         21,2423  1 2430 0           TCF     +5

 0183    REF 254  LAST  898   21,2424  10 000 0  +4       CCS     A                APPLY LOWER LIMIT OF POSITIVE ZERO
 0184    REF  87  LAST  894   21,2425  6 4744 1           AD      ONE
 0185                         21,2426  1 2430 0           TCF     +2
 0186    REF 172  LAST  899   21,2427  3 4746 0           CAF     ZERO

 0187    REF   2  LAST  898   21,2430  56 060 1  +5       XCH     ALTM
 0188    REF  34  LAST  898   21,2431  3 4742 1           CAF     BIT3
 0189                         21,2432  0 0006 1           EXTEND
 0190    REF  15  LAST  898   21,2433  05 014 1           WOR     CHAN14

R0191    ************************************************************************************
R0192    SEND OUT FORWARD AND LATERAL VELOCITIES
R0193    ************************************************************************************

 0194    REF   1              21,2434  0 2513 1           TC      CROSCOMP         FIRST CALL SUBROUTINE TO COMPUTE THEM

 0195    REF  29  LAST  877   21,2435  3 4733 1           CAF     BIT10            1/32 TO ITEMP2 FOR USE AS DIVISOR BELOW
 0196    REF  11  LAST  745   21,2436  54 062 1           TS      ITEMP2

 0197    REF   1              21,2437  3 2001 1           CAF     MAXVEL           LIMIT COMMAND TO 198.645 F/S
 0198    REF   1              21,2440  22 070 0           LXCH    FORVTEMP
 0199    REF   1              21,2441  0 2673 1           TC      LADLIMIT
 0200    REF   2  LAST  899   21,2442  22 071 1           LXCH    FORVTEMP +1
 0201                         21,2443  0 0006 1           EXTEND                   RESCALE TO UNITS OF ONE M/CS
 0202    REF  12  LAST  899   21,2444  10 062 1           DV      ITEMP2
 0203                         21,2445  0 0006 1           EXTEND                   RESCALE TO UNITS OF .5571 F/S/BIT
 0204    REF   1              21,2446  7 2003 1           MP      VELCONV
 0205    REF 152  LAST  899   21,2447  56 001 0           XCH     L                ROUND TO NEAREST .5571 F/S
 0206                         21,2450  6 0000 1           DOUBLE
 0207    REF 213  LAST  898   21,2451  54 002 1           TS      Q
 0208    REF   1              21,2452  1 2454 1           TCF     FORVOUT
 0209    REF 153  LAST  899   21,2453  26 001 1           ADS     L
 0210   REF   3  LAST  213    21,2454  4 1733 0  FORVOUT  CS      FORVMETR          SUBTRACT METER INDICATOR TO GET CHANGE
 0211   REF 154  LAST  899    21,2455  26 001 1           ADS     L
 0212   REF   1               21,2456  3 2002 1           CA      MAXDBITS
 0213   REF   2  LAST  899    21,2457  0 2673 1           TC      LADLIMIT          LIMIT CHANGE TO ABOUT 300 F/S
 0214   REF  21  LAST  871    21,2460  6 4745 0           AD      NEGO
 0215   REF   1               21,2461  54 054 1           TS      CDUSCMD
 0216   REF   4  LAST  900    21,2462  27'733 0           ADS     FORVMETR          UPDATE METER INDICATOR

 0217   REF   2  LAST  899    21,2463  3 2001 1           CAF     MAXVEL            LIMIT COMMAND TO 198.645 F/S
 0218   REF   1               21,2464  22 072 1           LXCH    LATVEL
 0219   REF   3  LAST  900    21,2465  0 2673 1           TC      LADLIMIT
 0220   REF   2  LAST  900    21,2466  22 073 0           LXCH    LATVEL   +1
 0221                         21,2467  0 0006 1           EXTEND                    RESCALE TO UNITS OF ONE M/CS
 0222   REF  13  LAST  899    21,2470  10 062 1           DV      ITEMP2
 0223                         21,2471  0 0006 1           EXTEND                    RESCALE TO UNITS OF .5571 F/S/BIT
 0224   REF   2  LAST  899    21,2472  7 2003 1           MP      VELCONV
 0225   REF 155  LAST  900    21,2473  56 001 0           XCH     L                 ROUND TO NEAREST .5571 F/S
 0226                         21,2474  6 0000 1           DOUBLE
 0227   REF 214  LAST  899    21,2475  54 002 1           TS      Q
 0228   REF   1               21,2476  1 2500 1           TCF     LATVOUT
 0229   REF 156  LAST  900    21,2477  26 001 1           ADS     L
 0230   REF   4  LAST  213    21,2500  4 1732 1  LATVOUT  CS      LATVMETR          SUBTRACT METER INDICATOR TO GET CHANGE
 0231   REF 157  LAST  900    21,2501  26 001 1           ADS     L
 0232   REF   2  LAST  900    21,2502  3 2002 1           CAF     MAXDBITS
 0233   REF   4  LAST  900    21,2503  0 2673 1           TC      LADLIMIT          LIMIT CHANGE TO ABOUT 300 F/S
 0234   REF  22  LAST  900    21,2504  6 4745 0           AD      NEGO
 0235   REF   2  LAST  552    21,2505  54 053 0           TS      CDUTCMD
 0236   REF   5  LAST  900    21,2506  27'732 1           ADS     LATVMETR          UPDATE METER INDICATOR

 0237   REF   1               21,2507  3 5011 1           CAF     BITSET            SET DRIVE BITS
 0238                         21,2510  0 0006 1           EXTEND
 0239   REF  16  LAST  899    21,2511  05 014 1           WOR     CHAN14

 0240   REF  59  LAST  862    21,2512  0 5263 0  LANADEND TC      TASKOVER

R0241   ************************************************************************
R0242   SUBROUTINE TO COMPUTE FORWARD AND LATERAL VELOCITIES
R0243   ************************************************************************

R0244       THE SCALARS VHY AND VHZ, COMPUTED NEXT, ARE THE VELOCITIES ALONG UNIT VECTORS UHYP AND UHZP, UHYP NORMAL
R0246   TO THE PRE-PDI ORBITAL PLANE, UHZP IN TURN NORMAL TO UHYP AND THE POSITION VECTOR.  NOW SINCE FOR THE "LANDING
R0248   ALIGNMENT" OF THE IMU THE STABLE-MEMBER Y-AXIS IS DEFINED THE SAME WAY AS UHYP, VVECTY IS PRECISELY VHY.
R0250   FURTHERMORE, THE Y-TERM OF THE VHZ COMPUTATION DROPS OUT, AND THE FOLLOWING USEFUL EQUALITIES BECOME TRUE:
R0252   UHZPX = - RUNITZ AND UHZPZ = RUNITX.  DRAW A PICTURE TO BE CONVINCED.

R0253       NOTE THAT IN THIS VERSION CROSS-POINTER DISPLAYS ARE OUTPUT DURING ASCENT AND ABORTS AS WELL AS DESCENT.

 0255   REF  30  LAST  833    21,2513  4 0074 0  CROSCOMP CS      FLAGWRD0          IS R10FLAG SET TO INDICATE ASCENT?
 0256   REF   2  LAST  833    21,2514  7 4743 1           MASK    R10FLBIT
 0257                         21,2515  0 0006 1           EXTEND
 0258   REF   1                21,2516  1 2615 0         BZF      APSLAD               YES:   DISPLAY LATVEL IN INERTIAL AXES

 0259   REF   4  LAST  897     21,2517  4 1716 1         CS       RUNITZ               NO:    COMPUTE DOWNRANGE VELOCITY
 0260                          21,2520  0 0006 1         EXTEND
 0261   REF   8  LAST  897     21,2521  7 1720 1         MP       VVECTX
 0262   REF   1                21,2522  52 066 0         DXCH     VHZ
 0263   REF   5  LAST  897     21,2523  3 1714 1         CA       RUNITX
 0264                          21,2524  0 0006 1         EXTEND
 0265   REF   7  LAST  897     21,2525  7 1724 0         MP       VVECTZ
 0266   REF   2  LAST  901     21,2526  20 066 0         DAS      VHZ
 0267   REF   6  LAST  901     21,2527  3 1714 1         CA       RUNITX               COMPUTE THE MORE SENSITIVE TERM IN DP
 0268                          21,2530  0 0006 1         EXTEND
 0269   REF   8  LAST  901     21,2531  7 1725 1         MP       VVECTZ     +1
 0270   REF 158  LAST  900     21,2532  54 001 1         TS       L
 0271   REF 173  LAST  899     21,2533  3 4746 0         CAF      ZERO
 0272   REF   3  LAST  901     21,2534  20 066 0         DAS      VHZ                  VHZ IN UNITS OF 2(5) M/CS

 0273                          21,2535  0 0006 1         EXTEND
 0274   REF   8  LAST  897     21,2536  3 1723 0         DCA      VVECTY
 0275   REF   1                21,2537  52 064 1         DXCH     VHY                  VHY IN UNITS OF 2(5) M/CS

 0276   REF   8  LAST  820     21,2540  3 5006 1         CAF      EBANK6               SWITCH TO DAP EBANK
 0277   REF  52  LAST  892     21,2541  54 003 0         TS       EBANK
 0278   REF   3  LAST  199     E6,1417                   EBANK=   M22

 0279   REF   2  LAST  200     21,2542  3 1420 0         CA       M32                  COS(AOG)
 0280                          21,2543  0 0006 1         EXTEND
 0281   REF   4  LAST  901     21,2544  7 0065 0         MP       VHZ
 0282   REF   3  LAST  899     21,2545  52 071 0         DXCH     FORVTEMP
 0283   REF   4  LAST  901     21,2546  4 1417 0         CS       M22                  SIN(AOG)
 0284                          21,2547  0 0006 1         EXTEND
 0285   REF   2  LAST  901     21,2550  7 0063 0         MP       VHY
 0286   REF   4  LAST  901     21,2551  20 071 0         DAS      FORVTEMP

 0287   REF   3  LAST  901     21,2552  3 1420 0         CA       M32                  COS(AOG)
 0288                          21,2553  0 0006 1         EXTEND
 0289   REF   5  LAST  901     21,2554  7 0066 0         MP       VHZ        +1
 0290   REF  14  LAST  900     21,2555  54 062 1         TS       ITEMP2
 0291   REF   5  LAST  901     21,2556  4 1417 0         CS       M22                  SIN(AOG)
 0292                          21,2557  0 0006 1         EXTEND
 0293   REF   3  LAST  901     21,2560  7 0064 1         MP       VHY        +1
 0294   REF  15  LAST  901     21,2561  6 0062 0         AD       ITEMP2
 0295   REF 159  LAST  901     21,2562  54 001 1         TS       L
 0296   REF 174  LAST  901     21,2563  3 4746 0         CAF      ZERO
 0297   REF   5  LAST  901     21,2564  20 071 0         DAS      FORVTEMP             FORWARD VELOCITY IN UNITS OF 2(5) M/CS

 0298   REF   6  LAST  901     21,2565  3 1417 1         CA       M22                  SIN(AOG)
 0299                          21,2566  0 0006 1         EXTEND
 0300   REF   6  LAST  901     21,2567  7 0065 0         MP       VHZ
 0301   REF   3  LAST  900     21,2570  52 073 1         DXCH     LATVEL
 0302   REF   4  LAST  901   21,2571  3 1420 0              CA      M32             COS(AOG)
 0303                        21,2572  0 0006 1              EXTEND
 0304   REF   4  LAST  901   21,2573  7 0063 0              MP      VHY
 0305   REF   4  LAST  901   21,2574  20 073 1              DAS     LATVEL

 0306   REF   7  LAST  901   21,2575  3 1417 1              CA      M22             SIN(AOG)
 0307                        21,2576  0 0006 1              EXTEND
 0308   REF   7  LAST  901   21,2577  7 0066 0              MP      VHZ       +1
 0309   REF  16  LAST  901   21,2600  54 062 1              TS      ITEMP2
 0310   REF   5  LAST  902   21,2601  3 1420 0              CA      M32             COS(AOG)
 0311                        21,2602  0 0006 1              EXTEND
 0312   REF   5  LAST  902   21,2603  7 0064 1              MP      VHY       +1
 0313   REF  17  LAST  902   21,2604  6 0062 0              AD      ITEMP2
 0314   REF 160  LAST  901   21,2605  54 001 1              TS      L
 0315   REF 175  LAST  901   21,2606  3 4746 0              CAF     ZERO
 0316   REF   5  LAST  902   21,2607  20 073 1              DAS     LATVEL          LATERAL VELOCITY IN UNITS OF 2(5) M/CS

 0317   REF  23  LAST  827   21,2610  24 006 1              INCR    BBANK           RETURN TO SERVICER EBANK
 0318   REF   4  LAST  897   E7,1711                        EBANK=  HDOTLAD

 0319                        21,2611  0 0006 1   CROSSOUT   EXTEND                  MOVE FORVTEMP TO FORVEL FOR DSKY DISPLAY
 0320   REF   6  LAST  901   21,2612  3 0071 1              DCA     FORVTEMP
 0321   REF   3  LAST  327   21,2613  53'735 0              DXCH    FORVEL

 0322   REF 215  LAST  900   21,2614  0 0002 0              TC      Q

 0323   REF   7  LAST  902   21,2615  54 070 1   APSLAD     TS      FORVTEMP        DURING ASCENT AND ABORTS COME HERE TO
 0324   REF   8  LAST  902   21,2616  54 071 0              TS      FORVTEMP +1       DISPLAY LATVEL = SM Y-AXIS VELOCITY

 0325                        21,2617  0 0006 1              EXTEND
 0326   REF   9  LAST  901   21,2620  3 1723 0              DCA     VVECTY
 0327   REF   6  LAST  902   21,2621  52 073 1              DXCH    LATVEL
 0328                        21,2622  0 0006 1              EXTEND                  ADD SURFACE VELOCITY BACK IN SO APS
 0329   REF   7  LAST  895   21,2623  3 1704 0              DCA     VSURFACE +2       LATVEL DISPLAY WILL BE IN TRUE
 0330   REF   7  LAST  902   21,2624  20 073 1              DAS     LATVEL            STABLE-MEMBER COORDINATES

 0331   REF   1              21,2625  1 2611 1              TCF     CROSSOUT        REJOIN THE MAINSTREAM

R0332   ********************************************************************************
P0333   LANDING ANALOG DISPLAYS INITIALIZATION
P0334   ********************************************************************************

 0335   REF   2  LAST  899   21,2626  0 2513 1   DISPINIT   TC      CROSCOMP        FIRST COMPUTE BUT NOT OUTPUT VELOCITIES

 0336   REF  31  LAST  898   21,2627  4 0075 1              CS      FLAGWRD1        SET DIDFLAG
 0337   REF   3  LAST  898   21,2630  7 4727 0              MASK    DIDFLBIT
 0338   REF  32  LAST  902   21,2631  26 075 1              ADS     FLAGWRD1

 0339   REF  30  LAST  805   21,2632  3 4735 1              CAF     BIT8            SET DISPLAY INERTIAL DATA OUTBIT
 0340                        21,2633  0 0006 1              EXTEND
 0341   REF  48  LAST  898   21,2634  05 012 1             WOR     CHAN12

 0342   REF 176  LAST  902   21,2635  4 4746 1             CS      ZERO             ZERO METER INDICATORS
 0343   REF   6  LAST  900   21,2636  55'732 1             TS      LATVMETR
 0344   REF   5  LAST  900   21,2637  55'733 0             TS      FORVMETR

 0345   REF  41  LAST  897   21,2640  3 4741 1             CAF     BIT4             SET UP TASK TO FINISH INITIALIZATION
 0346   REF  26  LAST  853   21,2641  0 5175 1             TC      TWIDDLE
 0347   REF   1              21,2642   02644 0             ADRES   INTLZE
 0348   REF   1              21,2643  1 2512 1             TCF     LANADEND

 0349   REF  41  LAST  898   21,2644  3 4743 0  INTLZE     CAF     BIT2             ENABLE RR ERROR COUNTER
 0350                        21,2645  0 0006 1             EXTEND
 0351   REF  49  LAST  903   21,2646  05 012 1             WOR     CHAN12

 0352   REF  33  LAST  540   21,2647  4 1300 1             CS      IMODES33         SET INERTIAL DATA FLAG
 0353   REF  31  LAST  902   21,2650  7 4735 0             MASK    BIT8
 0354   REF  34  LAST  903   21,2651  27'300 1             ADS     IMODES33
 0355   REF  60  LAST  900   21,2652  0 5263 0             TC      TASKOVER

R0356   ***************************************************************************************
R0357   LANDING ANALOG DISPLAYS RESET ROUTINE
R0358   ***************************************************************************************

 0359   REF   3  LAST  902   21,2653  0 2513 1  DISPRSET   TC      CROSCOMP         FIRST COMPUTE BUT NOT OUTPUT VELOCITIES

 0360   REF   4  LAST  902   21,2654  4 4727 0  +1         CS      DIDFLBIT         RESET DIDFLAG
 0361   REF  33  LAST  902   21,2655  7 0075 1             MASK    FLAGWRD1
 0362   REF  34  LAST  903   21,2656  54 075 1             TS      FLAGWRD1

 0363   REF  32  LAST  903   21,2657  3 4735 1             CAF     BIT8             WAS INERTIAL DATA JUST DISPLAYED?
 0364   REF  35  LAST  903   21,2660  7 1300 1             MASK    IMODES33
 0365   REF 255  LAST  899   21,2661  10 000 0             CCS     A
 0366   REF  42  LAST  903   21,2662  3 4743 0             CAF     BIT2             YES:  DISABLE RR ERROR COUNTER AND
 0367   REF  33  LAST  903   21,2663  6 4735 1             AD      BIT8             NO:   RESET DISPLAY INERTIAL DATA OUTBIT
 0368                        21,2664  4 0000 0             COM
 0369                        21,2665  0 0006 1             EXTEND
 0370   REF  50  LAST  903   21,2666  03 012 1             WAND    CHAN12

 0371   REF  34  LAST  903   21,2667  4 4735 0             CS      BIT8
 0372   REF  36  LAST  903   21,2670  7 1300 1             MASK    IMODES33
 0373   REF  37  LAST  903   21,2671  55'300 1             TS      IMODES33
 0374   REF   2  LAST  903   21,2672  1 2512 1             TCF     LANADEND

R0375   ***************************************************************************************
R0376   CONSTANTS FOR LANDING ANALOG DISPLAYS
R0377   ***************************************************************************************

R0378   CONSTANTS ON A-CARDS ARE FOUND IN THE CONTROLLED CONSTANTS SECTION
```

```
A0379                                                   LANAKPIP DEC     .0512         SCALES PIPAS TO UNITS OF 2(5) M/CS

A0380                                                   MAXVFL   OCT     00466         198.645 F/S IN UNITS OF 2(5) M/CS

A0381                                                   MAXDBITS OCT     01034         ABOUT 300 F/S

A0382                                                   VFLCONV  DEC     .03594        SCALES VFL AT ONE M/CS TO .5571 F/S/BIT

A0383                                                   ALTRCONV DEC     .16020        SCALES ALTR AT 2(2) M/CS TO .5 F/S/BIT

A0384                                                   ALTCONV  DEC     .69954        SCALES ALTITUDE AT 2(15) M TO 9.38 F/BIT

 0385   REF   2  LAST  552       5011                   BITSET   =       PRIO6         CROSS-POINTER DRIVE BITS

R0386   ****************************************************************************************
R0387   SUBROUTINES
R0388   ****************************************************************************************

 0389   REF  32  LAST  872   21,2673  54 061 1  LADLIMIT TS       ITEMP1
 0390   REF 177  LAST  903   21,2674  3 4746 0           CAF      ZERO
 0391                        21,2675  0 0006 1           EXTEND
 0392   REF  33  LAST  904   21,2676  10 061 1           DV       ITEMP1
 0393   REF 256  LAST  903   21,2677  10 000 0           CCS      A
 0394   REF  34  LAST  904   21,2700  22 061 0           LXCH     ITEMP1
 0395                        21,2701  1 2703 0           TCF      +2
 0396                        21,2702  1 2705 0           TCF      +3
 0397   REF 161  LAST  902   21,2703  3 0001 0           CA       L
 0398   REF 216  LAST  902   21,2704  0 0002 0           TC       Q
 0399   REF  35  LAST  904   21,2705  4 0061 1           CS       ITEMP1
 0400   REF 217  LAST  904   21,2706  0 0002 0           TC       Q

R0401   ****************************************************************************************
R0402   THE END OF THE LANDING ANALOG DISPLAYS
R0403   ****************************************************************************************
```

```
L        FINDCDUW - GUIDAP INTERFACE                                                USER'S PAGE NO.   1      E0 S3

R0001    PROGRAM NAME:    FINDCDUW

R0002    MOD NUMBER:      1         68 07 15

R0003    MOD AUTHOR:      KLUMPP

R0004    OBJECTS OF MOD:  1.        TO SUPPLY COMMANDED GIMBAL ANGLES FOR NOUN 22.
R0005                     2.        TO MAINTAIN CORRECT AND CURRENT THRUST
R0006                               DIRECTION DATA IN ALL MODES.  THIS IS DONE BY
R0007                               FETCHING FOR THE THRUST DIRECTION FILTER THE
R0008                               CDUD'S IN PNGCS-AUTO, THE CDU'S IN ALL OTHER
R0009                               MODES.
R0010                     3.        TO SUBSTITUTE A STOPRATE FOR THE NORMAL
R0011                               AUTOPILOT COMMANDS WHENEVER
R0012                               1) NOT IN PNGCS-AUTO, OR
R0013                               2) ENGINE IS OFF.

R00131   MOD NUMBER:      2         10 DECEMBER 1970

R00132   MOD AUTHOR:      P. S. WEISSMAN

R00133   OBJECTIVE OF MOD:  TO ISSUE STEERING COMMANDS TO THE DAP EVEN WHEN AGS IS INDICATED (IN CASE THE INDICA-
R001341                     TION IS FALSE).

R0014    FUNCTIONAL DESCRIPTION:

R0015    FINDCDUW PROVIDES THE INTERFACES BETWEEN THE VARIOUS POWERED FLITE GUIDANCE PROGRAMS
R0017    AND THE DIGITAL AUTOPILOT.  THE INPUTS TO FINDCDUW ARE THE THRUST COMMAND VECTOR
R0019    AND THE WINDOW COMMAND VECTOR, AND THE OUTPUTS ARE THE GIMBAL ANGLE
R0020    INCREMENTS, THE COMMANDED ATTITUDE ANGLE RATES, AND THE COMMANDED
R0021    ATTITUDE LAG ANGLES (WHICH ACCOUNT FOR THE ANGLES BY WHICH THE BODY WILL
R0022    LAG BEHIND A RAMP COMMAND IN ATTITUDE ANGLE DUE TO THE FINITE ANGULAR
R0023    ACCELERATIONS AVAILABLE).

R0024    FINDCDUW ALINES THE ESTIMATED THRUST VECTOR FROM THE THRUST DIRECTION
R0025    FILTER WITH THE THRUST COMMAND VECTOR, AND, WHEN  XOVINHIB  SET,
R0026    ALINES THE +Z HALF OF THE LM ZX PLANE WITH THE WINDOW COMMAND VECTOR.
```

```
L        FINDCDUW - GUIDAP INTERFACE                                            USER'S PAGE NO.   2       E0 S3

P0027    SPECIFICATIONS:

R0028    INITIALIZATION: A SINGLE INTERPRETIVE CALL TO  INITCDUW  IS REQUIRED
R0029                    BEFORE EACH GUIDED MANEUVER USING FINDCDUW.

R0030    CALL:           INTERPRETIVE CALL TO FINDCDUW WITH THE THRUST COMMAND
R0031                    VECTOR IN MPAC.  INTERPRETIVE CALL TO FINDCDUW -2 WITH
R0032                    THE THRUST COMMAND VECTOR IN UNFC/2 AND NOT IN MPAC.

R0033    RETURNS:        NORMAL INTERPRETIVE IN ALL CASES

R0034                    1.      NORMALLY ALL AUTOPILOT CMDS ARE ISSUED.

R0035                    2.      IF NOT PNGCS AUTO, DO STOPRATE AND RETURN
R0036                            WITHOUT ISSUING AUTOPILOT CMDS.

R0037                    3.      IF ENGINE OFF, DO STOPRATE AND RETURN WITHOUT
R0038                            ISSUING AUTOPILOT CMDS.

R0039    ALARMS:         00401 IF INPUTS DETERMINE AN ATTITUDE IN GIMBAL LOCK.
R0040                            FINDCDUW DRIVES CDUXD AND CDUYD TO THE RQD VALUES,
R0042                            BUT DRIVES CDUZD ONLY TO THE GIMBAL LOCK CONE.
R0043                    00402 IF UNFC/2 OR UNWC/2 PRODUCE OVERFLOW WHEN
R0044                            UNITIZED USING NORMUNIT.  FINDCDUW ISSUES
R0045                            STOPRATE AS ONLY INPUT TO AUTOPILOT.

R0046    INPUTS:         UNFC/2   THRUST COMMAND VECTOR, NEED NOT BE SEMI-UNIT.
R0047                    UNWC/2   WINDOW COMMAND VECTOR, NEED NOT BE SEMI-UNIT.
R0048                    OGABIAS  POSSIBLE BIAS FOR OUTER GIMBAL ANGLE (ZEROED IN INITCDUW), UNITS OF PI.
R0050                    XOVINHIB FLAG DENOTING X AXIS OVERRIDE INHIBITED.
R0051                    CSMDOCKD FLAG DENOTING CSM DOCKED.
R0052
R0053    OUTPUTS:        DELCDUX,Y,Z
R0054                    OMEGAPD,+1,+2
R0055                    DELPEROP,+1,+2
R0056                    CPHI,+1,+2 FOR NOUN22
R0057
R0058    DEBRIS:         FINDCDUW DESTROYS SINCDUX,Y,Z AND COSCDUX,Y,Z BY
R0059                    WRITING INTO THESE LOCATIONS THE SINES AND COSINES
R0060                    OF THE CDUD'S IN PNGCS-AUTO, OF THE CDU'S OTHERWISE.
```

```
P0061   INITIALIZATION FOR FINDCDUW

 0062                          30,3063                       BANK    30
 0063   REF    1               30,2000                       SETLOC  FCDUW
 0064                          30,3063                       BANK

 0065   REF    2  LAST   140   E6,1645                       FBANK=  FCDUW

 0066   REF    1                                             COUNT*  $$/FCDUW

 0067                          30,3063   77331 0   INITCDUW  SSP     VLOAD
 0068   REF    2  LAST   810   30,3064   03277 0                     OGABIAS
 0069                          30,3065   C0000 1                     0
 0070   REF   10  LAST   819   30,3066   06503 1                     UNITX
 0071   REF    5  LAST   141   30,3067   03266 0             STORE   UNFV/2
 0072   REF    9  LAST   853   30,3070   03260 0             STORE   UNWC/2
 0073                          30,3071   77616 0             RVQ

R0074   FINDCDUW PRELIMINARIES

 0075                          30,3072   77775 1             VLOAD                   FINDCDUW -2: ENTRY WHEN UNFC/2 PRE-STORD
 0076   REF   21  LAST   853   30,3073   03252 1                     UNFC/2          INPUT VECTORS NEED NOT BE SEMI-UNIT
 0077                          30,3074   40200 1   FINDCDUW  BOV     SETPD           FINDCDUW: ENTRY WHEN UNFC/2 IN MPAC
 0078   REF    5  LAST   851   30,3075   61074 0                     FINDCDUW        INTERPRETER NOW INITIALIZED
 0079                          30,3076   00C23 0                     22              LOCS 0 THRU 21 FOR DIRECTION COSINE MAT
 0080                          30,3077   77420 1             STQ     EXIT
 0081   REF    2  LAST   140   30,3100   03246 1                     QCDUWUSR        SAVE RETURN ADDRESS

R0082   MORE HOUSEKEEPING

 0083   REF    1               30,3101  3 3745 1             CA      ECDUWL
 0084   REF   53  LAST   901   30,3102  56 003 1             XCH     EBANK           SET EBANK
 0085   REF    2  LAST   140   30,3103  55'645 0             TS      ECDUWUSR        SAVE USER'S EBANK

 0086   REF   31  LAST   867   30,3104  3 0111 0             CA      DAPBOOLS
 0087   REF    6  LAST   748   30,3105  7 4730 0             MASK    CSMDOCKD        CSMDOCKD MUST NOT BE BIT15
 0088   REF  257  LAST   904   30,3106  10 000 0             CCS     A
 0089   REF   88  LAST   899   30,3107  3 4744 1             CA      ONE             INDEX IF CSM DOCKED
 0090   REF    2  LAST   140   30,3110  55'647 1             TS      NDXCDUW

 0091   REF    1               30,3111  3 4734 0             CA      XOVINHIB        XOVINHIB MUST NOT BE BIT15
 0093   REF   32  LAST   907   30,3112  7 C111 1             MASK    DAPBOOLS
 0094   REF    2  LAST   140   30,3113  55'650 1             TS      FLAGOODW        FLAGOODW = ANY PNZ NUMBER IF XOV INHIBTD
```

```
P0095    FETCH BASIC DATA

0096                               30,3114  0 0004 0          INHINT                         RELINT AT PAUTNO (TC INTPRET)

0097     REF  14  LAST  874        30,3115  3 0032 0          CA       CDUX                  FETCH CDUX,CDUY,CDUZ IN ALL CASES, BUT
0098     REF   2  LAST  876        30,3116  54 771 1          TS       CDUSPOTX                   REPLACE BELOW IF PNGCS AUTO
0099     REF   8  LAST  874        30,3117  3 0033 1          CA       CDUY
0100     REF   2  LAST  876        30,3120  54 765 1          TS       CDUSPOTY
0101     REF  11  LAST  874        30,3121  3 0034 0          CA       CDUZ
0102     REF   2  LAST  876        30,3122  54 767 0          TS       CDUSPOTZ

0103     REF  30  LAST  899        30,3123  3 4733 1          CA       BIT10                 PNGCS CONTROL BIT
0104                               30,3124  0 0006 1          EXTEND
0105     REF   8  LAST  832        30,3125  02 030 0          RAND     CHAN30
0106     REF 258  LAST  907        30,3126  10 000 0          CCS      A
0107     REF   1                   30,3127  1 3143 0          TCF      PAUTNO                NOT PNGCS (BITS INVERTED)

0108     REF  56  LAST  781        30,3130  3 4727 1          CA       BIT14                 AUTO MODE BIT
0109                               30,3131  0 0006 1          EXTEND
0110     REF   7  LAST  823        30,3132  02 031 1          RAND     CHAN31
0111     REF 259  LAST  908        30,3133  10 000 0          CCS      A
0112     REF   2  LAST  908        30,3134  1 3143 0          TCF      PAUTNO                NOT AUTO (BITS INVERTED)

0114     REF  16  LAST  536        30,3135  3 1634 1          CA       CDUXD                 PNGCS AUTO: FETCH CDUXD,CDUYD,CDUZD
0115     REF   3  LAST  908        30,3136  54 771 1          TS       CDUSPOTX
0116     REF   7  LAST  536        30,3137  3 1635 0          CA       CDUYD
0117     REF   3  LAST  908        30,3140  54 765 1          TS       CDUSPOTY
0118     REF   6  LAST  535        30,3141  3 1636 0          CA       CDUZD
0119     REF   3  LAST  908        30,3142  54 767 0          TS       CDUSPOTZ
```

```
P0120    FETCH INPUTS

 0121    REF 159  LAST  891    30,3143   0 6060 1  PAUTNO    TC      INTPRET           ENTERING THRUST CMD STILL IN MPAC
 0122                          30,3144    77634 0            RTB
 0123    REF   9  LAST  809    30,3145    21724 0                    NORMUNIT
 0124    REF   1               30,3146    24001 0            STOVL   UNX/2             SEMI-UNIT THRUST CMD AS INITIAL UNX/2
 0125    REF  10  LAST  907    30,3147    03260 0                    UNWC/2
 0126                          30,3150    47034 0            RTB     RTB
 0127    REF  10  LAST  909    30,3151    21724 0                    NORMUNIT
 0128    REF   2  LAST  865    30,3152    47607 0                    QUICTRIG          ALWAYS RQD TO OBTAIN TRIGS OF CDUD'S
 0129    REF   1               30,3153    24015 0            STOVL   UNZ/2             SEMI-UNIT WINDOW CMD AS INITIAL UNZ/2
 0130    REF  11  LAST  884    30,3154    00325 0                    DELV
 0131                          30,3155    53404 1            BOVB    UNIT
 0132    REF   1               30,3156    61734 0                    NOATTCNT          AT LEAST ONE ENTERING CMD VCT ZERO
 0133                          30,3157    45000 0            BOV     CALL
 0134    REF   1               30,3160    61174 1                    AFTRFLTR          IF UNIT DELV OVERFLOWS, SKIP FILTER
 0135    REF   5  LAST  564    30,3161    47663 1                    *SMNB*            YIELDS UNIT(DELV) IN VEH COORDS FOR FLTR

R0136    THRUST DIRECTION FILTER

 0137                          30,3162    77776 1            EXIT

 0138    REF   1               30,3163   3 1667 1            CA      UNFVY/2           FOR RESTARTS, UNFV/2 ALWAYS INTACT, MPAC
 0139    REF 349  LAST  891    30,3164   22 157 1            LXCH    MPAC      +3           RENEWED AFTER RETURN FROM CALLER,
 0140    REF   1               30,3165   0 3467 1            TC      FLTRSUB                TWO FILTER UPDATES MAY BE DONE.
 0141    REF   2  LAST  909    30,3166  55'667 0            TS      UNFVY/2           UNFV/2 NEED NOT BE EXACTLY SEMI-UNIT.

 0142    REF   1               30,3167   3 1671 0            CA      UNFVZ/2
 0143    REF 350  LAST  909    30,3170   22 161 1            LXCH    MPAC      +5
 0144    REF   2  LAST  909    30,3171   0 3467 1            TC      FLTRSUB
 0145    REF   2  LAST  909    30,3172  55'671 1            TS      UNFVZ/2

 0146    REF 160  LAST  909    30,3173   0 6060 1            TC      INTPRET           COMPLETES FILTER
```

```
P0147    FIND A SUITABLE WINDOW POINTING VECTOR

 0148                              30,3174   46135 1  AETPFLTR SLOAD  BHIZ            IF XOV NOT INHIBITED, GO FETCH ZNB
 0149    REF    3  LAST   907      30,3175   03251 1                  FLAGOODW
 0150    REF    1                  30,3176   61202 0                  FETCHZNB
 0151                              30,3177   45175 0           VLOAD  CALL
 0152    REF    2  LAST   909      30,3200   00015 0                  UNZ/2
 0153    REF    1                  30,3201   61507 1                  UNWCTEST

 0154                              30,3202   77775 1  FETCHZNB VLOAD
 0155    REF    1                  30,3203   02153 1                  ZNBPIP
 0156    REF    3  LAST   910      30,3204   34015 1           STCALL UNZ/2
 0157    REF    2  LAST   910      30,3205   61507 1                  UNWCTEST

 0158                              30,3206   57575 1           VLOAD  VCOMP           Z AND -X CAN'T BOTH PARALLEL UNFC/2
 0159    REF   12  LAST   892      30,3207   02137 0                  XNBPIP
 0160    REF    4  LAST   910      30,3210   00015 0           STORE  UNZ/2

R0161    COMPUTE THE REQUIRED DIRECTION COSINE MATRIX

 0162                              30,3211   47375 0  DCMCL    VLOAD  VXV
 0163    REF    5  LAST   910      30,3212   00015 0                  UNZ/2
 0164    REF    2  LAST   909      30,3213   00001 0                  UNX/2
 0165                              30,3214   41456 0           UNIT   PUSH            UNY/2 FIRST ITERATION
 0166                              30,3215   76435 1           VXV    VSL1
 0167    REF    3  LAST   910      30,3216   00001 0                  UNX/2
 0168    REF    6  LAST   910      30,3217   00015 0           STORE  UNZ/2           -UNZ/2 FIRST ITERATION
 0169                              30,3220   63361 0           VXSC   PDVL            EXCHANGE -UNFVZ/2 UNZ/2 FOR UNY/2
 0170    REF    3  LAST   909      30,3221   03272 0                  UNFVZ/2         MUST BE SMALL
 0171                              30,3222   51361 1           VXSC   BVSU            YIELDS -UNFVY/2 UNY/2-UNFVZ/2 UNZ/2
 0172    REF    3  LAST   909      30,3223   03270 1                  UNFVY/2         MUST BE SMALL
 0173                              30,3224   53372 1           VSL1   VAD
 0174    REF    4  LAST   910      30,3225   00001 0                  UNX/2
 0175                              30,3226   77656 1           UNIT                   TOTALLY ELIMINATES THRUST POINTING ERROR
 0176    REF    5  LAST   910      30,3227   00001 0           STORE  UNX/2           UNX/2
 0177                              30,3230   76435 1           VXV    VSL1
 0178    REF    7  LAST   910      30,3231   00015 0                  UNZ/2           -UNZ/2 WAS STORED HERE REMEMBER
 0179    REF    1                  30,3232   00007 0           STORE  UNY/2           UNY/2
 0180                              30,3233   47276 1           VCOMP  VXV
 0181    REF    6  LAST   910      30,3234   00001 0                  UNX/2
 0182                              30,3235   77772 0           VSL1
 0183    REF    8  LAST   910      30,3236   00015 0           STORE  UNZ/2           UNZ/2

R0184    COMPUTE THE REQUIRED GIMBAL ANGLES

 0185                              30,3237   77624 1           CALL
 0186    REF    1                  30,3240   61517 0                  NB2CDUSP        YIELDS THE ROD GIMBAL ANGLES, 2'S, PI
 0187                              30,3241   77776 1           EXIT
```

```
P0188    BIAS OUTER GIMBAL ANGLE

 0189    REF   3  LAST  907   30,3242  3 1676 1              CA      OGABIAS
 0190    REF 351  LAST  909   30,3243  26 154 0              ADS     MPAC

P0191    LIMIT THE MIDDLE GIMBAL ANGLE & COMPUTE THE UNLIMITED GIMBAL ANGLE CHGS

 0192    REF 352  LAST  911   30,3244  3 0156 0              CA      MPAC       +2      LIMIT THE MGA
 0193    REF 162  LAST  904   30,3245  54 001 1              TS      L                  CAN'T LXCH: NEED UNLIMITED MGA FOR ALARM
 0194    REF   1              30,3246  3 3757 1              CA      CDUZDLIM
 0195    REF   4  LAST  887   30,3247  0 3713 1              TC      LIMITSUB           YIELDS LIMITED MGA. 1 BIT ERROR POSSIBLE
 0196    REF 353  LAST  911   30,3250  56 156 0              XCH     MPAC       +2           BECAUSE USING 2'S COMP. WHO CARES?
 0197                         30,3251  0 0006 1              EXTEND
 0198    REF 354  LAST  911   30,3252  20 156 1              MSU     MPAC       +2      THIS BETTER YIELD ZERO
 0199                         30,3253  0 0006 1              EXTEND
 0200                         30,3254  1 3256 1              BZF     +2
 0201    REF   1              30,3255  1 3742 1              TCF     ALARMMGA

 0202                         30,3256  0 0004 0   MGARET     INHINT                     RELINT AT TC INTPRET AFTER TCQCDUW

 0203                         30,3257  22 007 0              ZL
 0204    REF  59  LAST  860   30,3260  3 4743 0              CA      TWO
 0205    REF   6  LAST  887   30,3261  54 142 1   DELGMBLP   TS      TEM2

 0206    REF 163  LAST  911   30,3262  3 0001 0              CA      L                  TO PREVENT FALSE STARTS ABOUT X, ZERO
 0207                         30,3263  0 0006 1              EXTEND                          FLAGOODW IF DELGMBZ OR Y TOO BIG.
 0208                         30,3264  7 0000 0              SQUARE
 0209    REF   5  LAST  429   30,3265  6 4341 0              AD      HI5                WITHIN 1 BIT OF -(45 DEG SQUARED)
 0210                         30,3266  0 0006 1              EXTEND
 0211                         30,3267  6 3272 0              BZMF    +3
 0212    REF 178  LAST  904   30,3270  3 4746 0              CA      ZERO
 0213    REF   4  LAST  910   30,3271  55'650 1              TS      FLAGOODW

 0214    REF   7  LAST  911   30,3272  50 142 0              INDEX   TEM2
 0215    REF 355  LAST  911   30,3273  3 0154 1              CA      MPAC
 0216    REF   8  LAST  911   30,3274  50 142 0              INDEX   TEM2
 0217    REF  10  LAST  535   30,3275  54 321 0              TS      CPHI               OUTPUTS TO NOUN22
 0218                         30,3276  0 0006 1              EXTEND
 0219    REF   9  LAST  911   30,3277  5 0142 0              INDEX   TEM2
 0220    REF  17  LAST  908   30,3300  21'634 0              MSU     CDUXD              NO MATTER THAT THESE SLIGHTLY DIFFERENT
 0221                         30,3301  4 0000 0              COM                             FROM WHEN WE INITIALLY FETCHED THEM
 0222    REF  10  LAST  911   30,3302  50 142 0              INDEX   TEM2
 0223    REF   2  LAST  141   30,3303  55'673 0              TS      -DELGMB            -UNLIMITED GIMBAL ANGLE CHGS, 1'S, PI
 0224    REF 164  LAST  911   30,3304  54 001 1              TS      L                  FOR PRECEDING TEST ON NEXT LOOP PASS
 0225    REF  11  LAST  911   30,3305  10 142 1              CCS     TEM2
 0226    REF   1              30,3306  1 3261 0              TCF     DELGMBLP
```

```
P0227   BRANCHES TO NOATTCNT

 0228   REF  57  LAST  908   30,3307  3 4727 1          CA      BIT14           AUTO MODE BIT
 02281                       30,3310  0 0006 1          EXTEND
 02282  REF   8  LAST  908   30,3311  02 031 1          RAND    CHAN31
 02283  REF 260  LAST  908   30,3312  10 000 0          CCS     A
 0229   REF   2  LAST  909   30,3313  1 3736 1          TCF     NOATTCNT +2     NOT AUTO

 0230   REF  28  LAST  833   30,3314  3 0101 1          CA      FLAGWRD5
 0231   REF   6  LAST  833   30,3315  7 4736 0          MASK    ENGONBIT
 0232                        30,3316  0 0006 1          EXTEND
 0233   REF   3  LAST  912   30,3317  1 3736 1          BZF     NOATTCNT +2     ENGINE NOT ON
```

```
P0234   LIMIT THE ATTITUDE ANGLE CHANGES

R0235   THIS SECTION LIMITS THE ATTITUDE ANGLE CHANGES ABOUT A SET OF ORTHOGONAL VEHICLE AXES X,YPRIME,ZPRIME.
R0237   THESE AXES COINCIDE WITH THE COMMANDED VEHICLE AXES IF AND ONLY IF CDUXD IS ZERO.  THE PRIME SYSTEM IS
R0239   THE COMMANDED VEHICLE SYSTEM ROTATED ABOUT THE X AXIS TO BRING THE Z AXIS INTO ALINEMENT WITH THE MIDDLE GIMBAL
R0241   AXIS.  ATTITUDE ANGLE CHANGES IN THE PRIME SYSTEM ARE RELATED TO SMALL GIMBAL ANGLE CHANGES BY:

R0243   * -DELATTX       *   * 1  SIN(CDUZD)  0 * * -DELGMBX *
R0244   *                *   *                  * *          *
R0245   * -DELATTYPRIME * = * 0  COS(CDUZD)  0 * * -DELGMBY *
R0246   *                *   *                  * *          *
R0247   * -DELATTZPRIME *   * 0  0            1 * * -DELGMBZ *

 0248   REF   3  LAST  911   30,3320  23'675 1            LXCH   -DELGMB  +2     SAME AS -DELATTZPRIME UNLIMITED
 0249   REF   3  LAST  907   30,3321  51'647 0            INDEX  NDXCDUW
 0250   REF   1              30,3322  3 3753 0            CA     DAZMAX
 0251   REF   5  LAST  911   30,3323  0 3713 1            TC     LIMITSUB
 0252   REF   4  LAST  913   30,3324  55'675 0            TS     -DELGMB  +2     -DELGMBZ

 0253   REF   5  LAST  913   30,3325  3 1674 0            CA     -DELGMB  +1
 0254                        30,3326  0 0006 1            EXTEND
 0255   REF   3  LAST  493   30,3327  7 0745 0            MP     COSCDUZ         YIELDS -DELATTYPRIME/2 UNLIMITED
 0256   REF 165  LAST  911   30,3330  54 001 1            TS     L
 0257   REF   4  LAST  913   30,3331  51'647 0            INDEX  NDXCDUW
 0258   REF   1              30,3332  3 3755 0            CA     DAY/2MAX
 0259   REF   6  LAST  913   30,3333  0 3713 1            TC     LIMITSUB
 0260                        30,3334  0 0006 1            EXTEND
 0261   REF   4  LAST  913   30,3335  10 745 0            DV     COSCDUZ
 0262   REF   6  LAST  913   30,3336  57'674 0            XCH    -DELGMB  +1     -DELGMBY, FETCHING UNLIMITED VALUE

 0263                        30,3337  0 0006 1            EXTEND
 0264   REF   3  LAST  493   30,3340  7 0737 0            MP     SINCDUZ
 0265                        30,3341  20 001 1            DDOUBL
 0266                        30,3342  4 0000 0            COM
 0267                        30,3343  0 0006 1            EXTEND                 YIELDS +DELATTX UNLIMITD, MAG < 180 DEG,
 0268   REF   7  LAST  913   30,3344  21'673 0            MSU    -DELGMB              BASED ON UNLIMITED DELGMBY.
 0269   REF 166  LAST  913   30,3345  54 001 1            TS     L                    ONE BIT ERROR IF OPERANDS IN MSU
 0270   REF   5  LAST  913   30,3346  51'647 0            INDEX  NDXCDUW              OF MIXED SIGNS.  WHO CARES?
 0271   REF   1              30,3347  3 3753 0            CA     DAXMAX
 0272   REF   7  LAST  913   30,3350  0 3713 1            TC     LIMITSUB
 0273   REF   8  LAST  913   30,3351  55'673 0            TS     -DELGMB         SAVE LIMITED +DELATTX
 0274   REF   5  LAST  911   30,3352  11'650 1            CCS    FLAGOODW
 0275   REF   9  LAST  913   30,3353  4 1673 0            CS     -DELGMB         FETCH IT BACK CHGING SIGN IF WINDOW GOOD
 0276   REF  10  LAST  913   30,3354  55'673 0            TS     -DELGMB         OTHERWISE USE ZERO FOR -DELATTX
 0277   REF  11  LAST  913   30,3355  4 1674 1            CS     -DELGMB  +1
 0278                        30,3356  0 0006 1            EXTEND
 0279   REF   4  LAST  913   30,3357  7 0737 0            MP     SINCDUZ
 0280                        30,3360  20 001 1            DDOUBL                 YIELDS -CNTRIB TO -DELATTX FROM -DELGMBY
 0281   REF  12  LAST  913   30,3361  27'673 0            ADS    -DELGMB         -DELGMBX.  NO OVERFLOW SINCE LIMITED TO
A0282                                                                            20DEG(1+SIN(70DEG)/COS(70DEG)) < 180DEG
```

```
L        FINDCDUW - GUIDAP INTERFACE                                                           USER'S PAGE NO.  10      F6 S3

P0283    COMPUTE COMMANDED ATTITUDE RATES

R0284    * OMEGAPD *   * -2  -4 SINCDUZ           +0          * * -DELGMBX *
R0285    *         *   *                                      * *          *
R0286    * OMEGAQD * = * +0  -8 COSCDUZ COSCDUX  -4 SINCDUX * * -DELGMBY *
R0287    *         *   *                                      * *          *
R0288    * OMEGARD *   * +0  +8 COSCDUZ SINCDUX  -4 COSCDUX * * -DELGMBZ *

R0289    ATTITUDE ANGLE RATES IN UNITS OF PI/4 RAD/SEC = K TRIG FCNS IN UNITS OF 2 X GIMBAL ANGLE RATES IN UNITS OF
R0291    PI/2 RAD/SEC.  THE CONSTANTS ARE BASED ON DELGMB BEING THE GIMBAL ANGLE CHANGES IN UNITS OF PI RADIANS,
R0293    AND 2 SECONDS BEING THE COMPUTATION PERIOD (THE PERIOD BETWEEN SUCCESSIVE PASSES THRU FINDCDUW).

 0295    REF  13  LAST  913    30,3362   4 1673 0           CS       -DELGMB
 0296    REF   7  LAST  381    30,3363   55'642 1           TS       OMEGAPD
 0297    REF  14  LAST  914    30,3364   4 1674 1           CS       -DELGMB   +1
 0298                          30,3365   0 0006 1           EXTEND
 0299    REF   5  LAST  913    30,3366   7 0737 0           MP       SINCDUZ
 0300                          30,3367   20 001 1           DDOUBL
 0301    REF   8  LAST  914    30,3370   27'642 1           ADS      OMEGAPD
 0302    REF   9  LAST  914    30,3371   27'642 1           ADS      OMEGAPD

 0303    REF  15  LAST  914    30,3372   4 1674 1           CS       -DELGMB   +1
 0304                          30,3373   0 0006 1           EXTEND
 0305    REF   4  LAST  493    30,3374   7 0747 1           MP       COSCDUX
 0306                          30,3375   20 001 1           DDOUBL
 0307                          30,3376   0 0006 1           EXTEND
 0308    REF   5  LAST  913    30,3377   7 0745 0           MP       COSCDUZ
 0309    REF   4  LAST  381    30,3400   55'643 0           TS       OMEGAQD
 0310    REF  16  LAST  914    30,3401   4 1675 0           CS       -DELGMB   +2
 0311                          30,3402   0 0006 1           EXTEND
 0312    REF   3  LAST  493    30,3403   7 0741 1           MP       SINCDUX
 0313    REF   5  LAST  914    30,3404   27'643 0           ADS      OMEGAQD
 0314    REF   6  LAST  914    30,3405   27'643 0           ADS      OMEGAQD
 0315    REF   7  LAST  914    30,3406   27'643 0           ADS      OMEGAQD

 0316    REF  17  LAST  914    30,3407   3 1674 0           CA       -DELGMB   +1
 0317                          30,3410   0 0006 1           EXTEND
 0318    REF   4  LAST  914    30,3411   7 0741 1           MP       SINCDUX
 0319                          30,3412   20 001 1           DDOUBL
 0320                          30,3413   0 0006 1           EXTEND
 0321    REF   6  LAST  914    30,3414   7 0745 0           MP       COSCDUZ
 0322    REF   3  LAST  381    30,3415   55'644 1           TS       OMEGARD
 0323    REF  18  LAST  914    30,3416   4 1675 0           CS       -DELGMB   +2
 0324                          30,3417   0 0006 1           EXTEND
 0325    REF   5  LAST  914    30,3420   7 0747 1           MP       COSCDUX
 0326    REF   4  LAST  914    30,3421   27'644 1           ADS      OMEGARD
 0327    REF   5  LAST  914    30,3422   27'644 1           ADS      OMEGARD
 0328    REF   6  LAST  914    30,3423   27'644 1           ADS      OMEGARD
```

```
R0329    FINAL TRANSFER

 0330    REF  60  LAST  911    30,3424   3 4743 0             CA      TWO
 0331    REF  12  LAST  911    30,3425   54 142 1   CDUWXFR   TS      TEM2
 0332    REF  13  LAST  915    30,3426   50 142 0             INDEX   TEM2
 0333    REF  19  LAST  914    30,3427   3 1673 1             CA      -DELGMB
 0334                          30,3430   0 0006 1             EXTEND
 0335    REF   1               30,3431   7 3760 1             MP      DT/DELT          RATIO OF DAP INTERVAL TO CDUW INTERVAL
 0336    REF   1               30,3432   0 3727 0             TC      ONESTO2S
 0337    REF  14  LAST  915    30,3433   50 142 0             INDEX   TEM2
 0338    REF   4  LAST  140    30,3434   55'637 0             TS      DELCDUX          ANGLE INTERFACE

 0339    REF  15  LAST  915    30,3435   50 142 0             INDEX   TEM2
 0340    REF  10  LAST  914    30,3436   11'642 1             CCS     OMEGAPD
 0341    REF  89  LAST  907    30,3437   6 4744 1             AD      ONE
 0342                          30,3440   1 3442 1             TCF     +2
 0343    REF  90  LAST  915    30,3441   6 4744 1             AD      ONE
 0344                          30,3442   0 0006 1             EXTEND                   WE NOW HAVE ABS(OMEGAPD,QD,RD)
 0345    REF  16  LAST  915    30,3443   5 0142 0             INDEX   TEM2
 0346    REF  11  LAST  915    30,3444   7 1642 1             MP      OMEGAPD
 0347                          30,3445   0 0006 1             EXTEND
 0348    REF  22  LAST  746    30,3446   7 4732 1             MP      BIT11            1/16
 0349                          30,3447   0 0006 1             EXTEND
 0350    REF  17  LAST  915    30,3450   5 0142 0             INDEX   TEM2                                  2
 0351    REF   5  LAST  379    30,3451   11'530 1             DV      1JACC            UNITS PI/4 RAD/SEC
 0352    REF 167  LAST  913    30,3452   54 001 1             TS      L
 0353    REF   1               30,3453   3 3755 0             CA      DELERLIM
 0354    REF   8  LAST  913    30,3454   0 3713 1             TC      LIMITSUB
 0355    REF  18  LAST  915    30,3455   50 142 0             INDEX   TEM2
 0356    REF   3  LAST  381    30,3456   55'274 0             TS      DELPEROR         LAG ANGLE = OMEGA ABS(OMEGA)/2 ACCEL
 0357    REF  19  LAST  915    30,3457   10 142 1             CCS     TEM2
 0358    REF   1               30,3460   1 3425 0             TCF     CDUWXFR

R0359    HAUSKEEPING AND RETURN

 0360    REF   3  LAST  907    30,3461   3 1645 1   TCQCDUW   CA      ECDUWUSR
 0361    REF  54  LAST  907    30,3462   54 003 0             TS      EBANK            RETURN USER'S EBANK

 0362    REF 161  LAST  909    30,3463   0 6060 1             TC      INTPRET
 0363                          30,3464    52001 1             SETPD   GOTO
 0364                          30,3465    00001 0                     0
 0365    REF   3  LAST  907    30,3466    03246 1                     QCDUWUSR         NORMAL AND ABNORMAL RETURN TO USER
```

```
L        FINDCDUW - GUIDAP INTERFACE                                                          USER'S PAGE NO.  12       E6 S3

P0366    THRUST VECTOR FILTER SUBROUTINE

 0367                                30,3467  0 0006 1  FLTRSUB  EXTEND
 0368    REF  20  LAST  915          30,3470  22 142 0           QXCH    TEM2
 0369    REF   3  LAST   99          30,3471  54 143 0           TS      TEM3                   SAVE ORIGINAL OFFSET
 0370                                30,3472  4 0000 0           COM                            ONE MCT, NO WDS, CAN BE SAVED IF NEG OF
 0371    REF 168  LAST  915          30,3473  6 0001 0           AD      L                           ORIG OFFSET ARRIVES IN A, BUT IT'S
 0372                                30,3474  0 0006 1           EXTEND                              NOT WORTH THE INCREASED OBSCURITY.
 0373    REF   6  LAST  913          30,3475  5 1647 0           INDEX   NDXCDUW
 0374    REF   1                     30,3476  7 3746 0           MP      GAINFLTR
 0375    REF 169  LAST  916          30,3477  54 001 1           TS      L                      INCR TO OFFSET, UNLIMITED
 0376    REF   1                     30,3500  3 3750 0           CA      DUNFVLIM               SAME LIMIT FOR Y AND Z
 0377    REF   9  LAST  915          30,3501  0 3713 1           TC      LIMITSUB               YIELDS INCR TO OFFSET, LIMITED
 0378    REF   4  LAST  916          30,3502  6 0143 1           AD      TEM3                   ORIGINAL OFFSET
 0379    REF 170  LAST  916          30,3503  54 001 1           TS      L                      TOTAL OFFSET, UNLIMITED
 0380    REF   1                     30,3504  3 3751 1           CA      UNFVLIM                SAME LIMIT FOR Y AND Z
 0381    REF  10  LAST  916          30,3505  0 3713 1           TC      LIMITSUB               YIELDS TOTAL OFFSET, LIMITED
 0382    REF  21  LAST  916          30,3506  0 0142 0           TC      TEM2

R0383    SUBR TO TEST THE ANGLE BETWEEN THE PROPOSED WINDOW AND THRUST CMD VCTS

 0384                                30,3507   63441 0  UNWCTEST DOT     DSQ
 0385    REF   7  LAST  910          30,3510   00001 0                   UNX/2
 0386                                30,3511   50025 0           DSU     BMN
 0387    REF   1                     30,3512   21753 0                   DOTSWFMX
 0388    REF   1                     30,3513   61211 1                   DCMCL
 0389                                30,3514   43531 1           SSP     RVQ                    RVQ FOR ALT CHOICE IF DOT MAGN TOO LARGE
 0390    REF   6  LAST  913          30,3515   03251 1                   FLAGOODW                    ZEROING WINDOW GOOD FLAG
 0391                                30,3516   00000 1                   0
```

```
P0392   NB2CDUSP RETURNS THE 2'S COMPLEMENT, PI, SP CDU ANGLES X,Y,Z IN MPAC,+1,+2 GIVEN THE MATRIX WHOSE ROW VECTORS
R0394   ARE THE SEMI-UNIT NAV BASE VECTORS X,Y,Z EXPRESSED IN STABLE MEMBER COORDINATES, LOCATED AT 0 IN THE PUSH LIST.

R0396   NB2CDUSP USES ARCTRGSP WHICH HAS A MAXIMUM ERROR OF +-4 BITS.

 0397                           30,3517   63545 0  NB2CDUSP DLOAD  DSQ
 0398                           30,3520   00003 1                  2
 0399                           30,3521   51021 0           BDSU   BPL
 0400   REF   6  LAST  653      30,3522   06475 1                  DP1/4TH
 0401                           30,3523   61526 1                  +3
 0402                           30,3524   77745 1           DLOAD
 0403   REF  16  LAST  807      30,3525   06505 1                  ZEROVECS          IN CASE SIN WAS SLIGHTLY > 1/2
 0404                           30,3526   77566 1           SQRT   EXIT              YIELDS COS(CDUZ) IN UNITS OF 2

 0405                           30,3527  0 0006 1           EXTEND
 0406   REF 356  LAST  911      30,3530  3 0155 0           DCA    MPAC
 0407                           30,3531  20 001 1           DDOUBL
 0408   REF   7  LAST  887      30,3532  54 145 0           TS     TEM5
 0409                           30,3533  1 3536 0           TCF    +3
 0410   REF  25  LAST  899      30,3534  3 4724 1           CA     POSMAX            OVERFLOW. FETCH POSMAX, MPAC ALWAYS POS
 0411   REF   8  LAST  917      30,3535  54 145 0           TS     TEM5              COS(CDUZ) IN TEM5, UNITS 1

 0412   REF  35  LAST  893      30,3536  50 120 1           INDEX  FIXLOC
 0413                           30,3537  3 0002 0           CA     2
 0414   REF 357  LAST  917      30,3540  22 154 1           LXCH   MPAC
 0415   REF   1                 30,3541  0 3606 1           TC     ARCTRGSP
 0416   REF 358  LAST  917      30,3542  54 156 1           TS     MPAC      +2      CDUZ

 0417   REF 179  LAST  911      30,3543  3 4746 0           CA     ZERO
 0418   REF   1                 30,3544  0 3564 0           TC     DVBYCOSM
 0419   REF  22  LAST  886      30,3545  3 4742 1           CA     FOUR
 0420   REF   2  LAST  917      30,3546  0 3564 0           TC     DVBYCOSM
 0421   REF  10  LAST  887      30,3547  4 0141 1           CS     TEM1
 0422   REF   2  LAST  917      30,3550  0 3606 1           TC     ARCTRGSP
 0423   REF 359  LAST  917      30,3551  54 155 1           TS     MPAC      +1      CDUY

 0424   REF  42  LAST  903      30,3552  3 4741 1           CA     BIT4
 0425   REF   3  LAST  917      30,3553  0 3564 0           TC     DVBYCOSM
 0426   REF   1                 30,3554  3 3563 1           CA     16OCT
 0427   REF   4  LAST  917      30,3555  0 3564 0           TC     DVBYCOSM
 0428   REF  11  LAST  917      30,3556  4 0141 1           CS     TEM1
 0429   REF   3  LAST  917      30,3557  0 3606 1           TC     ARCTRGSP
 0430   REF 360  LAST  917      30,3560  54 154 0           TS     MPAC              CDUX

 0431   REF 162  LAST  915      30,3561  0 6060 1           TC     INTPRET
 0432                           30,3562   77616 0           RVQ

 0433                           30,3563   00016 0  16OCT    OCT    16
```

```
R0434   THE ELEMENTS OF THE NAV BASE MATRIX WHICH WE MUST DIVIDE BY COS(MGA)
R0435   ALREADY CONTAIN COS(MGA)/2 AS A FACTOR.  THEREFORE THE QUOTIENT SHOULD
R0436   ORDINARILY NEVER EXCEED 1/2 IN MAGNITUDE.  BUT IF THE MGA IS NEAR PI/2
R0437   THEN COS(MGA) IS NEAR ZERO, AND THERE MAY BE SOME CHAFF IN THE OTHER
R0438   ELEMENTS OF THE MATRIX WHICH WOULD PRODUCE CHAOS UNDER DIVISION.
R0439   BEFORE DIVIDING WE MAKE SURE COS(MGA) IS AT LEAST ONE BIT LARGER
R0440   THAN THE MAGNITUDE OF THE HIGH ORDER PART OF THE OPERAND.

R0441   IF ONE OR MORE DIVIDES CANNOT BE PERFORMED, THIS MEANS THAT THE
R0442   REQUIRED MGA IS VERY NEARLY +-PI/2 AND THEREFORE THE OTHER GIMBAL
R0443   ANGLES ARE INDETERMINATE.  THE INNER AND OUTER GIMBAL ANGLES RETURNED
R0444   IN THIS CASE WILL BE RANDOM MULTIPLES OF PI/2.

 0445   REF  36  LAST  917    30,3564  6 0120 1  DVBYCOSM AD      FIXLOC
 0446   REF   1               30,3565  54 116 0           TS      ADDRWD          ADRES OF OPERAND

 0447   REF   2  LAST  918    30,3566  50 116 1           INDEX   ADDRWD          FETCH NEG ABS OF OPERAND, AD TEM5, AND
 0448                         30,3567  3 0000 1           CA      0                   SKIP DIVIDE IF RESULT NEG OR ZERO
 0449                         30,3570  0 0006 1           EXTEND
 0450                         30,3571  6 3573 0           BZME    +2
 0451                         30,3572  4 0000 0           CDM
 0452   REF   9  LAST  917    30,3573  6 0145 1           AD      TEM5            C(A) ZERO OR NEG, C(TEM5) ZERO OR POS
 0453                         30,3574  0 0006 1           EXTEND
 0454   REF   1               30,3575  6 3603 1           BZMF    TSL&TCQ         DIFFERENCE ALWAYS SMALL IF BRANCH

 0455                         30,3576  0 0006 1           EXTEND                  TEM5 EXCEEDS ABS HIGH ORDER PART OF
 0456   REF   3  LAST  918    30,3577  5 0116 1           INDEX   ADDRWD               OPERAND BY AT LEAST ONE BIT.
 0457                         30,3600  3 0001 0           DCA     0                    THEREFORE IT EXCEEDS THE DP OPERAND
 0458                         30,3601  0 0006 1           EXTEND                       AND DIVISION WILL ALWAYS SUCCEED.
 0459   REF  10  LAST  918    30,3602  10 145 0           DV      TEM5
 0460   REF 171  LAST  916    30,3603  54 001 1  TSL&TCQ  TS      L
 0461   REF  12  LAST  917    30,3604  22 141 0           LXCH    TEM1
 0462   REF 218  LAST  904    30,3605  0 0002 0           TC      Q
```

```
R0463   ARCTRGSP RETURNS THE 2'S COMPLEMENT, PI, SP ANGLE IN THE A REGISTER GIVEN ITS SINE IN A AND ITS COSINE IN L IN
R0465   UNITS OF 2.  THE RESULT IS AN UNAMBIGUOUS ANGLE ANYWHERE IN THE CIRCLE, WITH A MAXIMUM ERROR OF +-4 BITS.
R0467   THE ERROR IS PRODUCED BY THE SUBROUTINE SPARCSIN WHICH IS USED ONLY IN THE REGION +-45 DEGREES.

 0469                            30,3606  0 0006 1  ARCTRGSP EXTEND
 0470   REF    1                 30,3607  1 3651 1           BZF     SINZERO          TO AVOID DIVIDING BY ZERO

 0471                            30,3610  0 0006 1           EXTEND
 0472   REF   10  LAST  887      30,3611  22 144 0           QXCH    TEM4
 0473   REF   22  LAST  916      30,3612  54 142 1           TS      TEM2
 0474   REF  172  LAST  918      30,3613  3 0001 0           CA      L
 0475   REF    5  LAST  916      30,3614  54 143 0           TS      TEM3
 0476   REF  180  LAST  917      30,3615  3 4746 0           CA      ZERO
 0477                            30,3616  0 0006 1           EXTEND
 0478   REF   23  LAST  919      30,3617  10 142 1           DV      TEM2
 0479                            30,3620  0 0006 1           EXTEND
 0480   REF    1                 30,3621  1 3640 1           BZF     USECOS

 0481   REF    6  LAST  919      30,3622  10 143 0           CCS     TEM3             SIN IS SMALLER OR EQUAL
 0482   REF  181  LAST  919      30,3623  3 4746 0           CA      ZERO
 0483                            30,3624  1 3630 0           TCF     +4
 0484   REF   24  LAST  919      30,3625  4 0142 1           CS      TEM2             IF COS NEG, REVERSE SIGN OF SIN,
 0485   REF   25  LAST  919      30,3626  54 142 1           TS      TEM2                  ANGLE = PI-ARCSIN(SIN)
 0486   REF    4  LAST  898      30,3627  3 4726 0           CA      NEGMAX           PICK UP PI, 2'S COMPLEMENT
 0487   REF    7  LAST  919      30,3630  54 143 0           TS      TEM3             WE NO LONGER NEED COS
 0488   REF   26  LAST  919      30,3631  3 0142 0           CA      TEM2
 0489   REF    2  LAST  804      30,3632  0 3656 1           TC      SPARCSIN -1
 0490   REF    2  LAST  915      30,3633  0 3727 0           TC      ONESTO2S
 0491                            30,3634  0 0006 1           EXTEND
 0492   REF    8  LAST  919      30,3635  20 143 0           MSU     TEM3
 0493   REF    3  LAST  919      30,3636  0 3727 0  LTO2&TCQ TC      ONESTO2S
 0494   REF   11  LAST  919      30,3637  0 0144 0           TC      TEM4

 0495   REF    9  LAST  919      30,3640  4 0143 0  USECOS   CS      TEM3             COS IS SMALLER
 0496   REF    3  LAST  919      30,3641  0 3656 1           TC      SPARCSIN -1      ANGLE = SIGN(SIN)(PI/2-ARCSIN(COS))
 0497   REF   13  LAST  896      30,3642  6 4727 1           AD      HALF
 0498   REF   10  LAST  919      30,3643  54 143 0           TS      TEM3             WE NO LONGER NEED COS
 0499   REF   27  LAST  919      30,3644  10 142 1           CCS     TEM2
 0500   REF   11  LAST  919      30,3645  3 0143 1           CA      TEM3
 0501   REF    1                 30,3646  1 3636 0           TCF     LTO2&TCQ
 0502   REF   12  LAST  919      30,3647  4 0143 0           CS      TEM3
 0503   REF    2  LAST  919      30,3650  1 3636 0           TCF     LTO2&TCQ

 0504   REF  173  LAST  919      30,3651  10 0001 1  SINZERO  CCS     L
 0505   REF  182  LAST  919      30,3652  3 4746 0           CA      ZERO
 0506   REF  219  LAST  918      30,3653  0 0002 0           TC      Q
 0507   REF    5  LAST  919      30,3654  3 4726 0           CA      NEGMAX           PI, 2'S COMP
 0508   REF  220  LAST  919      30,3655  0 0002 0           TC      Q
```

```
P0509    SPARCSIN TAKES AN ARGUMENT SCALED UNITY IN A AND RETURNS AN ANGLE SCALED
R0510    180 DEGREES IN A.  IT HAS BEEN UNIT TESTED IN THE REGION +-.94 (+- 70
R0511    DEGREES) AND THE MAXIMUM ERROR IS +-5 BITS WITH AN AVERAGE TIME OF
R0512    450 MICROSECONDS.  SPARCSIN -1 TAKES THE ARGUMENT SCALED TWO.(BOB CRISP)

 0513                               30,3656  6 0000 1               DOUBLE
 0514    REF   6  LAST  459         30,3657  54 021 0  SPARCSIN TS      SR
 0515                               30,3660  1 3664 1               TCF      +4
 0516    REF 261  LAST  912         30,3661  50 000 1               INDEX    A
 0517    REF   1                    30,3662  4 4725 1               CS       LIMITS
 0518    REF   9  LAST  920         30,3663  54 021 0               TS       SR
 0519                               30,3664  0 0006 1               EXTEND
 0520    REF 262  LAST  920         30,3665  7 0000 0               MP       A
 0521    REF  13  LAST  918         30,3666  54 141 1               TS       TEM1
 0522                               30,3667  0 0006 1               EXTEND
 0523    REF   1                    30,3670  7 3712 1               MP       DPL9
 0524    REF   1                    30,3671  6 3711 0               AD       DPL7
 0525                               30,3672  0 0006 1               EXTEND
 0526    REF  14  LAST  920         30,3673  7 0141 1               MP       TEM1
 0527    REF   1                    30,3674  6 3710 1               AD       DPL5
 0528                               30,3675  0 0006 1               EXTEND
 0529    REF  15  LAST  920         30,3676  7 0141 1               MP       TEM1
 0530    REF   1                    30,3677  6 3707 1               AD       DPL3
 0531                               30,3700  0 0006 1               EXTEND
 0532    REF  16  LAST  920         30,3701  7 0141 1               MP       TEM1
 0533    REF   1                    30,3702  6 3706 0               AD       DPL1
 0534                               30,3703  0 0006 1               EXTEND
 0535    REF  10  LAST  920         30,3704  7 0021 0               MP       SR
 0536    REF 221  LAST  919         30,3705  0 0002 0               TC       Q
 0537                               30,3706   24406 0  DPL1         DEC      10502
 0538                               30,3707   00660 1  DPL3         DEC      432
 0539                               30,3710   16204 0  DPL5         DEC      7300
 0540                               30,3711   50744 0  DPL7         DEC      -11803
 0541                               30,3712   20315 1  DPL9         DEC      8397
```

```
R0542    LIMITSUB LIMITS THE MAGNITUDE OF THE POSITIVE OR NEGATIVE VARIABLE
R0543    ARRIVING IN L TO THE POSITIVE LIMIT ARRIVING IN A.
R0544    THE SIGNED LIMITED VARIABLE IS RETURNED IN A.

R0545    VERSION COURTESY HUGH BLAIR-SMITH

 0546    REF  17  LAST  920    30,3713  54 141 1  LIMITSUB TS      TEM1
 0547    REF 183  LAST  919    30,3714  3 4746 0           CA      ZERO
 0548                          30,3715  0 0006 1           EXTEND
 0549    REF  18  LAST  921    30,3716  10 141 1           DV      TEM1
 0550    REF 263  LAST  920    30,3717  10 000 0           CCS     A
 0551    REF  19  LAST  921    30,3720  22 141 0           LXCH    TEM1
 0552                          30,3721  1 3723 0           TCF     +2
 0553                          30,3722  1 3725 0           TCF     +3
 0554    REF 174  LAST  919    30,3723  3 0001 0           CA      L
 0555    REF 222  LAST  920    30,3724  0 0002 0           TC      Q
 0556    REF  20  LAST  921    30,3725  4 0141 1           CS      TEM1
 0557    REF 223  LAST  921    30,3726  0 0002 0           TC      Q

R0558    SUBROUTINE TO CONVERT 1'S COMP SP TO 2'S COMP

 0559    REF 264  LAST  921    30,3727  10 000 0  ONESTO2S CCS     A
 0560    REF  91  LAST  915    30,3730  6 4744 1           AD      ONE
 0561    REF 224  LAST  921    30,3731  0 0002 0           TC      Q
 0562    REF 265  LAST  921    30,3732  4 0000 0           CS      A
 0563    REF 225  LAST  921    30,3733  0 0002 0           TC      Q

R0564    NO ATTITUDE CONTROL

 0565    REF  34  LAST  878    30,3734  0 5571 1  NOATTCNT TC      ALARM
 0566                          30,3735   00402 1           OCT     00402                 NO ATTITUDE CONTROL

 0567                          30,3736  0 0004 0  +2       INHINT                        COME HERE FOR NOATTCNT WITHOUT ALARM
 0568    REF  48  LAST  867    30,3737  0 4665 0           TC      IBNKCALL              RELINT AT TC INTPRET AFTER TCQCDUW
 0569    REF   9  LAST  867    30,3740   40166 1           FCADR   STOPRATE
 0570    REF   1               30,3741  1 3461 0           TCF     TCQCDUW               RETURN TO USER SKIPPING AUTOPILOT CMDS

R0571    MIDDLE GIMBAL ANGLE ALARM

 0572    REF  35  LAST  921    30,3742  0 5571 1  ALARMMGA TC      ALARM
 0573                          30,3743   00401 1           OCT     00401
 0574    REF   1               30,3744  1 3256 1           TCF     MGARET
```

```
P0575   ===========================================================================================
R0577   CONSTANTS
R0578   ===========================================================================================

R0580   ADDRESS CONSTANTS

 0581   REF   3  LAST  907   30,3745   03245 1  FCDUWL   ECADR  ECDUW
R0582
R0583   THRUST DIRECTION FILTER CONSTANTS

 0584                        30,3746   06315 0  GAINFLTR DEC    .2                    GAIN FILTER SANS CSM
 0585                        30,3747   03146 1           DEC    .1                    GAIN FILTER WITH CSM

 0586                        30,3750   00071 1  DUNFVLIM DEC    .007        8-1       7 MR MAX CHG IN F DIR IN VEH IN 2 SECS.
A0587                                                                                 THIS DOES NOT ALLOW FOR S/C ROT RATE.

 0588                        30,3751   02041 0  UNFVLIM  DEC    .129        B-1       129 MR MAX THRUST OFFSET. 105 MR TRAVEL
A0589                                                                                 +10MR DEFL+5MR MECH MOUNT+9MR ABLATION.
R0590
R0591   CONSTANTS RELATED TO GIMBAL ANGLE COMPUTATIONS

 0592                        30,3752   01673 1  DOTSWFMX DEC    .93302      B-4       LIM COLNRTY OF UNWC/2 & UNFC/2 TO 85 DEG
A0593                                                                                 LOWER PART COMES FROM NEXT CONSTANT

 0594                        30,3753   03434 1  DAXMAX   DEC    .11111111111          DELATTX LIM TO 20 DEG IN 2 SECS, 1'S, PI
 0595                        30,3754   00266 0           DEC    .0111111111           2 DEG WHEN CSM DOCKED

 0596                        30,3755   01616 1  DAY/2MAX DEC    .05555555555          LIKEWISE FOR DELATTY
 0597                        30,3756   00133 0           DEC    .0055555555

 0598   REF   2  LAST  913   30,3753            DAZMAX   =      DAXMAX                LIKEWISE FOR DELATTZ

 0599                        30,3757   14344 1  CDUZDLIM DEC    .3888888888           70 DEG LIMIT FOR MGA, 1'S, PI
R0600
R0601   CONSTANTS FOR DATA TRANSFER

 0602                        30,3760   01463 1  DT/DELT  DEC    .05                   .1 SEC/2 SEC WHICH IS THE AUTOPILOT
A0603                                                                                 CONTROL SAMPLE PERIOD/COMPUTATION PERIOD

 0604   REF   2  LAST  913   30,3755            DELFKLIM =      DAY/2MAX              10 DEG LIMIT FOR LAG ANGLES, 1'S, PI
R0605


*** END OF FLY      .197 ***
```

```
R0001    PROGRAM NAME- PROG52                                                                              DATE- JAN 9, 1967
R0003    MOD NO- 0                                                                                         LOG SECTION- P51-P53
R0005    MODIFICATION BY- LONSKE                                                                           ASSEMBLY- SUNDANCE REV 46

R0007    FUNCTIONAL DESCRIPTION-

R0008         ALIGNS THE IMU TO ONE OF THREE ORIENTATIONS SELECTED BY THE ASTRONAUT. THE PRESENT IMU ORIENTATION IS KNOWN
R0010    AND IS STORED IN REFSMMAT. THE THREE POSSIBLE ORIENTATIONS MAY BE_

R0011         (A) PREFERRED ORIENTATION

R0012          AN OPTIMUM ORIENTATION FOR A PREVIOUSLY CALCULATED MANUEVER. THIS ORIENTATION MUST BE CALCULATED AND
R0014         STORED BY A PREVIOUSLY SELECTED PROGRAM.

R0015         (B) NOMINAL ORIENTATION

R0016             X    =  UNIT ( R )
R0017            -SM

R0018             Y   =  UNIT (V X R)
R0019              SM

R0020             Z    =  UNIT (X    X   Y  )
R0021              SM             SM      SM

R0022             WHERE_
R0023              R = THE GEOCENTRIC RADIUS VECTOR AT TIME T(ALIGN) SELECTED BY THE ASTRONAUT
R0025              -

R0026              V = THE INERTIAL VELOCITY VECTOR AT TIME T(ALIGN) SELECTED BY THE ASTRONAUT
R0028              -

R0029         (C) REFSMMAT ORIENTATION

R0030             (D)  LANDING SITE - THIS IS NOT AVAILIBLE IN SUNDANCE

R0031          THIS SELECTION CORRECTS THE PRESENT IMU ORIENTATION. THE PRESENT ORIENTATION DIFFERS FROM THAT TO WHICH IT
R0033         WAS LAST ALIGNED ONLY DUE TO GYRO DRIFT(I.E. NEITHER GIMBAL LOCK NOR IMU POWER INTERRUPTION HAS OCCURED
R0035         SINCE THE LAST ALIGNMENT).

R0036         AFTER A IMU ORIENTATION HAS BEEN SELECTED ROUTINE S52.2 IS OPERATED TO COMPUTE THE GIMBAL ANGLES USING THE
R0038    NEW ORIENTATION AND THE PRESENT VEHICLE ATTITUDE. CAL52A THEN USES THESE ANGLES, STORED IN THETAD,+1,+2, TO
R0040    COARSE ALIGN THE IMU. THE STAR SELECTION ROUTINE, R56, IS THEN OPERATED. IF 2 STARS ARE NOT AVAILABLE AN ALARM
R0042    IS FLASHED TO NOTIFY THE ASTRONAUT. AT THIS POINT THE ASTRONAUT WILL MANUEVER THE VEHICLE AND SELECT 2 STARS
R0044    EITHER MANUALLY OR AUTOMATICALLY. AFTER 2 STARS HAVE BEEN SELECTED THE IMU IS FINE ALIGNED USING ROUTINE R51. IF
R0046    THE RENDEZVOUS NAVIGATION PROCESS IS OPERATING(INDICATED BY RNDVZFLG) P20 IS DISPLAYED. OTHERWISE P00 IS
R0048    REQUESTED.

R0049    CALLING SEQUENCE-
```

```
R0050          THE PROGRAM IS CALLED BY THE ASTRONAUT BY DSKY ENTRY.

R0051    SUBROUTINES CALLED-

R0052         1. FLAGDOWN        7. S52.2             13. NEWMODEX
R0053         2. R02BOTH         8. CAL53A            14. PRIOLARM
R0054         3. GOPERF4         9. FLAGUP
R0055         4. MATMOVE        10. R56
R0056         5. GOFLASH        11. R51
R0057         6. S52.3          12. GOPERF3

R0058    NORMAL EXIT MODES-

R0059         EXITS TO ENDOFJOB

R0060    ALARM OR ABORT EXIT MODES-

R0061         NONE

R0062    OUTPUT-

R0063         THE FOLLOWING MAY BE FLASHED ON THE DSKY
R0064            1. IMU ORIENTATION CODE
R0065            2. ALARM CODE 215 -PREFERRED IMU ORIENTATION NOT SPECIFIED
R0066            3. TIME OF NEXT IGNITION
R0067            4. GIMBAL ANGLES
R0068            5. ALARM CODE 405 -TWO STARS NOT AVAILABLE
R0069            6. PLEASE PERFORM P00
R0070         THE MODE DISPLAY MAY BE CHANGED TO 20

R0071    ERASABLE INITIALIZATION REQUIRED-

R0072         PFRATFLG SHOULD BE SET IF A PREFERRED ORIENTATION HAS BEEN COMPUTED.IF IT HAS BEEN COMPUTED IT IS STORED IN
R0074         XSMD,YSMD,ZSMD.
R0075         RNDVZFLG INDICATES WHETHER THE RENDEZVOUS NAVIGATION PROCESS IS OPERATING.

R0077    DEBRIS-

R0078         WORK AREA
 0080    REF   2  LAST  261    15,2000                         SETLOC P50S
 0081                          15,2201                         BANK

 0082    REF   4  LAST  209    E5,1755                         EBANK= BESTI
 0083    REF   1                                               COUNT* $$/P52
 0084    REF 241  LAST  894    15,2201  0 4607 1    PROG52     TC     BANKCALL
 0085    REF  10  LAST  839    15,2202   33757 1               CADR   R02BOTH          IMU STATUS CHECK
 0086    REF   1               15,2203  3 4741 1               CAF    PFRATBIT
 0087    REF  21  LAST  866    15,2204  7 0076 1               MASK   FLAGWRD2         IS PFRATFLG SET?
 0088    REF 266  LAST  921    15,2205  10 000 0               CCS    A
 0089    REF   1               15,2206  0 2211 1               TC     P52A             YES
```

```
L        P51-P53                                                                                  USER'S PAGE NO.   3      E5 S3

 0090    REF  25  LAST  834    15,2207   3 6266 0            CAF     THREE           DISPLAY REFSMMAT OPTION 3
 0091    REF   2  LAST  924    15,2210   0 2212 1            TC      P52A +1
 0092    REF  44  LAST  892    15,2211   3 4744 1   P52A     CAF     BIT1
 0093    REF   6  LAST  659    15,2212   55'144 0            TS      OPTION2
 0094    REF  45  LAST  925    15,2213   3 4744 1   P52B     CAF     BIT1
 0095    REF 242  LAST  924    15,2214   0 4607 1            TC      BANKCALL        FLASH OPTION CODE AND ORIENTATION CODE
 0096    REF   1               15,2215    20725 0            CADR    GOPERF4R        FLASH V04N06
 0097    REF  34  LAST  855    15,2216   0 6001 0            TC      GOTOPOOH
 0098                          15,2217   1 2224 0            TCF     +5              V33-PROCEED
 0099    REF   1               15,2220   0 2213 0            TC      P52B            NEW CODE - NEW ORIENTATION CODE INPUT
 0100    REF  80  LAST  894    15,2221   0 5355 1            TC      PHASCHNG        DISPLAY RETURN
 0101                          15,2222    00014 1            OCT     00014
 0102    REF 133  LAST  894    15,2223   0 5146 1            TC      ENDOFJOB

 0103    REF   7  LAST  925    15,2224   3 1144 1            CA      OPTION2
 0104    REF  26  LAST  925    15,2225   7 6266 1            MASK    THREE
 0105    REF 267  LAST  924    15,2226   50 000 1            INDEX   A
 0106                          15,2227   0 2230 1            TC      +1
 0107    REF   1               15,2230   1 2236 0            TCF     OPT4            OPTION 4 LANDING SITE
 0108    REF   1               15,2231   1 2310 0            TCF     P52H            OPTION 1 PREFERRED
 0109    REF   1               15,2232   1 2243 1            TCF     P52T            OPTION 2 NOMINAL
 0110    REF 163  LAST  917    15,2233   0 6060 1   P52E     TC      INTPRET         OPTION 3 REFSMMAT
 0111                          15,2234    77650 1            GOTO
 0112    REF   1               15,2235    32321 0                    P52F            GO DO R51

 01125   REF   7  LAST  892    15,2236   3 4732 0   OPT4     CAF     EBANK4          SET EBANK TO USE TLAND
 0113    REF  55  LAST  915    15,2237   54 C03 0            TS      EBANK
 01133   REF   4  LAST  782    E4,1426                       EBANK=  TLAND
 01135                         15,2240   0 0006 1            EXTEND
 0114    REF   5  LAST  925    15,2241   3 1427 1            DCA     TLAND           IF OPTION 4 DISPLAY TLAND
 0115    REF   2  LAST  925    15,2242   1 2245 1            TCF     P52T +2

 0116                          15,2243   0 0006 1   P52T     EXTEND
 0117    REF  23  LAST  900    15,2244   3 4746 0            DCA     NEGO
 0118    REF  24  LAST  660    15,2245   53'045 0            DXCH    DSPTEM1
 01184   REF  12  LAST  890    15,2246   3 5005 1            CAF     EBANK5          RESTORE EBANK AFTER USE OF TLAND
 01186   REF  56  LAST  925    15,2247   54 C03 0            TS      EBANK
 01188   REF   4  LAST  214    E5,1774                       EBANK=  TALIGN
 0119    REF   1               15,2250   3 2325 1            CAF     V06N34*
 0120    REF 243  LAST  925    15,2251   0 4607 1            TC      BANKCALL
 0121    REF  26  LAST  855    15,2252   20471 1             CADR    GOFLASH
 0122    REF  35  LAST  925    15,2253   0 6001 0            TC      GOTOPOOH
 0123                          15,2254   0 2256 1            TC      +2
 0124                          15,2255   0 2250 1            TC      -5
 0125    REF  25  LAST  925    15,2256   53'045 0            DXCH    DSPTEM1
 0126                          15,2257   0 0006 1            EXTEND
 0127                          15,2260   6 2262 0            BZMF    +2              IF TIME ZERO OR NEG USE TIME2
 0128                          15,2261   1 2264 1            TCF     +3
 0129                          15,2262   0 0006 1            EXTEND
 0130    REF  28  LAST  874    15,2263   3 0025 0            DCA     TIME2
 0131    REF   5  LAST  925    15,2264  53'775 1              DXCH    TALIGN
 0132    REF   8  LAST  925    15,2265  3 1144 1  P52V        CA      OPTION2
 0133    REF  43  LAST  903    15,2266  7 4743 1              MASK    BIT2
 0134    REF 268  LAST  925    15,2267  10 C00 0              CCS     A
 0135    REF   1               15,2270  0 2274 1              TC      P52W
 0136    REF 164  LAST  925    15,2271  0 6060 1              TC      INTPRET         OPTION 4 - GET LS ORIENTATION
 0137                          15,2272   77650 1              GOTO
 0138    REF   1               15,2273   32355 0                      P52LS
```

```
P0139   START ALIGNMENT

 0140   REF 165  LAST  926   15,2274  0 6060 1  P52W      TC      INTPRET
 0141                        15,2275   45145 0            DLOAD   CALL              PICK UP ALIGN TIME
 0142   REF   6  LAST  926   15,2276   02775 0                    TALIGN            COMPUTE NOMINAL IMU
 0143   REF   1              15,2277   42740 1                    S52.3              ORIENTATION
 0144                        15,2300   77624 1  P52D      CALL                      READ VEHICLE ATTITUDE AND
 0145   REF   1              15,2301   42707 1                    S52.2              COMPUTE GIMBAL ANGLES
 0146                        15,2302   77776 1            EXIT
 0147   REF   2  LAST  500   15,2303  3 5001 0            CAF     V06N22
 0148   REF 244  LAST  925   15,2304  0 4607 1            TC      BANKCALL          DISPLAY GIMBAL ANGLES
 0149   REF  27  LAST  925   15,2305   20471 1            CADR    GOFLASH
 0150   REF  36  LAST  925   15,2306  0 6001 0            TC      GOTOPOOH
 0151   REF   1              15,2307  1 2326 0            TCF     COARSTYP          V33-PROCEED, SEE IF GYRO TORQUE COARSE
 0152   REF 166  LAST  927   15,2310  0 6060 1  P52H      TC      INTPRET
 0153                        15,2311   77650 1            GOTO
 0154   REF   1              15,2312   32300 0                    P52D
 0155   REF 167  LAST  927   15,2313  0 6060 1  REGCOARS  TC      INTPRET
 0156                        15,2314   77624 1            CALL                      DO COARSE ALIGN
 0157   REF   1              15,2315   31316 1                    CAL53A             ROUTINE
 0158                        15,2316   43014 0  COARSRET  SET     CLEAR
 0159   REF   2  LAST  683   15,2317   01462 0                    REFSMFLG
 0160   REF   2  LAST  764   15,2320   01273 0                    PFRATFLG
 0161                        15,2321   77624 1  P52F      CALL
 0162   REF   1              15,2322   31023 1                    R51
 0163                        15,2323   77776 1  P52OUT    EXIT
 0164   REF  37  LAST  927   15,2324  0 6001 0            TC      GOTOPOOH
 0165   REF   5  LAST  743      4777            VB05N09   =       V05N09
 0166                        15,2325   01442 1  V06N34*   VN      634
 L        P51-R53                                                                         USER'S PAGE NO.   6       E5 S3

P0167     CHECK FOR GRRO TORQUE COARSE ALIGNMENT
 0168     REF   1                15,2326  3 2354 1  COARSTYR CAF     OCT13
 0169     REF 245   LAST   927   15,2327  0 4607 1           TC       BANKCALL          DISRLAY V 50N25 WITH COARSE ALIGN ORTION
 0170     REF   5   LAST   785   15,2330   20635 0           CAOR     GORERF1
 0171     REF  38   LAST   927   15,2331  1 6001 1           TCF      GOTOPOOH          V34-TERMINEOF
 0172     REF   1                15,2332  1 2313 0           TCF      REGCOARS          V33-NORMAL COARSE
 0173     REF 168   LAST   927   15,2333  0 6060 1           TC       INTPRET           V32-GYRO TORQUE COARSE
 0174                            15,2334   64375 1           VLOAD    MXV
 0175     REF   5   LAST   156   15,2335   03607 0                    XSMO              GET SM(DESIRED) WRT SM(RRESENT)
 0176     REF  40   LAST   882   15,2336   01732 0                    REFSMMAT
 0177                            15,2337   77656 1           UNIT
 0178     REF   3   LAST   127   15,2340   26665 0           STOVL    XOC
 0179     REF   3   LAST   155   15,2341   03615 0                    YSMO
 0180                            15,2342   53521 1           MXV      UNIT
 0181     REF  41   LAST   928   15,2343   01732 0                    REFSMMAT
 0182     REF   3   LAST   127   15,2344   26673 1           STOVL    YOC
 0183     REF   3   LAST   155   15,2345   03623 0                    ZSMO
 0184                            15,2346   53521 1           MXV      UNIT
 0185     REF  42   LAST   928   15,2347   01732 0                    REFSMMAT
 0186     REF   3   LAST   128   15,2350   36701 1           STCALL   ZOC
 0187     REF   1                15,2351   31174 1                    GYCOARS
 0188                             15,2352   77650 1           GOTO
 0189     REF   1                15,2353   32323 1                    P52OUT
 0190                            15,2354   00013 0  OCT13    OCT      13
```

```
P0191    COMPUTE LANDING ORIENTATION FOR OPTION 4
 0192                             15,2355   43014 0  P52LS     SET     CLEAR              GET LANDING SITE ORIENTATION
 0193    REF   4  LAST  787       15,2356   01463 1                    LUNAFLAG
 0194    REF   2  LAST  660       15,2357   00662 0                    ERADFLAG           TO PICK UP RLS
 0195                             15,2360   77201 1            SETPD   VLOAD
 0196                             15,2361   00001 0                    0
 0197    REF  10  LAST  842       15,2362   02021 0                    RLS                PICK UP LANDING SITE VEC IN MF
 0198                             15,2363   41525 0            PDDL    PUSH               RLS PD 0-5
 0199    REF   7  LAST  927       15,2364   02775 0                    TALIGN
 0200    REF   6  LAST  925       15,2365   36027 1            STCALL  TLAND              JAM ALIGN TIME IN TLAND FOR OPTION 4

 0201    REF   3  LAST  842       15,2366   55716 1                    RP-TO-R            TRANS RLS TO REF
 0202                             15,2367   77742 0            VSR2
 0203    REF   4  LAST  787       15,2370   16032 1            STODL   ALPHAV             INPUT TO LAT-LONG
 0204    REF   8  LAST  929       15,2371   02775 0                    TALIGN
 0205                             15,2372   77624 1            CALL
 0206    REF   1                  15,2373   30455 0                    N89DISP
 0207                             15,2374   53575 0            VLOAD   UNIT               COMPUTE LANDING SITE ORIENT (XSMD)
 0208    REF   5  LAST  929       15,2375   02032 1                    ALPHAV
 0209    REF   6  LAST  928       15,2376   37607 1            STCALL  XSMD
 0210    REF   1                  15,2377   11014 1                    LSORIENT
 0211                             15,2400   77650 1            GOTO
 02111   REF   2  LAST  927       15,2401   32300 0                    P52D               NOW GO COMPUTE GIMBAL ANGLES

 02112   REF   1                  13,2000                      SETLOC  P50S2
 02113                            13,2374                      BANK

 02114                            13,2374   77773 1  MATMOVE   VLOAD*
 02115                            13,2375   00001 0                    0,1
 02116                            13,2376   10001 1            STORE   0,2
 02117                            13,2377   77773 1            VLOAD*
 02118                            13,2400   00007 0                    6D,1
 02119                            13,2401   10007 1            STORE   6D,2
 0212                             13,2402   77773 1            VLOAD*
 02121                            13,2403   00015 0                    12D,1
 02122                            13,2404   10015 1            STORE   12D,2
 02123                            13,2405   77616 0            RVQ
```

```
P0213    SUBROUTINE TO CALCULATE AND DISPLAY THE LUNAR LANDING SITE

 0214    REF   4  LAST  264   14,2000                       SETLOC P50S1
 0215                         14,2455                       BANK
 0216    REF  16  LAST  400   E5,1642                       EBANK= XSM

 0217                         14,2455   77620 0  N89DISP    STQ
 0218    REF   2  LAST  128   14,2456   02746 0                    QMAJ
 0219    REF   1              14,2457   35242 0             STCALL SITIME           STORE TIME
 0220    REF   3  LAST  787   14,2460   26406 1                    LAT-LONG
 0221                         14,2461   70545 1             DLOAD  SR1
 0222    REF   3  LAST  326   14,2462   01122 1                    LONG
 0223    REF   3  LAST  329   14,2463   16711 1             STODL  LANDLONG
 0224    REF   3  LAST  326   14,2464   01124 1                    ALT
 0225    REF   2  LAST  329   14,2465   16713 0             STODL  LANDALT
 0226    REF   3  LAST  326   14,2466   01120 0                    LAT
 0227    REF   3  LAST  329   14,2467   02707 0             STORE  LANDLAT
 0228                         14,2470   77776 1             EXIT

 0229    REF   1              14,2471  3 2514 0  LSDISP     CAF    V06N89*          DISPLAY LAT,LONG/2,ALT
 0230    REF 246  LAST  928   14,2472  0 4607 1             TC     BANKCALL
 0231    REF  28  LAST  927   14,2473   20471 1             CADR   GOFLASH
 0232    REF  39  LAST  928   14,2474  1 6001 1             TCF    GOTOPOOH         V34-TERMINATE-EXIT P57
 0233                         14,2475  1 2477 0             TCF    +2               V33-PROCEED- ACCEPT LS DATA
 0234    REF   1              14,2476  1 2471 0             TCF    LSDISP           V32 OR E- LOOK AGAIN AND/OR LOAD NEW LS

 0235    REF 169  LAST  928   14,2477  0 6060 1             TC     INTPRET
 0236                         14,2500   72545 0             DLOAD  SL1
 0237    REF   4  LAST  930   14,2501   02711 1                    LANDLONG
 0238    REF   4  LAST  930   14,2502   15122 1             STODL  LONG
 0239    REF   3  LAST  930   14,2503   02713 0                    LANDALT
 0240    REF   4  LAST  930   14,2504   15124 1             STODL  ALT
 0241    REF   4  LAST  930   14,2505   02707 0                    LANDLAT
 0242    REF   4  LAST  930   14,2506   15120 0             STODL  LAT
 0243    REF   2  LAST  930   14,2507   01242 1                    SITIME           PICK UP TIME
 0244                         14,2510   77624 1             CALL                    GET RLS BACK FROM LAT,LONG, ALT
 0245    REF   1              14,2511   26457 0                    LALOTORV         RLS B-29 IN MPAC AND ALPHAV
 0246                         14,2512   77650 1             GOTO
 0247    REF   3  LAST  930   14,2513   02746 0                    QMAJ
 0248                         14,2514   01531 1  V06N89*    VN     689
```

```
R0249   NAME -S50 ALIAS  LCCSAM
R0250   BY
R0251   VINCENT
R0252   FUNCTION - COMPUTE INPUTS FOR PICAPAR  AND PLANET

R0253            DEFINE

R0254
R0255            U    = UNIT( SUN WRT EARTH)
R0256             ES

R0257            U    =UNIT( MOON WRT EARTH)
R0258             EM

R0259            R    =POSITION VECTOR OF LEM
R0260             L

R0261            R    =MEAN DISTANCE (384402KM) BETWEEN EARTH AND MOON
R0262             EM

R0263            P    =RATIO   R   /(DISTANCE SUN TO EARTH)     >.00257125
R0264                            EM

R0265            R    =EQUATORIAL RADIUSS (6378.166KM) OF EARTH
R0266             E

R0267            LOCSAM  COMPUTES IN EARTH INFLUENCE
R0268

R0269        VSUN   =   U
R0270                    ES

R0271       VEARTH  =   -UNIT( R   )
R0272                           L

R0273       VMOON   =    UNIT(R  .U   - R  )
R0274                          EM  EM    L

R0275       CSUN    =   COS 90

R0276       CEARTH  =    COS(5 +ARCSIN(R /MAG(R )))
R0277                                       E      L

R0278       CMOON   =    COS 5

R0279
R0280   INPUT -  TIME IN MPAC
R0281   OUTPUT - LISTED ABOVE
R0282   SUBROUTINES -LSPOS,LEMPREC
R0283   DEBRIS - VAC AREA ,TSIGHT
```

```
 0284   REF   2 LAST   47 TO  47:      8     8*            COUNT* $$/LOSAM

 0285   REF   1                 14,2515                S50        =      LOCSAM
 0286                           14,2515   77620 0  LOCSAM     STQ
 0287   REF   4  LAST  264      14,2516   02745 0                        QMIN
 0288   REF   4  LAST  271      14,2517   37562 1             STCALL TSIGHT
 0289   REF   1                 14,2520   33646 0                        LSPOS
 0290                           14,2521   77745 1             DLOAD
 0291   REF   5  LAST  932      14,2522   03562 0                        TSIGHT
 0292   REF  47  LAST  839      14,2523   34041 0             STCALL TDEC1
 0293   REF  10  LAST  839      14,2524   27115 1                        LEMPREC
 0294                           14,2525   61131 0             SSP        TIX,2
 0295   REF  10  LAST  724      14,2526   00052 0                        S2
 0296                           14,2527   00000 1                        0
 0297   REF   1                 14,2530   30552 0                        MOONCNTR
 0298                           14,2531   74375 0  EARTCNTR VLOAD      VXSC
 0299   REF   3  LAST  502      14,2532   02723 0                        VMOON
 0300   REF   1                 14,2533   30001 0                        RSUBEM
 0301                           14,2534   52372 0             VSL1       VSU
 0302   REF  26  LAST  840      14,2535   00001 0                        RATT
 0303                           14,2536   77656 1             UNIT
 0304   REF   4  LAST  932      14,2537   26723 0             STOVL      VMOON
 0305   REF  27  LAST  932      14,2540   00001 0                        RATT
 0306                           14,2541   57456 1             UNIT       VCOMP
 0307   REF   3  LAST  128      14,2542   16707 0             STODL      VEARTH
 0308   REF   1                 14,2543   30005 1                        RSUBE
 0309                           14,2544   77624 1             CALL
 0310   REF   1                 14,2545   30604 0                        OCCUS
 0311   REF   1                 14,2546   14017 1             STODL      CEARTH
 0312   REF   1                 14,2547   30613 0                        CSS5
 0313   REF   1                 14,2550   34023 1             STCALL CMOON
 0314   REF   1                 14,2551   30577 1                        ENDSAM
 0315                           14,2552   74375 0  MOONCNTR VLOAD      VXSC
 0316   REF   5  LAST  932      14,2553   02723 0                        VMOON
 0317   REF   1                 14,2554   30007 0                        ROE
 0318                           14,2555   53445 1             BVSU       UNIT
 0319   REF   2  LAST  128      14,2556   02715 0                        VSUN
 0320   REF   3  LAST  932      14,2557   26715 0             STOVL      VSUN
 0321   REF   6  LAST  932      14,2560   02723 0                        VMOON
 0322                           14,2561   53361 0             VXSC       VAD
 0323   REF   2  LAST  932      14,2562   30001 0                        RSUBEM
 0324   REF  28  LAST  932      14,2563   00001 0                        RATT
 0325                           14,2564   57456 1             UNIT       VCOMP
 0326   REF   4  LAST  932      14,2565   26707 0             STOVL      VEARTH
 0327   REF  29  LAST  932      14,2566   00001 0                        RATT
 0328                           14,2567   57456 1             UNIT       VCOMP
 0329   REF   7  LAST  932      14,2570   16723 0             STODL      VMOON
 0330   REF   1                 14,2571   30003 1                        RSUBM
 0331                           14,2572   77624 1             CALL
 0332   REF   2  LAST  932      14,2573   30604 0                        OCCUS
```

```
0333  REF   2  LAST  932   14,2574   14023 0           STODL   CMOON
0334  REF   2  LAST  932   14,2575   30613 0                   CSS5
0335  REF   2  LAST  932   14,2576   00017 1           STORE   CEARTH
0336                       14,2577   77745 1  ENDSAM   DLOAD
0337  REF   1              14,2600   30615 0                   CSSUN
0338  REF   1              14,2601   00021 1           STORE   CSUN
0339                       14,2602   77650 1           GOTO
0340  REF   5  LAST  932   14,2603   02745 0                   QMIN
0341                       14,2604   70471 1  OCCOS    DDV     SR1
0342                       14,2605   00045 0                   36D
0343                       14,2606   43336 0           ASIN    DAD
0344  REF   1              14,2607   30617 1                   5DEGREES
0345                       14,2610   70546 1           COS     SR1
0346                       14,2611   77616 0           RVQ
0347                          0016            CEARTH   =       14D
0348                          0020            CSUN     =       16D
0349                          0022            CMOON    =       18D
0350                       14,2612   07760 1  CSS5     2DEC    .2490475           (COS 5)/4
0350                       14,2613   14473 1
0351                       14,2614   04000 0  CSSUN    2DEC    .125               (COS60)/4
0351                       14,2615   00000 1
0352                       14,2616   00343 0  5DEGREES 2DEC    .013888889            SCALED IN REVS
0352                       14,2617   21616 0
```

```
R0353   PROGRAM NAME - R56                DATE  DEC 20 66
R0354   MOD 1                             LOG SECTION P51-P53
R0355                                     ASSEMBLY  SUNDISK  REV40
R0356   BY KEN VINCENT
R0357
R0358   FUNCTION
R0359     THIS PROGRAM READ THE IMU-CDUS AND COMPUTES THE VEHICLE ORIENTATION
R0360   WITH RESPECT TO INERTIAL SPACE. IT THEN COMPUTES THE SHAFT AXIS (SAX)
R0361   WITH RESPECT TO REFERENCE INERTIAL. EACH STAR IN THE CATALOG IS TESTED
R0362   TO DETERMINE IF IT IS OCCULTED BY EITHER THE EARTH,SUN OR MOON. IF A
R0363   STAR IS NOT OCCULTED  THEN IT IS PAIRED WITH ALL STAR OF LOWER INDEX.
R0364   THE PAIRED STAR  IS TESTED FOR OCCULTATION. PAIRS OF STARS THAT PASS
R0365   THE OCCULTATION TESTS ARE TESTED FOR GOOD SEPARATION.A PAIR OF STARS
R0366   HAVE GOOD SEPERATION IF THE ANGLE BETWEEN THEM IS LESS THAN 100 DEGREES
R0367   AND MORE THAN 50 DEGREES. THOSE PAIRS WITH GOOD SEPARATION
R0368   ARE THEN TESTED TO SEE IF THEY LIE IN CURRENT FIELD OF VIEW.(WITHIN
R0369   50 DEGREESOF SAX).THE PAIR WITH MAX SEPARATION IS CHOSEN FROM
R0370   THOSE WITH GOOD SEPARATION,AND      IN FIELD OF VIEW.
R0371
R0372   CALLING SEQUENCE
R0373   L          TC      BANKCALL
R0374   L+1        CADR    R56
R0375   L+2        ERROR RETURN - NO STARS IN FIELD OF VIEW
R0376   L+3        NORMAL RETURN
R0377
R0378   OUTPUT
R0379   BESTI,BESTJ -SINGLE PREC,INTEGERS,STAR NUMBERS TIMES 6
R0380   VFLAG - FLAG BIT  SET IMPLIES NO STARS IN FIELD OF VIEW
R0381
R0382   INITIALIZATION
R0383   1)A CALL TO LOCSAM MUST BE MADE
R0384
R0385   DEBRIS
R0386   WORK AREA
R0387   X,Y,ZNB
R0388   SINCDU,COSCDU
R0389   STARAD - STAR +5
 0390   REF   1               14,2620                R56       =        PICAPAR
 0391   REF   1                                                COUNT*   $$/R56
 0392   REF  11  LAST  743    14,2620  0 4636 0   PICAPAR   TC       MAKECADR
 0393   REF   6  LAST  933    14,2621  55'745 1             TS       QMIN
 0394   REF 170  LAST  930    14,2622  0 6060 1             TC       INTPRET
 0395                         14,2623   45014 0             SET      CALL
 0396   REF   1               14,2624   01465 1                      VFLAG
 0397   REF   4  LAST  564    14,2625   47522 1                      CDUTRIG
 0398                         14,2626   77624 1             CALL
 0399   REF   1               14,2627   20030 0                      CALCSMSC
 0400                         14,2630   71201 1             SETPD    DLOAD
 0401                         14,2631   00001 0                      0
 0402   REF   1               14,2632   24007 0                      DPZERO
```

```
0404  REF   5  LAST  924   14,2633   26756 1                STOVL   BESTI
0405  REF   3  LAST  393   14,2634   02665 0                        XNB
0406                       14,2635   63361 0                VXSC    PDVL
0407  REF   1              14,2636   24005 1                        HALFDP
0408  REF   3  LAST  386   14,2637   02701 0                        ZNB
0409                       14,2640   74370 0                AXT,1   VXSC
0410                       14,2641   00344 1                        228D                X1 = 37 X 6 +6
0411  REF   2  LAST  935   14,2642   24005 1                        HALFDP
0412                       14,2643   77655 1                VAD
0413                       14,2644   53505 1                VXM     UNIT
0414  REF  43  LAST  928   14,2645   01732 0                        REFSMMAT
0415  REF   1              14,2646   02731 0                STORE   SAX                 SAX = SHAFT AXIS
0416                       14,2647   66331 0                SSP     SSP                 S1=S2=6
0417  REF   7  LAST  615   14,2650   00051 0                        S1
0418                       14,2651   00006 1                        6
0419  REF  11  LAST  932   14,2652   00052 0                        S2
0420                       14,2653   00006 1                        6
0421                       14,2654   52100 1  PIC1          TIX,1   GOTO                MAJOR STAR
0422  REF   1              14,2655   30657 0                        PIC2
0423  REF   1              14,2656   30774 0                        PICEND
0424                       14,2657   50373 0  PIC2          VLOAD*  DOT
0425  REF   1              14,2660   30347 1                        CATLOG,1
0426  REF   2  LAST  935   14,2661   02731 0                        SAX
0427                       14,2662   50025 0                DSU     BMN
0428  REF   1              14,2663   30773 1                        CSS33
0429  REF   1              14,2664   30654 0                        PIC1
0430                       14,2665   77754 1                LXA,2
0431  REF  25  LAST  893   14,2666   00046 0                        X1
0432                       14,2667   52104 0  PIC3          TIX,2   GOTO
0433  REF   1              14,2670   30672 1                        PIC4
0434  REF   2  LAST  935   14,2671   30654 0                        PIC1
0435                       14,2672   50373 0  PIC4          VLOAD*  DOT
0436  REF   2  LAST  935   14,2673   47430 0                        CATLOG,2
0437  REF   3  LAST  935   14,2674   02731 0                        SAX
0438                       14,2675   50025 0                DSU     BMN
0439  REF   2  LAST  935   14,2676   30773 1                        CSS33
0440  REF   1              14,2677   30667 0                        PIC3
0441                       14,2700   47773 1                VLOAD*  DOT*
0442  REF   3  LAST  935   14,2701   30347 1                        CATLOG,1
0443  REF   4  LAST  935   14,2702   47430 0                        CATLOG,2
0444                       14,2703   51025 1                DSU     BPL
0445  REF   1              14,2704   30771 0                        CSS40
0446  REF   2  LAST  935   14,2705   30667 0                        PIC3
0447                       14,2706   45173 0                VLOAD*  CALL
0448  REF   5  LAST  935   14,2707   30347 1                        CATLOG,1
0449  REF   1              14,2710   30746 1                        OCCULT
0450                       14,2711   77614 1                BON
0451  REF   1              14,2712   01710 0                        CULTFLAG
0452  REF   3  LAST  935   14,2713   30654 0                        PIC1
0453                       14,2714   45173 0                VLOAD*  CALL
```

```
0454   REF   6  LAST  935   14,2715   47430 0                    CATLOG,2
0455   REF   2  LAST  935   14,2716   30746 1                    OCCULT
0456                        14,2717   77614 1           BON
0457   REF   2  LAST  935   14,2720   01710 0                    CULTFLAG
0458   REF   3  LAST  935   14,2721   30667 0                    PIC3
0459                        14,2722   77614 1  STRATGY  BONCLR
0460   REF   2  LAST  934   14,2723   01605 0                    VFLAG
0461   REF   1              14,2724   30741 0                    NEWPAR
0462                        14,2725   65120 1           XCHX,1   XCHX,2
0463   REF   6  LAST  935   14,2726   02755 1                    BESTI
0464   REF   3  LAST  209   14,2727   02756 1                    BESTJ
0465                        14,2730   47773 1  STRAT    VLOAD*   DOT*
0466   REF   7  LAST  936   14,2731   30347 1                    CATLOG,1
0467   REF   8  LAST  936   14,2732   47430 0                    CATLOG,2
0468                        14,2733   43006 0           PUSH     BOFINV
0469   REF   3  LAST  936   14,2734   01545 1                    VFLAG
0470   REF   1              14,2735   30725 1                    STRAT -3
0471                        14,2736   45345 1           DLOAD    DSU
0472                        14,2737   77644 1           BPL
0473   REF   4  LAST  936   14,2740   30667 0                    PIC3
0474                        14,2741   67130 1  NEWPAR   SXA,1    SXA,2
0475   REF   7  LAST  936   14,2742   02755 1                    BESTI
0476   REF   4  LAST  936   14,2743   02756 1                    BESTJ
0477                        14,2744   77650 1           GOTO
0478   REF   5  LAST  936   14,2745   30667 0                    PIC3
0479                        14,2746   51321 0  OCCULT   MXV      BVSU
0480   REF   1              14,2747   02707 0                    CULTRIX
0481   REF   1              14,2750   00017 1                    CSS
0482                        14,2751   77654 0           BZE
0483   REF   1              14,2752   30765 0                    CULTED
0484                        14,2753   75240 0           BMN      SIGN
0485   REF   2  LAST  936   14,2754   30765 0                    CULTED
0486   REF 361  LAST  917   14,2755   00160 0                    MPAC +3
0487                        14,2756   75240 0           BMN      SIGN
0488   REF   3  LAST  936   14,2757   30765 0                    CULTED
0489   REF 362  LAST  936   14,2760   00162 1                    MPAC +5
0490                        14,2761   43040 1           BMN      CLRGO
0491   REF   4  LAST  936   14,2762   30765 0                    CULTED
0492   REF   3  LAST  936   14,2763   01630 0                    CULTFLAG
0493   REF   4  LAST  713   14,2764   00052 0                    QPRET
0494                        14,2765   77614 1  CULTED   SETGO
0495   REF   4  LAST  936   14,2766   01430 1                    CULTFLAG
0496   REF   5  LAST  936   14,2767   00052 0                    QPRET
0497   REF   3  LAST  933        0016          CSS      =        CEARTH
0498                        14,2770   05110 1  CSS40    2DEC     .16070            COS 50 /4
0498                        14,2771   35052 0
0499                        14,2772   05110 1  CSS33    2DEC     .16070             COS 50 /4
0499                        14,2773   35052 0
0500                        14,2774   77414 0  PICEND   BOFF     EXIT
0501   REF   4  LAST  936   14,2775   01745 0                    VFLAG
```

```
 0502  REF   1                 14,2776   31000 0                      PICGXT
 0503  REF   1                 14,2777  0 3021 1            TC        PICBXT
 0504                          14,3000   73150 1  PICGXT    LXA,1     LXA,2
 0505  REF   8  LAST   936     14,3001   02755 1                      BESTI
 0506  REF   5  LAST   936     14,3002   02756 1                      BESTJ
 0507                          14,3003   47775 1            VLOAD     DOT*
 0508  REF   4  LAST   935     14,3004   02731 0                      SAX
 0509  REF   9  LAST   936     14,3005   30347 1                      CATLOG,1
 0510                          14,3006   47715 1            PDVL      DOT*
 0511  REF   5  LAST   937     14,3007   02731 0                      SAX
 0512  REF  10  LAST   937     14,3010   47430 0                      CATLOG,2
 0513                          14,3011   77625 0            DSU
 0514                          14,3012   66044 1            BPL       SXA,1
 0515  REF   1                 14,3013   31017 0                      PICNSWP
 0516  REF   6  LAST   937     14,3014   02756 1                      BESTJ
 0517                          14,3015   77734 1            SXA,2
 0518  REF   9  LAST   937     14,3016   02755 1                      BESTI
 0519                          14,3017   77776 1  PICNSWP   EXIT
 0520  REF   7  LAST   934     14,3020  25'745 0            INCR      QMIN
 0521  REF   8  LAST   937     14,3021  3 1745 0  PICBXT    CA        QMIN
 0522  REF   3  LAST   506     14,3022  0 4613 1            TC        SWCALL
 0523                             0000            VPD       =         0D
 0524                             0006            V0        =         6D
 0525                             0014            V1        =         12D
 0526                             0022            V2        =         18D
 0527                             0030            V3        =         24D
 0528                             0036            DP0       =         30D
 0529                             0040            DP1       =         32D
```

```
P0530   NAME-R51  FINE ALIGN
R0531   FUNCTION-TO ALIGN THE STABLE MEMBER TO REFSMMAT
R0532   CALLING SEQ- CALL  R51
R0533   INPUT -  REFSMMAT
R0534   OUTPUT- GYRO TORQUE PULSES
R0535   SUBROUTINES -LOCSAM,PICAPAR,R52,R53,R54,R55
 0536   REF   1                                          COUNT* $$/R51
 0537                          14,3023   77620 0  R51     STQ
 0538   REF   4  LAST  930     14,3024   02746 0                 QMAJ
 0539                          14,3025   77776 1  R51.1   EXIT
 0540   REF  81  LAST  925     14,3026  0 5355 1          TC     PHASCHNG
 0541                          14,3027   04024 0          OCT    04024

 0542   REF  88  LAST  894     14,3030  0 5520 0  R51C    TC     DOWNFLAG
 05421  REF   5  LAST  266     14,3031   00222 0          ADRES  FLT59FLG

 05422  REF   2  LAST  139     14,3032  3 4752 0          CAF    OCT15
 0543   REF 247  LAST  930     14,3033  0 4607 1          TC     BANKCALL
 0544   REF   6  LAST  928     14,3034   20635 0          CADR   GOPERF1
 0545   REF  40  LAST  930     14,3035  0 6001 0          TC     GOTOPOOH
 0546   REF   1                14,3036  0 3046 0          TC     DOSAM
 0547   REF  41  LAST  823     14,3037  4 4737 1          CS     BIT6
 05471  REF 363  LAST  936     14,3040  7 0154 0          MASK   MPAC
 05472  REF 269  LAST  926     14,3041  10 000 0          CCS    A
 05473  REF   1                14,3042  1 3071 0          TCF    R51E            ENTER
 05474  REF  67  LAST  893     14,3043  0 5506 1          TC     UPFLAG          V32-SET FLT59FLG
 05475  REF   6  LAST  938     14,3044   00222 0          ADRES  FLT59FLG
 05476  REF   2  LAST  938     14,3045  1 3071 0          TCF    R51E

 0548   REF 171  LAST  934     14,3046  0 6060 1  DOSAM   TC     INTPRET
 0549                          14,3047   43234 0          RTB    DAD
 0550   REF  27  LAST  853     14,3050   21603 1                 LOADTIME
 0551   REF   1                14,3051   31173 0                 TSIGHT1
 0552                          14,3052   77624 1          CALL
 0553   REF   2  LAST  932     14,3053   30515 0                 LOCSAM
 0554                          14,3054   77776 1          EXIT
 0555   REF 248  LAST  938     14,3055  0 4607 1          TC     BANKCALL
 0556   REF   1                14,3056   30620 0          CADR   R56
 0557   REF   1                14,3057  0 3061 0          TC     R51I
 0558   REF   3  LAST  938     14,3060  0 3071 1  R51F    TC     R51E
 0559   REF  36  LAST  921     14,3061  0 5571 1  R51I    TC     ALARM
 0560                          14,3062   00405 0          OCT    405
 0561   REF   1                14,3063  3 4777 1          CAF    VB05N09
 0562   REF 249  LAST  938     14,3064  0 4607 1          TC     BANKCALL
 0563   REF  29  LAST  930     14,3065   20471 1          CADR   GOFLASH
 0564   REF  41  LAST  938     14,3066  0 6001 0          TC     GOTOPOOH
 0565   REF   4  LAST  938     14,3067  0 3071 1          TC     R51F
 0566   REF   1                14,3070  0 3030 1          TC     R51C
 0567   REF 184  LAST  921     14,3071  3 4746 0  R51E    CAF    ZERO
 0568   REF   3  LAST  741     14,3072  55'757 1          TS     STARIND
```

```
0569  REF 172  LAST  938   14,3073  0 6060 1  R51.2    TC      INTPRET
0570                       14,3074   77776 1  R51.3    EXIT
0571  REF  82  LAST  938   14,3075  0 5355 1           TC      PHASCHNG
0572                       14,3076   04024 0           OCT     04024

0573  REF 173  LAST  939   14,3077  0 6060 1           TC      INTPRET
0574                       14,3100   77624 1           CALL
0575  REF   1              14,3101   31603 0                   R52                AOP WILL MAKE CALLS TO SIGHTING
0576                       14,3102   77776 1           EXIT
0577  REF 250  LAST  938   14,3103  0 4607 1           TC      BANKCALL
0578  REF   1              14,3104   16000 0           CADR    AOTMARK
0579  REF 251  LAST  939   14,3105  0 4607 1           TC      BANKCALL
0580  REF   1              14,3106   17731 1           CADR    OPTSTALL
0581  REF   1              14,3107  0 5705 0           TC      CURTAINS
0582  REF   4  LAST  938   14,3110  11'757 1           CCS     STARIND
0583                       14,3111  1 3113 0           TCF     +2
0584  REF   1              14,3112  0 3156 0           TC      R51.4
0590  REF  83  LAST  939   14,3113  0 5355 1           TC      PHASCHNG
0591                       14,3114   04024 0           OCT     04024

0592  REF 174  LAST  939   14,3115  0 6060 1           TC      INTPRET
0593                       14,3116   45145 0           DLOAD   CALL
0594  REF   6  LAST  932   14,3117   03562 0                   TSIGHT
0595  REF   2  LAST  259   14,3120   16607 1                   PLANET
0596                       14,3121   53521 1           MXV     UNIT
0597  REF  44  LAST  935   14,3122   01732 0                   REFSMMAT
0598  REF  12  LAST  329   14,3123   26715 0           STOVL   STARAD +6
0599  REF   2  LAST  151   14,3124   03554 0                   PLANVEC
0600                       14,3125   53521 1           MXV     UNIT
0601  REF  45  LAST  939   14,3126   01732 0                   REFSMMAT
0602  REF  13  LAST  939   14,3127   26707 0           STOVL   STARAD
0603  REF   3  LAST  209   14,3130   02761 0                   STARSAV1
0604                       14,3131   24007 0           STOVL   6D
0605  REF   6  LAST  267   14,3132   02767 0                   STARSAV2
0606                       14,3133   34015 1           STCALL  12D
0607  REF   1              14,3134   31265 1                   R54                STAR DATA TEST
0608                       14,3135   45014 0           BOFF    CALL
0609  REF   3  LAST  262   14,3136   00354 0                   FREEFLAG
0610  REF   1              14,3137   31145 0                   R51K
0611  REF   1              14,3140   47424 0                   AXISGEN
0612                       14,3141   77624 1           CALL
0613  REF   1              14,3142   31234 0                   R55                GYRO TORQUE
0614                       14,3143   77614 1           CLEAR
0615  REF   3  LAST  927   14,3144   01273 0                   PFRATFLG
0616                       14,3145   77776 1  R51K     EXIT
0617  REF   2  LAST  191   14,3146  3 5745 1  R51P63   CAF     OCT14
0618  REF 252  LAST  939   14,3147  0 4607 1           TC      BANKCALL
0619  REF   7  LAST  938   14,3150   20635 0           CADR    GOPERF1
0620  REF  42  LAST  938   14,3151  0 6001 0           TC      GOTOPOOH
0621  REF   2  LAST  938   14,3152  0 3030 1           TC      R51C
```

```
0622  REF 175  LAST  939   14,3153  C 6060 1           TC      INTPRET
0623                       14,3154   77650 1           GOTO
0624  REF   5  LAST  938   14,3155   02746 0                   QMAJ
0625  REF 176  LAST  940   14,3156  C 6060 1  R51.4    TC      INTPRET
0626                       14,3157   77775 1           VLOAD
0627  REF   7  LAST  939   14,3160   02767 0                   STARSAV2
0628  REF   4  LAST  939   14,3161   02761 0           STORE   STARSAV1
0629                       14,3162   45145 0           DLOAD   CALL
0630  REF   7  LAST  939   14,3163   03562 0                   TSIGHT
0631  REF   3  LAST  939   14,3164   16607 1                   PLANET
0632  REF   3  LAST  939   14,3165   03554 0           STORE   PLANVEC
0633                       14,3166   52131 0           SSP     GOTO
0634  REF   5  LAST  939   14,3167   02760 1                   STARIND
0635                       14,3170   00001 0                   1
0636  REF   1              14,3171   31074 0                   P51.3

0638                       14,3172   00002 0  TSIGHT1  2DEC    36000            6  MIN  TO  MARKING
0638                       14,3173   06240 1
```

```
P0639   GYRO TORQUE COARSE ALIGNMENT
 0640                          14,3174   45020 1  GYCOARS  STQ      CALL
 0641   REF   6  LAST  940     14,3175   02746 0                    QMAJ
 0642   REF   1                14,3176   47232 1                    CALCGTA
 0643                          14,3177   43014 0           CLEAR    CLEAR
 0644   REF   2  LAST  867     14,3200   01260 1                    DRIFTFLG
 0645   REF   3  LAST  927     14,3201   01662 1                    REFSMFLG
 0646                          14,3202   77776 1           EXIT
 0647   REF   1                14,3203   3 3233 0          CAF      V16N20          MONITOR GIMBALS
 0648   REF 253  LAST  939     14,3204   0 4607 1          TC       BANKCALL
 0649   REF   2  LAST  512     14,3205   20444 1           CADR     GODSPR
 0650   REF   1                14,3206   3 3264 1          CA       R55CDR
 0651   REF 254  LAST  941     14,3207   0 4607 1          TC       BANKCALL
 0652   REF   4  LAST  400     14,3210   17310 0           CADR     IMUPULSE
 0653   REF 255  LAST  941     14,3211   0 4607 1          TC       BANKCALL
 0654   REF   8  LAST  390     14,3212   17735 0           CADR     IMUSTALL
 0655   REF   2  LAST  939     14,3213   0 5705 0          TC       CURTAINS
 0656   REF  84  LAST  939     14,3214   0 5355 1          TC       PHASCHNG
 0657                          14,3215   04024 0           OCT      04024

 0658   REF 177  LAST  940     14,3216   0 6060 1          TC       INTPRET
 0659                          14,3217   75160 1           AXC,1    AXC,2
 0660   REF   7  LAST  929     14,3220   03606 1                    XSMD
 0661   REF  46  LAST  939     14,3221   01731 0                    REFSMMAT
 0662                          14,3222   77624 1           CALL                     STORE DESIRED REFSMMAT
 0663   REF   1                14,3223   26374 0                    MATMOVE
 0664                          14,3224   43014 0           CLEAR    SET
 0665   REF   4  LAST  939     14,3225   01273 0                    PFRATFLG
 0666   REF   4  LAST  941     14,3226   01462 0                    REFSMFLG
 0667                          14,3227   77624 1           CALL
 0668   REF   1                14,3230   31566 0                    NCOARSE         SET DRIFT AND INITIALIZE 1/PIPADT
 0669                          14,3231   77650 1           GOTO
 0670   REF   2  LAST  939     14,3232   31145 0                    R51K
 0671                          14,3233   04024 0  V16N20   VN       1620
```

```
P0672   R55  GYRO TORQUE
R0673   FUNCTION-COMPUTE AND SEND GYRO PULSES
R0674   CALLING SEQ- CALL R55
R0675   INPUT- X,Y,ZDC- REFSMMAT WRT PRESENT STABLE MEMBER
R0676   OUTPUT- GYRO PULSES
R0677   SUBROUTINES- CALCGTA,GOFLASH,GODSPR,IMUFINE,IMUPULSE,GOPERF1
 0678   REF   1                                          COUNT* $$/R55
 0679                         14,3234   45020 1  R55      STQ    CALL
 0680   REF   5  LAST  937    14,3235   02745 0                  QMIN
 0681   REF   2  LAST  941    14,3236   47232 1                  CALCGTA
 0683                         14,3237   77776 1  PULSEM   EXIT
 0684   REF   1               14,3240  3 3263 0  R55.1    CAF    V06N93
 0685   REF 256  LAST  941    14,3241  0 4607 1           TC     BANKCALL
 0686   REF  30  LAST  938    14,3242   20471 1           CADR   GOFLASH
 0687   REF  43  LAST  939    14,3243  0 6C01 0           TC     GOTOPOOH
 0688   REF   1               14,3244  0 3246 1           TC     R55.2
 0689   REF   1               14,3245  0 3260 0           TC     R55RET
 0690   REF  85  LAST  941    14,3246  0 5355 1  R55.2    TC     PHASCHNG
 0691                         14,3247   0C214 0           OCT    00214
 0692   REF   2  LAST  941    14,3250  3 3264 1           CA     R55CDR
 0693   REF 257  LAST  942    14,3251  0 4607 1           TC     BANKCALL
 0694   REF   5  LAST  941    14,3252   17310 0           CADR   IMUPULSE
 0695   REF 258  LAST  942    14,3253  0 4607 1           TC     BANKCALL
 0696   REF   9  LAST  941    14,3254   17735 0           CADR   IMUSTALL
 0697   REF   3  LAST  941    14,3255  0 5705 0           TC     CURTAINS
 0698   REF  86  LAST  942    14,3256  0 5355 1           TC     PHASCHNG
 0699                         14,3257   04024 0           OCT    04024

 0700   REF 178  LAST  941    14,3260  0 6060 1  R55RET   TC     INTPRET
 0701                         14,3261   77650 1           GOTO
 0702   REF  10  LAST  942    14,3262   02745 0                  QMIN
 0703                         14,3263   01535 0  V06N93   VN     0693
 0704   REF  12  LAST  400    14,3264   02737 0  R55CDR   ECADR  OGC
 0705   REF   1               14,3265            R54      =      CHKSDATA
```

```
P0706   CHKSDATA                                                                                     DATE- JAN 9, 1967
R0725   THE ANGULAR DIFFERENCE IS DISPLAYED FOR ASTRONAUT ACCEPTENCE
R0726   EXIT MODE 1. FREEFLAG SET  IMPLIES  ASTRONAUT WANTS TO PROCEED
R0727             2. FREEFLAG RESET IMPLIES ASTRONAUT WANTS TO RECYCLE          ERANCE)
R0729   OUTPUT - 1.VERB 6,NOUN 3- DISPLAYS ANGULAR DIFFERENCE BETWEEN 2 SETS OF STARS.
R0731            2.STAR VECTORS FROM STAR CATALOG ARE LEFT IN 6D AND 12D.

R0732   ERASABLE INITIALIZATION REQUIRED -
R0733            1.MARK VECTORS ARE STORED IN STARAD AND STARAD +6.
R0734            2.CATALOG VECTORS ARE STORED IN 6D AND 12D.
R0735   DEBRIS -
 0736   REF   1                                          COUNT* $$/R54
 0737                           14,3265   50375 0  CHKSDATA VLOAD  DOT
 0738   REF  14  LAST  939      14,3266   02707 0                  STARAD         1ST CATALOG STAR
 0739   REF  15  LAST  943      14,3267   02715 0                  STARAD +6      2ND CATALOG STAR
 0740                           14,3270   65552 0           SL1    ACOS
 0741   REF   1                 14,3271   24025 0           STOVL  THETA
 0742                           14,3272   00007 0                  6              1ST OBSERVED STAR
 0743                           14,3273   72441 0           DOT    SL1
 0744                           14,3274   00015 0                  12D            2ND OBSERVED STAR
 0745                           14,3275   45326 1           ACOS   DSU
 0746   REF   2  LAST  943      14,3276   00025 0                  THETA
 0747                           14,3277   77634 0           RTB
 0748   REF   3  LAST  885      14,3300   21622 1                  SGNAGREE
 0749   REF   1                 14,3301   01045 1           STORE  NORMTEM1       OBSERVED DIF - CATALOG DIF
 0750                           14,3302   77414 0           SET    EXIT
 0751   REF   4  LAST  939      14,3303   00074 1                  FREEFLAG
 0752   REF   1                 14,3304   3 3315 0          CAF    VB6N5
 0753   REF 259  LAST  942      14,3305   0 4607 1          TC     BANKCALL
 0754   REF  31  LAST  942      14,3306    20471 1          CADR   GOFLASH
 0755   REF  44  LAST  942      14,3307   0 6001 0          TC     GOTOPOOH       V34
 0756   REF   1                 14,3310   1 3313 1          TCF    CHKOUT         V33-PROCEED
 0757   REF  89  LAST  938      14,3311   0 5520 0          TC     DOWNFLAG       V32-REJECT DATA-CLEAR FLAG
 0758   REF   5  LAST  943      14,3312    00014 1          ADRES  FREEFLAG
 0759   REF 179  LAST  942      14,3313   0 6060 1  CHKOUT  TC     INTPRET
 0760                           14,3314   77616 0           RVQ

 0778                           14,3315   01405 1  VB6N5    VN     605
```

```
P0779    CAL53A
R0780    FUNCTION -COMPUTE DESIRED GIMBAL ANGLES AND COARSE ALIGN IF NECESSARY
R0781    CALLING SEQUENCE - CALL CAL53A
R0782    INPUT - X,Y,ZSMD ,CDUX,Y,Z
R0783             DESIRED GIMBAL ANGLES - THETAD,+1,+2
R0784    OUTPUT - THE IMU COORDINATES ARE STORED IN REFSMMAT
R0785    SUBROUTINES - S52.2, IMUCOARSE , IMUFINE
 0786    REF   1                                                 COUNT* $$/R50
 0787                                14,3316   77624 1  CAL53A   CALL
 0788    REF   2  LAST  927          14,3317   42707 1                  S52.2         MAKE ONE FINAL COMP OF GIMBALE ANGLES
 0789                                14,3320   66234 1           RTB    SSP
 0790    REF   1                     14,3321   31370 1                  RDCDUS        READ CDUS
 0791    REF   8  LAST  935          14,3322   00051 0                  S1
 0792                                14,3323   00001 0                  1
 0793                                14,3324   40370 1           AXT,1  SETPD
 0794                                14,3325   00003 1                  3
 0795                                14,3326   00005 1                  4
 0796                                14,3327   70543 1  CALOOP   DLOAD* SR1
 0797    REF  14  LAST  390          14,3330   00325 0                  THETAD +3D,1
 0798                                14,3331   70523 1           PDDL*  SR1
 0799                                14,3332   00005 1                  4,1
 0800                                14,3333   51425 0           DSU    ABS
 0801                                14,3334   45206 1           PUSH   DSU
 0802    REF   1                     14,3335   31367 1                  DEGREE1
 0803                                14,3336   71240 1           BMN    DLOAD
 0804    REF   1                     14,3337   31355 0                  CALOOP1
 0805                                14,3340   51025 1           DSU    BPL
 0806    REF   1                     14,3341   31370 1                  DEG359
 0807    REF   2  LAST  944          14,3342   31355 0                  CALOOP1
 0808                                14,3343   77776 1           EXIT
 0809    REF  87  LAST  942          14,3344   0 5355 1          TC     PHASCHNG
 0810                                14,3345   04024 0           OCT    04024

 0811    REF 180  LAST  943          14,3346   0 6060 1          TC     INTPRET
 0812                                14,3347   77624 1  COARFINE CALL
 0813    REF   1                     14,3350   31542 0                  COARSE
 0814                                14,3351   77624 1           CALL
 0815    REF   2  LAST  941          14,3352   31566 0                  NCOARSE
 0816                                14,3353   77650 1           GOTO
 0817    REF   1                     14,3354   31357 1                  FINEONLY
 0818                                14,3355   77700 0  CALOOP1  TIX,1
 0819    REF   1                     14,3356   31327 0                  CALOOP
 0820                                14,3357   75160 1  FINEONLY AXC,1  AXC,2
 0821    REF  17  LAST  930          14,3360   02642 0                  XSM
 0822    REF  47  LAST  941          14,3361   01731 0                  REFSMMAT
 0823                                14,3362   77624 1           CALL
 0824    REF   2  LAST  941          14,3363   26374 0                  MATMOVE
 0825                                14,3364   77650 1           GOTO
 0826    REF   1                     14,3365   32316 1                  COARSRET
 0837                                14,3366   00056 1  DEGREE1  DEC    46            1 DEG SCALED CDU/2
```

```
0838                            14,3367   37722 1  DEG359    DEC     16338          359 DEG SCALED CDU/2
0839                            14,3370   0 0004 0  RDCDUS    INHINT                 READ CDUS
0840   REF  15   LAST   908     14,3371   3 0032 0            CA      CDUX
0841   REF  37   LAST   918     14,3372   50 120 1            INDEX   FIXLOC
0842                            14,3373   54 001 1            TS      1
0843   REF   9   LAST   908     14,3374   3 0033 1            CA      CDUY
0844   REF  38   LAST   945     14,3375   50 120 1            INDEX   FIXLOC
0845                            14,3376   54 002 1            TS      2
0846   REF  12   LAST   908     14,3377   3 0034 0            CA      CDUZ
0847   REF  39   LAST   945     14,3400   50 120 1            INDEX   FIXLOC
0848                            14,3401   54 003 0            TS      3
0849                            14,3402   0 0003 1            RELINT
0850   REF   2   LAST   827     14,3403   0 6102 1            TC      DANZIG
0851   REF   1                                                COUNT*  $$/INFLT
```

```
P0852   NAME - P51 - IMU ORIENTATION DETERMINATION
R0853             MOD.NO.1  23 JAN 67                                                                LOG SECTION - P51-P53
R0855   MOD BY STURLAUGSON                                                                        ASSEMBLY SUNDANCE REV56

R0857   FUNCTIONAL DESCRIPTION

R0858        DETERMINES THE INERTIAL ORIENTATION OF THE IMU. THE PROGRAM IS SELECTED BY DSKY ENTRY. THE SIGHTING
R0860   (AOTMARK)ROUTINE IS CALLED TO COLLECT AND PROCESS MARKED-STAR DATA. AOTMARK(R53) RETURNS THE STAR NUMBER AND THE
R0862   STAR LOS VECTOR IN STARAD+6. TWO STARS ARE THUS SIGHTED. THE ANGLE BETWEEN THE TWO STARS IS THEN CHECKED AT
R0864   CHKSDATA(R54). REFSMMAT IS THEN COMPUTED AT AXISGEN.

R0865   CALLING SEQUENCE

R0866     THE PROGRAM IS CALLED BY THE ASTRONAUT BY DSKY ENTRY.

R0867   SUBROUTINES CALLED.

R0868        GOPERF3
R0869        GOPERF1
R0870        GODSPR
R0871        IMUCOARS
R0872        IMUFIN20
R0873        AOTMARK(R53)
R0874        CHKSDATA(R54)
R0875        MKRELEAS
R0876        AXISGEN
R0877        MATMOVE

R0878   ALARMS

R0879        NONE.

R0880   ERASABLE INITIALIZATION

R0881        IMU ZERO FLAG SHOULD BE SET.

R0882   OUTPUT

R0883        REFSMMAT
R0884        REFSMFLG

R0885   DEBRIS

R0886        WORK AREA
R0887        STARAD
R0888        STARIND
P0889        BESTI
R0890        BESTJ

 0891   REF    1                                    COUNT* $$/P51
 0892   REF 260  LAST  943    14,3404  0 4607 1  P51      TC     BANKCALL        IS ISS ON - IF NOT, IMUCHK WILL SEND
 0893   REF   1               14,3405   33634 0           CADR   IMUCHK          ALARM CODE 210 AND EXIT VIA GOTOPOOH.

 0894   REF   3  LAST  938    14,3406  3 4752 0           CAF    OCT15
 0895   REF 261  LAST  947    14,3407  0 4607 1           TC     BANKCALL
 0896   REF   8  LAST  939    14,3410   20635 0           CADR   GOPERF1
 0897   REF  45  LAST  943    14,3411  0 6001 0           TC     GOTOPOOH        TERM.
 0898   REF   1               14,3412  1 3436 1           TCF    P51B            V33
 0899   REF  88  LAST  944    14,3413  0 5355 1           TC     PHASCHNG
 0900                         14,3414   04024 0           OCT    04024

 0901   REF 185  LAST  938    14,3415  3 4746 0           CAF    ZERO
 0902   REF  15  LAST  944    14,3416  54 321 0           TS     THETAD          ZERO THE GIMBALS
 0903   REF  16  LAST  947    14,3417  54 322 0           TS     THETAD +1
 0904   REF  17  LAST  947    14,3420  54 323 1           TS     THETAD +2
 0905   REF   3  LAST  927    14,3421  3 5001 0           CAF    V06N22
 0906   REF 262  LAST  947    14,3422  0 4607 1           TC     BANKCALL
 0907   REF   3  LAST  752    14,3423   20441 1           CADR   GODSPRET
 0908   REF   1               14,3424  3 3541 1           CAF    V41K            NOW DISPLAY COARSE ALIGN VERB 41
 0909   REF 263  LAST  947    14,3425  0 4607 1           TC     BANKCALL
 0910   REF   4  LAST  947    14,3426   20441 1           CADR   GODSPRET
 0911   REF 181  LAST  944    14,3427  0 6060 1           TC     INTPRET
 0912                         14,3430   77624 1           CALL
 0913   REF   2  LAST  944    14,3431   31542 0                  COARSE
 0914                         14,3432   77776 1           EXIT
 0915   REF  89  LAST  947    14,3433  0 5355 1           TC     PHASCHNG
 0916                         14,3434   04024 0           OCT    04024
 0917   REF   2  LAST  245    14,3435  1 3406 1           TCF    P51 +2

 0918   REF  90  LAST  947    14,3436  0 5355 1  P51B     TC     PHASCHNG
 0919                         14,3437   00014 1           OCT    00014
 0920   REF 182  LAST  947    14,3440  0 6060 1           TC     INTPRET
 0921                         14,3441   77624 1           CALL
 0922   REF   3  LAST  944    14,3442   31566 0                  NCOARSE
 0923                         14,3443   40331 1           SSP    SETPD
 0924   REF   6  LAST  940    14,3444   02760 1                  STARIND         INDEX-STAR 1 OR 2
 0925                         14,3445   00000 1                  0
 0926                         14,3446   00001 0                  0
 0927                         14,3447   77776 1  P51C     EXIT
 0928   REF  91  LAST  947    14,3450  0 5355 1           TC     PHASCHNG
 0929                         14,3451   04024 0           OCT    04024

 0930   REF 264  LAST  947    14,3452  0 4607 1           TC     BANKCALL
 0931   REF   2  LAST  939    14,3453   16000 0           CADR   AOTMARK         R53
 0932   REF 265  LAST  947    14,3454  0 4607 1           TC     BANKCALL
 0933   REF   1               14,3455   17731 1           CADR   AOTSTALL
 0934   REF   4  LAST  942    14,3456  0 5705 0           TC     CURTAINS
 0935   REF   7  LAST  947    14,3457  11'757 1           CCS    STARIND
 0936   REF   1               14,3460  1 3466 1           TCF    P51D +1
 0937   REF 183  LAST  947    14,3461  0 6060 1           TC     INTPRET
 0938                          14,3462   77775 1           VLOAD
 0939   REF   8  LAST  940     14,3463   02767 0                   STARSAV2
 0940   REF   5  LAST  940     14,3464   02761 0           STORE   STARSAV1
 0941                          14,3465   77776 1  P51D     EXIT
 0942   REF  52  LAST  947     14,3466  0 5355 1           TC      PHASCHNG
 0943                          14,3467   04024 0           OCT     04024

 0944   REF   8  LAST  947     14,3470  11'757 1           CCS     STARIND
 0945   REF   1                14,3471  1 3505 0           TCF     P51E
 0946   REF  53  LAST  948     14,3472  0 5355 1           TC      PHASCHNG
 0947                          14,3473   04024 0           OCT     04024

 0948   REF 184  LAST  947     14,3474  0 6060 1           TC      INTPRET
 0949                          14,3475   45145 0           DLOAD   CALL
 0950   REF   8  LAST  940     14,3476   03562 0                   TSIGHT
 0951   REF   4  LAST  940     14,3477   16607 1                   PLANET
 0952   REF   4  LAST  940     14,3500   03554 0           STORE   PLANVEC
 0953                          14,3501   77776 1           EXIT
 0954   REF  46  LAST  925     14,3502  3 4744 1           CAF     BIT1
 0955   REF   9  LAST  948     14,3503  55'757 1           TS      STARIND
 0956   REF   1                14,3504  1 3450 1           TCF     P51C +1             DO SECOND STAR
 0957   REF  54  LAST  948     14,3505  0 5355 1  P51E     TC      PHASCHNG
 0958                          14,3506   04024 0           OCT     04024

 0959   REF 185  LAST  948     14,3507  0 6060 1           TC      INTPRET
 0960                          14,3510   45145 0           DLOAD   CALL
 0961   REF   9  LAST  948     14,3511   03562 0                   TSIGHT
 0962   REF   5  LAST  948     14,3512   16607 1                   PLANET
 0963                          14,3513   24015 0           STOVL   12D
 0964   REF   5  LAST  948     14,3514   03554 0                   PLANVEC
 0965                          14,3515   24007 0           STOVL   6D
 0966   REF   6  LAST  948     14,3516   02761 0                   STARSAV1
 0967   REF  16  LAST  943     14,3517   26707 0           STOVL   STARAD
 0968   REF   9  LAST  948     14,3520   02767 0                   STARSAV2
 0969   REF  17  LAST  948     14,3521   36715 1           STCALL  STARAD +6
 0970   REF   2  LAST  942     14,3522   31265 1                   CHKSDATA            CHECK STAR ANGLES IN STARAD AND
 0971                          14,3523   77414 0           BON     EXIT
 0972   REF   6  LAST  943     14,3524   00314 1                   FREEFLAG
 0973   REF   1                14,3525   31527 0                   P51G
 0974   REF   3  LAST  947     14,3526  0 3406 0           TC      P51 +2
 0975                          14,3527   77624 1  P51G     CALL
 0976   REF   2  LAST  939     14,3530   47424 0                   AXISGEN             COME BACK WITH REFSMMAT IN XDC
 0977                          14,3531   75160 1           AXC,1   AXC,2
 0978   REF   4  LAST  928     14,3532   02664 1                   XDC
 0979   REF  48  LAST  944     14,3533   01731 0                   REFSMMAT
 0980                          14,3534   77624 1           CALL
 0981   REF   3  LAST  944     14,3535   26374 0                   MATMOVE
 0982                          14,3536   77414 0           SET     EXIT
 0983   REF   5  LAST  941     14,3537   01462 0                   REFSMFLG
 0984   REF  46  LAST  947     14,3540  0 6001 0           TC      GOTOPOOH            FINIS
 0985                               14,3541   12200 0  V41K       VN      4100
 0986                               14,3542   77776 1  COARSE     EXIT
 0987  REF   5  LAST  286           14,3543  3 1301 1     +1      CA      MODECADR          SEE IF IMU DEVICE IS IN USE.
 0988                               14,3544  0 C006 1             EXTEND
 0989  REF   1                      14,3545  1 3552 1             BZF     DOCORS            NOT IN USE, DO COARSE ALIGN
 0990  REF  16  LAST  816           14,3546  3 4770 0             CAF     1SEC              IN USE, DELAY ONE SEC
 0991  REF 266  LAST  947           14,3547  0 4607 1             TC      BANKCALL
 0992  REF  16  LAST  752           14,3550   01736 1             CADR    DELAYJOB
 0993  REF   3  LAST  947           14,3551  1 3543 1             TCF     COARSE +1
 0994  REF 267  LAST  949           14,3552  C 4607 1  DOCORS     TC      BANKCALL
 0995  REF   4  LAST  390           14,3553   16765 1             CADR    IMUCOARS
 0996  REF 268  LAST  949           14,3554  C 4607 1             TC      BANKCALL
 0997  REF  10  LAST  942           14,3555   17735 0             CADR    IMUSTALL
 0998  REF   5  LAST  947           14,3556  C 5705 0             TC      CURTAINS
 0999  REF 269  LAST  949           14,3557  C 4607 1             TC      BANKCALL
 1000  REF   3  LAST  390           14,3560   17175 1             CADR    IMUFINE
 1001  REF 270  LAST  949           14,3561  0 4607 1             TC      BANKCALL
 1002  REF  11  LAST  949           14,3562   17735 0             CADR    IMUSTALL
 1003  REF   6  LAST  949           14,3563  0 5705 0             TC      CURTAINS
 1004  REF 186  LAST  948           14,3564  0 6060 1             TC      INTPRET
 1005                               14,3565   77616 0             RVQ
 1006                               14,3566   77776 1  NCOARSE    EXIT
 1007  REF  22  LAST  896           14,3567  3 0025 0             CA      TIME1
 1008  REF   9  LAST  867           14,3570  55 074 1             TS      1/PIPADT
 1009  REF 186  LAST  947           14,3571  4 4746 1             CS      ZERO
 1010  REF  16  LAST  896           14,3572  54 037 1             TS      PIPAX
 1011  REF   7  LAST  896           14,3573  54 040 1             TS      PIPAY
 1012  REF  10  LAST  896           14,3574  54 041 0             TS      PIPAZ
 1013  REF 187  LAST  949           14,3575  0 6C60 1             TC      INTPRET
 1014                               14,3576   77775 1             VLOAD
 1015  REF   3  LAST  690           14,3577   24007 0                     ZEROVEC
 1016  REF  24  LAST  395           14,3600   01472 1             STORE   GCOMP
 1017                               14,3601   43414 1             SET     RVQ
 1018  REF   3  LAST  941           14,3602   01C60 0                     DRIFTFLG
```

```
P1019    NAME-S52.2
R1020    FUNCTION-COMPUTE GIMBAL ANGLES FOR DESIRED SM AND PRESENT VEHICLE
R1021    CALL-  CALL  S52.2
R1022    INPUT- X,Y,ZSMD
R1023    OUTPUT- OGC,IGC,MGC,THETAD,+1,+2
R1024    SUBROUTINES-CDUTRIG,CALCSMSC,MATMOVE,CALCGA
 10241   REF   1                  21,2000                          SETLOC P50S3
 10242                            21,2707                          BANK

 1025    REF   1                                                   COUNT* $$/S52.1
 1026                             21,2707   45020 1  S52.2         STO     CALL
 1027    REF   7  LAST  941       21,2710   02746 0                        QMAJ
 1028    REF   5  LAST  934       21,2711   47522 1                        CDUTRIG
 1029                             21,2712   77624 1                CALL
 1030    REF   2  LAST  934       21,2713   20030 0                        CALCSMSC
 1031                             21,2714   66370 0                AXT,1   SSP
 1032                             21,2715   00022 1                        18D
 1033    REF   9  LAST  944       21,2716   00051 0                        S1
 1034                             21,2717   00006 1                        6D
 1035                             21,2720   61373 1  S52.2A        VLOAD*  VXM
 1036    REF   4  LAST  935       21,2721   02707 0                        XNB +18D,1
 1037    REF  49  LAST  948       21,2722   01732 0                        REFSMMAT
 1038                             21,2723   77656 1                UNIT
 1039    REF   5  LAST  950       21,2724   06707 1                STORE   XNB +18D,1
 1040                             21,2725   77700 0                TIX,1
 1041    REF   1                  21,2726   42720 1                        S52.2A
 1042                             21,2727   75160 1  S52.2.1       AXC,1   AXC,2
 1043    REF   8  LAST  941       21,2730   03606 1                        XSMD
 1044    REF  18  LAST  944       21,2731   02642 0                        XSM
 1045                             21,2732   77624 1                CALL
 1046    REF   4  LAST  948       21,2733   26374 0                        MATMOVE
 1047                             21,2734   77624 1                CALL
 1048    REF   2  LAST  386       21,2735   47336 1                        CALCGA
 1049                             21,2736   77650 1                GOTO
 1050    REF   8  LAST  950       21,2737   02746 0                        QMAJ
```

```
P1051    NAME-S52.3
R1052    FUNCTION  XSMD= UNIT  R
R1053              YSMD= UNIT(V X R)
R1054              ZSMD= UNIT(XSMD X YSMD)
R1055    CALL      DLOAD  CALL
R1056                     TALIGN
R1057                     S52.3
R1058    INPUT-    TIME OF ALIGNMENT IN MPAC
R1059    OUTPUT-   X,Y,ZSMD
R1060    SUBROUTINES- CSMCONIC
 1061    REF   1                                               COUNT* $$/S52.3
 1062                           21,2740    77620 0   S52.3     STQ
 1063    REF   9  LAST  950     21,2741    02746 0                    QMAJ
 1064    REF  48  LAST  932     21,2742    34041 0             STCALL TDEC1
 1065    REF   5  LAST  609     21,2743    27136 0                    LEMCONIC
 1066                           21,2744    53575 0             VLOAD  UNIT
 1067    REF  30  LAST  932     21,2745    00001 0                    RATT
 1068    REF   9  LAST  950     21,2746    27607 0             STOVL  XSMD
 1069    REF  22  LAST  840     21,2747    00007 0                    VATT
 1070                           21,2750    53435 0             VXV    UNIT
 1071    REF  31  LAST  951     21,2751    00001 0                    RATT
 1072    REF   4  LAST  928     21,2752    27615 0             STOVL  YSMD
 1073    REF  10  LAST  951     21,2753    03607 0                    XSMD
 1074                           21,2754    53435 0             VXV    UNIT
 1075    REF   5  LAST  951     21,2755    03615 0                    YSMD
 1076    REF   4  LAST  928     21,2756    37623 1             STCALL ZSMD
 1077    REF  10  LAST  951     21,2757    02746 0                    QMAJ
```

```
R1078   NAME     -R52 (AUTOMATIC OPTICS POSITIONING ROUTINE)

R1079   FUNCTION-POINT THE AOT OPTIC AXIS BY MANEUVERING THE LEM TO A NAVIGATION
R1080              STAR SELECTED BY ALIGNMENT PROGRAMS OR DSKY INPUT

R1081   CALLING -CALL R52

R1082   INPUT    -BESTI AND BESTJ (STAR CODES TIMES 6)
R1083   OUTPUT   -STAR CODE IN BITS1-6, DETENT CODE IN BITS 7-9
R1084              (NO CHECK IS MADE TO INSURE THE DETENT  CODE TO BE VALID)
R1085              POINTVSM-1/2 UNIT NAV STAR VEC IN SM
R1086              SCAXIS-AOT OPTIC AXIS VEC IN NB X-Z PLANE

R1087   SUBROUT -R60LEM

 10871  REF    5  LAST  930   14,2000                          SETLOC P50S1
 10872                        14,3603                          BANK

 1088   REF    1                                               COUNT* $$/R52
 1089                         14,3603   77420 1  R52           STQ     EXIT
 1090   REF    1              14,3604   03665 1                        SAVQR52
 1091   REF   43  LAST  917   14,3605  3 4741 1                CAF     BIT4
 10911  REF    8  LAST  851   14,3606  7 0105 1                MASK    FLAGWRD9
 10912                        14,3607  0 0006 1                EXTEND
 10913  REF    1              14,3610  1 3613 1                BZF     DOR52
 10914  REF  271  LAST  949   14,3611  0 4607 1                TC      BANKCALL
 10915  REF    1              14,3612   32402 0                CADR    R59

 10916  REF   10  LAST  946   14,3613  51'757 0  DOR52         INDEX   STARIND
 1092   REF   10  LAST  937   14,3614  3 1755 1                CA      BESTI              PICK UP STARCODE DETERMINED BY R56
 1093                         14,3615  0 0006 1                EXTEND
 1094   REF    1              14,3616  7 3712 1                MP      1/6TH
 1095   REF   35  LAST  903   14,3617  6 4735 1                AD      BIT8               SET DETENT POSITION 2
 1096   REF    1              14,3620  55'235 0                TS      STARCODE           SCALE AND STORE IN STARCODE

 1097   REF    1              14,3621  3 3713 1  R52A          CAF     V01N70
 1098   REF  272  LAST  952   14,3622  0 4607 1                TC      BANKCALL
 1099   REF   32  LAST  943   14,3623   20471 1                CADR    GOFLASH            DISPLAY STARCODE AND WAIT FOR RESPONSE
 1100   REF   47  LAST  948   14,3624  0 6001 0                TC      GOTOPOOH           V34-TERMINATE
 1101   REF    1              14,3625  1 3627 0                TCF     R52B               V33-PROCEED TO ORIENT LEM
 1102   REF    1              14,3626  1 3621 0                TCF     R52A               ENTER-SELECT NEW STARCODE-RECYCLE

 1103   REF   90  LAST  943   14,3627  0 5520 0  R52B          TC      DOWNFLAG
 1104   REF    7  LAST  749   14,3630   00124 0                ADRES   3AXISFLG           BIT6 OF FLAGWRD5 ZERO TO ALLOW VECPOINT
 1105   REF    2  LAST  952   14,3631  3 1235 1                CA      STARCODE           GRAB DETENT CODE
 1106   REF    3  LAST  686   14,3632  7 7765 0                MASK    HIGH9
 1107                         14,3633  0 0006 1                EXTEND
 1108   REF   22  LAST  868   14,3634  7 4734 1                MP      BIT9
 1109   REF  175  LAST  921   14,3635  54 001 1                TS      L                  TEMP STORE DETENT
 1110                           14,3636  0 0006 1                 EXTEND
 1111   REF   1                 14,3637  6 3655 1                 BZMF    GETAZEL          CODE 0, COAS CALIBRATION

 1112   REF   2  LAST   257     14,3640  6 5652 0                 AD      NEG7
 1113                           14,3641  0 0006 1                 EXTEND
 1114   REF   2  LAST   953     14,3642  1 3655 0                 BZF     GETAZEL          CODE 7, COAS SIGHTING

 1115   REF  25  LAST   274     E7,1551                           EBANK=  XYMARK
 1116   REF  15  LAST   891     14,3643  3 5007 0                 CA      EBANK7
 1117   REF  57  LAST   925     14,3644  54 003 0                 TS      EBANK

 1118   REF 176  LAST   952     14,3645  50 001 0                 INDEX   L
 1119   REF   4  LAST   258     14,3646  3 1403 1                 CA      AOTAZ -1         PICK UP AZ CORRESPONDING TO DETENT
 1120   REF 177  LAST   953     14,3647  54 001 1                 TS      L
 1121   REF  19  LAST   950     F5,1642                           EBANK=  XSM
 1122   REF  13  LAST   925     14,3650  3 5005 1                 CA      EBANK5           CHANGE TO EBANK5 BUT DONT DISTURB L
 1123   REF  58  LAST   953     14,3651  54 003 0                 TS      EBANK
 1124   REF  33  LAST   838     14,3652  3 4730 1                 CA      BIT13            SET ELV TO 45 DEG
 1125   REF 178  LAST   953     14,3653  56 001 0                 XCH     L                SET C(A)=AZ, C(L)=45 DEG
 1126   REF   1                 14,3654  1 3665 0                 TCF     AZEL             GO COMP OPTIC AXIS

 1127   REF   1                 14,3655  3 3714 0  GETAZEL        CAF     V06N87           CODE 0 OR 7, GET AZ AND EL KEY IN
 1128   REF 273  LAST   952     14,3656  0 4607 1                 TC      BANKCALL
 1129   REF  33  LAST   952     14,3657   20471 1                 CADR    GOFLASH
 1130   REF  48  LAST   952     14,3660  0 6001 0                 TC      GOTOPOOH         V34-TERMINATE
 1131                           14,3661  1 3663 0                 TCF     +2               PROCEED-CALC OPTIC AXIS
 1132   REF   3  LAST   953     14,3662  1 3655 0                 TCF     GETAZEL          ENTER-RECYCLE

 1133                           14,3663  0 0006 1                 EXTEND
 1134   REF   4  LAST   329     14,3664  3 1345 1                 DCA     AZ               PICK UP AZ AND EL IN SP 2S COMP
 1135   REF  4   LAST   945     14,3665  50 120 1  AZEL           INDEX   FIXLOC           JAM AZ AND EL IN 8 AND 9 OF VAC
 1136                           14,3666  52 011 0                 DXCH    8D
 1137   REF 188  LAST   949     14,3667  0 6060 1                 TC      INTPRET
 1138                           14,3670   77624 1                 CALL                     GO COMPUTE OPTIC AXIS AND STORE IN
 1139   REF   2  LAST   259     14,3671   10557 1                         OANB             SCAXIS IN NB COORDS
 1140                           14,3672   45034 1                 RTB     CALL
 1141   REF  28  LAST   938     14,3673   21603 1                         LOADTIME
 1142   REF   6  LAST   948     14,3674   16607 1                         PLANET
 1143                           14,3675   53521 1                 MXV     UNIT
 1144   REF  50  LAST   950     14,3676   01732 0                         REFSMMAT
 1145   REF   9  LAST   784     14,3677   03773 1                 STORE   POINTVSM         STORE FOR VECPOINT

 1146                           14,3700   77776 1                 EXIT
 1147   REF 274  LAST   953     14,3701  0 4607 1                 TC      BANKCALL
 1148   REF   6  LAST   784     14,3702   54125 0                 CADR    R60LEM           GO TORQUE LEM OPTIC AXIS TO STAR LOS

 1149   REF   4  LAST   952     14,3703  3 7765 1                 CAF     HIGH9            IF COAS CALIBRATION CODE 0, RECYCLE
 1150   REF   3  LAST   952     14,3704  7 1235 0                 MASK    STARCODE
 1151                           14,3705  0 0006 1                 EXTEND
 1152   REF   2  LAST   952     14,3706  1 3621 0                 BZF     R52A
 1153   REF 189   LAST  953   14,3707  0 6060 1            TC       INTPRET          RETURN FROM KALCMANU
 1154                         14,3710   77650 1            GOTO
 1155   REF   2   LAST  952   14,3711   03665 1                     SAVQR52          RETURN TO CALLER

 1156                         14,3712   05253 0  1/6TH     DEC      .1666667
 1157                         14,3713   00306 1  V01N70    VN       0170
 1158                         14,3714   01527 0  V06N87    VN       687
```

```
P1159   LUNAR SURFACE STAR AQUISITION

 1161   REF    3  LAST  924   15,2000                               SETLOC P50S
 1162                         15,2402                               BANK
 1163   REF    2 LAST  261 TO  265:    155    155*                  COUNT* $$/R59

 1164   REF    9  LAST  386   15,2402  4 0077 0  R59                CS      FLAGWRD3
 1165   REF    3  LAST  224   15,2403  7 4730 0                     MASK    REFSMBIT         IF REFSMMAT FLAG CLEAR BYPASS STAR AQUIR
 1166   REF 270  LAST  938    15,2404  10 000 0                     CCS     A
 1167   REF    1              15,2405  1 2574 1                     TCF     R59OUT           NO REFSMMAT GO TO AOTMARK

 1168   REF    1              15,2406  3 2606 0                     CAF     V01N70*          SELECT STAR CODE FOR ACQUISITION
 1169   REF 275  LAST  953    15,2407  0 4607 1                     TC      BANKCALL
 1170   REF   34  LAST  953   15,2410   20471 1                     CADR    GOFLASH
 1171   REF   49  LAST  953   15,2411  0 6001 0                     TC      GOTOPOOH         V34-TERMINATE
 1172   REF    1              15,2412  1 2414 0                     TCF     R59A             V33-PROCEED
 1173   REF    2  LAST  952   15,2413  1 2402 1                     TCF     R59              V32-RECYCLE

 1174   REF 150  LAST  954    15,2414  0 6060 1  R59A               TC      INTPRET
 1175                         15,2415   45034 1                     RTB     CALL
 11751  REF   29  LAST  953   15,2416   21603 1                             LOADTIME
 1176   REF    7  LAST  953   15,2417   16607 1                             PLANET           GO GET CELESTRIAL BODY IN PEF COORDS.
 1177                         15,2420   53521 1                     MXV     UNIT
 1178   REF   51  LAST  953   15,2421   01732 0                             REFSMMAT         TRANSFORM TO NB COORDS.
 1179                         15,2422   77624 1                     CALL
 1180   REF    4  LAST  788   15,2423   47640 0                             CDU*SMNB
 1195   REF    3  LAST  252   15,2424   02731 0                     STORE   STAR             TEMP STORE STAR VEC(NB)
 1196                         15,2425   77776 1                     EXIT

 1197   REF   47  LAST  948   15,2426  3 4744 1                     CAF     BIT1             INITIALIZE AZ POSITION CODE TO 1 (-60)
 1198   REF    2  LAST  328   15,2427  54 734 0                     TS      POSCODE

 1199   REF   26  LAST  953   E7,1551                               EBANK=  XYMARK
 1200   REF   16  LAST  953   15,2430  3 5007 0  INCAZ              CA      EBANK7
 1201   REF   59  LAST  953   15,2431  54 003 0                     TS      EBANK

 1202   REF    3  LAST  955   15,2432  50 734 1                     INDEX   POSCODE
 1203   REF    5  LAST  953   15,2433  3 1403 1                     CA      AOTAZ -1         PICK UP AZ CORRESPONDING TO POSCODE
 1204   REF 179  LAST  953    15,2434  54 001 1                     TS      L

 1205   REF   20  LAST  953   E5,1642                               EBANK=  XSM
 1206   REF   14  LAST  953   15,2435  3 5005 1                     CA      EBANK5
 1207   REF   60  LAST  955   15,2436  54 003 0                     TS      EBANK

 1208   REF   34  LAST  953   15,2437  3 4730 1                     CA      BIT13            SET ELV TO 45 DEG
 1209   REF 180  LAST  955    15,2440  56 001 0                     XCH     L                SET C(A)=AZ, C(L)=45 DEG
 1210   REF   11  LAST  942   15,2441  55 745 1                     TS      QMIN             STORE QMIN=AZ FOR LATER
 1211   REF   41  LAST  953   15,2442  50 120 1                     INDEX   FIXLOC
 1212                         15,2443  52 011 0                     DXCH    8D               JAM AZ IN 8D, 45 DEG IN 9D FOR OANB
 1213   REF 191  LAST  955   15,2444  0 6060 1              TC      INTPRET
 1214                        15,2445   77624 1              CALL
 1215   REF   3  LAST  953   15,2446   10557 1                      OANB            GO CALC OPTIC AXIS WRT NB
 1216                        15,2447   50375 0              VLOAD   DOT
 1217   REF   4  LAST  955   15,2450   02731 0                      STAR            DOT STAR WITH OA
 1218   REF  24  LAST  784   15,2451   03765 0                      SCAXIS
 1219                        15,2452   65552 0              SL1     ARCCOS
 1220                        15,2453   00031 0              STORE   24D             TEMP STORE ARCCOS(STAR.OPTAXIS)

 1221                        15,2454   51025 1              DSU     BPL
 1222   REF   1              15,2455   32611 0                      DEG30           SEE IF STAR IN AOT FIELD-OF-VIEW
 1223   REF   1              15,2456   32533 0                      NXAX            NOT IN FIELD - TRY NEXT POSITION
 1224                        15,2457   45345 1              DLOAD   DSU             SEE IF STAR AT FIELD CENTER
 1225                        15,2460   00031 0                      24D
 1226   REF   1              15,2461   32613 1                      DEG.5
 1227                        15,2462   71240 1              BMN     DLOAD           CALC SPIRAL AND CURSOR
 1228   REF   1              15,2463   32552 1                      ZSPCR           GO ZERO CURSOR AND SPIRAL
 1229                        15,2464   00031 0                      24D             GET SPIRAL
 1230                        15,2465   42405 0              DMP     SL4
 1231   REF   2  LAST  263   15,2466   23773 0                      3/4             12 SCALED AT 16
 1232                        15,2467   24031 0              STOVL   24D             12(ARCCOS(AO.STAR)) SCALED IN REVS

 1233   REF  25  LAST  956   15,2470   03765 0                      SCAXIS          OA
 1234                        15,2471   53435 0              VXV     UNIT
 1235   REF   3  LAST   38   15,2472   24005 1                      XUNIT
 1236                        15,2473   47206 0              PUSH    VXV              OA X UNITX    PD 0-5
 1237   REF  26  LAST  956   15,2474   03765 0                      SCAXIS
 1238                        15,2475   77676 0              VCOMP
 1239                        15,2476   63256 0              UNIT    PDVL            UNIT(OA X(OA X UNITX))  PD 6-11
 1240   REF  27  LAST  956   15,2477   03765 0                      SCAXIS
 1241                        15,2500   53435 0              VXV     UNIT
 1242   REF   5  LAST  956   15,2501   02731 0                      STAR
 1243                        15,2502   50206 0              PUSH    DOT             1/2(OA X STAR)   PD 12-17
 1244                        15,2503   00001 0                      0               DOT WITH 1/2(OA X UNITX)  FOR YROT
 1245                        15,2504   65552 0              SL1     ARCCOS
 1246                        15,2505   24033 1              STOVL   26D             STORE THET SCALED IN REVS

 1247                        15,2506   77641 1              DOT                     UP 12-17, UP 6-11 FOR C2
 1248                        15,2507   71244 0              BPL     DLOAD           IF THET NEG-GET 360-THET
 1249   REF   1              15,2510   32515 1                      R59D
 1250   REF   2  LAST  261   15,2511   32157 0                      ABOUTONE
 1251                        15,2512   77625 0              DSU
 1252                        15,2513   00033 1                      26D
 1253                        15,2514   00033 1              STORE   26D             360-THET SCALED IN REVS

 1254                        15,2515   70535 0   R59D       SLOAD   SR1
 1255   REF  12  LAST  955   15,2516   02746 0                      QMIN            RESCALE AZ(N) TO REVS
 1256                        15,2517   41415 1              DAD     PUSH            PUSH YROT + AZ(N) REVS
 1257                        15,2520   00033 1                      26D
 1258                        15,2521   77634 0              RTB
 1259   REF   2  LAST  335    15,2522   21624 1               1STO2S
 1260   REF   6  LAST  328    15,2523   15241 1        STODL  CURSOR        YROT IN 1/2 REVS
 1261                         15,2524   00031 0               24D           LOAD SROT IN REVS
 1262                         15,2525   77615 0        DAD                  12(SEP) + YROT
 1263                         15,2526   77634 0        RTB
 1264   REF   3  LAST  957    15,2527   21624 1               1STO2S
 1265   REF   4  LAST  328    15,2530   01242 1        STORE  SPIRAL        SPOT IN 1/2 REVS
 1266                         15,2531   77776 1        EXIT
 1267   REF   1               15,2532  1 2556 1        TCF    79DISP        GO DISPLAY CURSOR-SPIRAL-POS CODE

 1273                         15,2533   77776 1 NXAX   EXIT
 1274   REF   4  LAST  955    15,2534  24 734 1        INCR   POSCODE
 1275   REF   5  LAST  957    15,2535  4 0734 0        CS     POSCODE
 1276   REF  15  LAST  862    15,2536  6 4750 1        AD     SEVEN
 1277                         15,2537  0 0006 1        EXTEND
 1278   REF   1               15,2540  6 2542 0        BZMF   R59ALM        THIS STAR NOT AT ANY POSITION
 1279   REF   1               15,2541  1 2430 0        TCF    INCAZ

 1280   REF  37  LAST  938    15,2542  0 5571 1 R59ALM TC     ALARM         THIS STAR CANT BE LOCATED IN AOT FIELD
 1281                         15,2543   00404 1        OCT    404
 1282   REF   2  LAST  938    15,2544  3 4777 1        CAF    VB05N09       DISPLAY ALARM
 1283   REF 276  LAST  955    15,2545  0 4607 1        TC     BANKCALL
 1284   REF  35  LAST  955    15,2546   20471 1        CADR   GOFLASH
 1285   REF  50  LAST  955    15,2547  1 6001 1        TCF    GOTOPOOH      VB34-TERMINATE
 1286   REF   2  LAST  955    15,2550  1 2574 1        TCF    R59OUT        VB33-PROCEED, GO WITHOUT AQUIRE
 1287   REF   3  LAST  955    15,2551  1 2402 1        TCF    R59           VB32-RECYCLE AND TRY ANOTHER STAR

 12871                        15,2552   77776 1 ZSPCR  EXIT
 12872  REF 187  LAST  949    15,2553  3 4746 0        CAF    ZERO
 12873  REF   7  LAST  957    15,2554  55'240 1        TS     CURSOR
 12874  REF   5  LAST  957    15,2555  55'241 0        TS     SPIRAL

 1288   REF   1               15,2556  3 2607 1 79DISP CAF    V06N79        DISPLAY CURSOR, SPIRAL AND POS CODE
 1289   REF 277  LAST  957    15,2557  0 4607 1        TC     BANKCALL
 1290   REF  36  LAST  957    15,2560   20471 1        CADR   GOFLASH
 1291   REF  51  LAST  957    15,2561  1 6001 1        TCF    GOTOPOOH      V34-TERMINATE
 1292   REF   1               15,2562  1 2564 0        TCF    R59E          V33-PROCEED TO MARK ROUTINE
 1293   REF   4  LAST  957    15,2563  1 2402 1        TCF    R59           V32-RECYCLE TO TOP OF R59 AGAIN

 1294   REF  16  LAST  957    15,2564  3 4750 1 R59E   CAF    SEVEN         GET DETENT CODE CORRESPONDING TO POSCODE
 1295   REF   6  LAST  957    15,2565  7 0734 0        MASK   POSCODE
 1296                         15,2566  0 0006 1        EXTEND
 1297   REF  27  LAST  891    15,2567  7 4736 0        MP     BIT7          DETENT CODE NOW IN L
 1298   REF   5  LAST  953    15,2570  4 7765 0        CS     HIGH9
 1299   REF  15  LAST  328    15,2571  7 1235 0        MASK   ACTCODE       ISOLATE STAR NO IN BIT 1-6
 1300   REF 181  LAST  955    15,2572  6 0001 0        AD     L
 1301   REF  16  LAST  957    15,2573  55'235 0        TS     ACTCODE       STORE DETENT 7-9

 1302   REF 192  LAST  956    15,2574  0 6060 1 R59OUT TC     INTPRET
 13021                        15,2575   77414 0        BON    EXIT
 13022  REF   7  LAST  938    15,2576   04713 0                        FLT59FLG        IF FLT59FLG SET GO BACK TO R51 TO
 13023  REF   3  LAST  954    15,2577   03665 1                        SAVOR52         DO AOTMARK
 13024  REF 278  LAST  957    15,2600  0 4607 1              TC        BANKCALL
 1303   REF   3  LAST  947    15,2601   16000 0              CADR      AOTMARK
 1304   REF 279  LAST  958    15,2602  0 4607 1              TC        BANKCALL
 1305   REF   2  LAST  947    15,2603   17731 1              CADR      AOTSTALL        SLEEP TILL SIGHTING DONE
 1306   REF   7  LAST  949    15,2604  0 5705 0              TC        CURTAINS        BADEND RETURN FROM AOTMARK
 1307   REF   1               15,2605  1 3073 1              TCF       R59RET          RETURN TO 1 STAR OR 2STAR

 1308                         15,2606   00306 1  VC1N70*     VN        170
 1309                         15,2607   01517 0  VC6N79      VN        679
 1310                         15,2610   02525 1  DEG30       2DEC      .083333333      30 DEGREES
 1310                         15,2611   12525 0
 1311                         15,2612   00026 0  DEG.5       2DEC      .00138888       .5 DEGREES SCALED IN REVS
 1311                         15,2613   30131 1
 1312                         15,2614   12525 0  DEG60       OCT       12525           60 DEG CDU SCALING
```

```
P1316   NAME -   PLANET
R1317   FUNCTION -TO PROVIDE THE REFERENCE VECTOR FOR THE SIGHTED CELESTIAL
R1318             BODY. STARS ARE FETCHED FROM THE CATALOG,SUN,EARTH AND
R1319             MOON ARE COMPUTED BY LOCSAM,PLANET VECTORS ARE ENTERED
R1320             BY DSDY INPUT
R1321   CALL   -  CALL
R1322                   PLANET
R1323   INPUT -  TIME IN MPAC
R1324   OUTPUT - VECTOR  IN MPAC
R1325   SUBROUTINES - LOCSAM
R1326   DEBRIS - VAC ,STARAD - STARAD +17

 1327   REF   3  LAST  265   07,2000                          SETLOC ADTMARK1
 1328                        07,2607                          BANK
 1329   REF   1                                               COUNT* $$/R58

 1330   REF  10  LAST  948   07,2607   03562 0  PLANET        STORE  TSIGHT
 1331                        07,2610   77420 1                STQ    EXIT
 1332   REF   4  LAST  260   07,2611   02736 1                       GCTR
 1333   REF   6  LAST  957   07,2612  4 7765 0                CS     HIGH9
 1334   REF  17  LAST  957   07,2613  7 1235 0                MASK   ADTCODE
 1335                        07,2614  0 0006 1                EXTEND
 1336   REF   1              07,2615  7 6263 1                MP     REVCNT
 1337   REF 182  LAST  957   07,2616  56 001 0                XCH    L
 1338   REF  11  LAST  952   07,2617  51'757 0                INDEX  STARIND
 1339   REF  11  LAST  952   07,2620  55'755 0                TS     BESTI
 1340   REF 271  LAST  955   07,2621  10 000 0                CCS    A
 1341   REF   1              07,2622  1 2637 0                TCF    NOTPLAN
 1342   REF   1              07,2623  3 2676 1                CAF    VNPLANV
 1343   REF 280  LAST  958   07,2624  0 4607 1                TC     BANKCALL
 1344   REF  37  LAST  957   07,2625   20471 1                CADR   GOFLASH
 1345                        07,2626  0 2623 1                TC     -3
 1346                        07,2627  0 2631 1                TC     +2
 1347                        07,2630  0 2623 1                TC     -5
 1348   REF 193  LAST  957   07,2631  0 6060 1                TC     INTPRET
 1349                        07,2632   74375 0                VLOAD  VXSC
 1350   REF  18  LAST  948   07,2633   02707 0                       STARAD
 1351   REF   1              07,2634   16700 1                       1/SQR3
 1352                        07,2635   52056 0                UNIT   GOTO
 13521  REF   5  LAST  959   07,2636   02736 1                       GCTR

 1353   REF 272  LAST  959   07,2637  4 0000 0  NOTPLAN       CS     A
 1354   REF   1              07,2640  6 2675 1                AD     DEC227
 1355                        07,2641  0 0006 1                EXTEND
 1356   REF   1              07,2642  6 2653 0                BZMF   CALSAM1
 1357   REF  12  LAST  959   07,2643  51'757 0                INDEX  STARIND
 1358   REF  12  LAST  959   07,2644  3 1755 1                CA     BESTI
 1359   REF  42  LAST  955   07,2645  50 120 1                INDEX  FIXLOC
 1360   REF  26  LAST  935   07,2646  54 046 1                TS     X1
 1361   REF 194  LAST  959   07,2647  0 6060 1                TC     INTPRET
 1362                          07,2650    52173 0                VLOAD* GOTO
 1363     REF  11  LAST  937   07,2651    30347 1                       CATLOG,1
 1364     REF   6  LAST  959   07,2652    02736 1                       GCTR
 1365     REF 195  LAST  959   07,2653  0 6060 1  CALSAM1   TC      INTPRET
 1366                          07,2654    45145 0  CALSAM    DLOAD   CALL
 1367     REF  11  LAST  959   07,2655    03562 0                       TSIGHT
 1368     REF   3  LAST  938   07,2656    30515 0                       LOCSAM
 1369                          07,2657    77340 0            LXC,1   VLOAD
 1370     REF  13  LAST  959   07,2660    02757 0                       STARIND
 1371     REF   5  LAST  932   07,2661    02707 0                       VEARTH
 1372                          07,2662    24001 0            STOVL   0D
 1373     REF   4  LAST  932   07,2663    02715 0                       VSUN
 1374     REF   6  LAST  960   07,2664    26707 0            STOVL   VEARTH
 1375                          07,2665    00001 0                       0D
 1376     REF   5  LAST  960   07,2666    02715 0            STORE   VSUN
 1377                          07,2667    70143 0            DLOAD* LXC,1
 1378     REF  13  LAST  959   07,2670    02756 1                       BESTI,1
 1379     REF 364  LAST  938   07,2671    00154 1                       MPAC
 1380                          07,2672    52173 0            VLOAD* GOTO
 1381     REF  19  LAST  959   07,2673    02343 1                       STARAD -228D,1
 1382     REF   7  LAST  960   07,2674    02736 1                       GCTR
 1383                          07,2675    00343 0  DEC227    DEC     227
 1384                          07,2676    01530 0  VNPLANV   VN      0688
 1385     REF   4  LAST  861   37,3543             PIPSRINE =       PIPASR +3       EBANK NOT 4 SO DONT LOAD PIPTIME1
 13851                         07,2677    22363 1  1/SQR3    2DEC    .57735021
 13851                         07,2700    11623 0
```

```
P1386   GRAVITY VECTOR DETERMINATION ROUTINE
R1387   BY KEN VINCENT
R1388   FOR OETAILED DESCRIPTION SEE 504GSOP 5.6.3.2.5
R1389   THIS PROGRAM FINDS THE DIRECTION CF THE MOONS GRAVITY
R1390   WHILE THE LM IS ON THE MOONS SURFACE. IT WILL BE USED
R1391   FOR LUNAR SURFACE ALIGNMENT. THE GRAVITY VECTOR IS
R1392   DETERMINED BY REAOING THE PIPAS WITH THE IMU AT TWO
R1393   PARTICULAR ORIONTATICNS. THE TWO READINGS ARE AVERAGED
R1394   AND UNITIZED AND TRANSFORMED TO NB COORDINATES. THE TWO
R1395   ORIENTATION WERE CHOSEN TO REDUCE BIAS ERRORS IN THE
R1396   READINGS.
R1397
R1398   CALL-
R1399            TC      BANKCALL
R1400            CADR    GVDETER
R1401   INPUTS-
R1402            PIPAS,COUS
R1403   OUTPUTS-
R1404            STARSAV1 = UNIT GRAVITY
R1405            GSAV     =   OITTO
R1406            GRAVBIT  = 1
R1407   SUBROUTINES-
R1408            PIPASR,IMUCOARS,IMUFINE,IMUSTALL,1/PIPA,OELAYJOB,COUTRIG,
R1409            *NBSM* ,*SNMB*, CALCGA,FOFLASH
R1410   OEBRIS-
R1411            VAC,SAC,STARAD,XSM,XNB,THETAD,OELV,COSCOU,SINCDU
 14112  REF   4  LAST  955    15,2000                          SETLOC P50S
 14113                        15,2615                          BANK
 14114  REF   1                                                COUNT* $$/P57

 1412   REF   1               15,2615  3 3016 0  GVDETER   CAF    42DEG
 1413   REF  18  LAST  947    15,2616  54 321 0            TS     THETAD
 1414                         15,2617  4 0000 0            COM
 1415   REF  19  LAST  961    15,2620  54 322 0            TS     THETAO +1
 1416   REF   1               15,2621  3 3017 1            CAF    35DEG
 1417   REF  20  LAST  961    15,2622  54 323 1            TS     THETAD +2
 1418   REF 196  LAST  960    15,2623  0 6060 1            TC     INTPRET
 1419                         15,2624   45014 0            CLEAR  CALL
 1420   REF   6  LAST  948    15,2625   01662 1                   REFSMFLG
 1421   REF   1               15,2626   32722 1                   LUNG
R1422   FIND  GIMBAL ANGLES WHICH ROTATE SM 180DEG  ABOUT  G VEC
R1423
R1424    DEFINE G COOR SYS
R1425                        -
R1426                        X   UNIT G
R1427                   *    -                -
R1428                   M=   Y =  UNITEZSM *  X )
R1429                        -        -       -
R1430                        Z    UNIT(X    * Y )
R1431    THEN   ROTATEO  SM WRT  PRESENT IS
```

```
R1432
R1433
R1434                       1,  0 , 0
R1435             *      *T            *          *          *
R1436            XSM =   M  0, -1 , 0  M  = 2  (X X ) - 1/2  I  *
R1437                                            I J
R1438                       0,  0 ,-1
R1439
R1440    ALSO   NB WRT PRES SM  IS
R1441
R1442                  *      *   *
R1443                 XNB = NBSM  I
R1444                                  *     *
R1445    GIMBAL ANGLES  = CALCGA( XSM , XNB )
R1446
 1447   REF   5  LAST  961   15,2000                     SETLOC P50S
 1448                        15,2627                     BANK
 1449   REF   2 LAST  961 TO 962:     10    10*          COUNT* $$/P57
 1450                        15,2627   66370 0           AXT,1  SSP             X1=18
 1451                        15,2630   00022 1                  18D             S1= 6
 1452   REF  10  LAST  950   15,2631   00051 0                  S1              X2, -2
 1453                        15,2632   00006 1                  6D
 1454                        15,2633   77744 0           LXC,2
 1455   REF  11  LAST  962   15,2634   00050 1                  S1
 1456                        15,2635   45173 0  GRAVEL   VLOAD* CALL
 1457   REF   4  LAST  956   15,2636   54000 0                  XUNIT -6,2
 1458   REF   6  LAST  819   15,2637   47665 1                  *NBSM*          SIN AND COS COMPUTED IN LUNG
 1459   REF   6  LAST  950   15,2640   06707 1           STORE  XNB +18D,1
 1460                        15,2641   77775 1           VLOAD
 1461   REF   6  LAST  956   15,2642   02731 0                  STAR
 1462                        15,2643   73744 1           LXC,2  VXSC*           COMPLEMENT- UNITX  ARE BACKWARD -
 1463   REF  15  LAST  882   15,2644   00047 1                  X2
 1464   REF   7  LAST  962   15,2645   75040 1                  STAR +6,2       OUTER PRODUCT
 1465                        15,2646   71152 1           VSL2   LXC,2
 1466   REF  16  LAST  962   15,2647   00047 1                  X2
 1467                        15,2650   63047 1           VSU*   INCR,2
 1468   REF   5  LAST  962   15,2651   54000 0                  XUNIT -6,2
 1469                        15,2652   00002 0                  2D
 1470   REF  21  LAST  955   15,2653   06665 1           STORE  XSM +18D,1
 1471                        15,2654   45100 1           TIX,1  CALL
 1472   REF   1              15,2655   32635 0                  GRAVEL
 1473   REF   3  LAST  950   15,2656   47336 1                  CALCGA
 1474                        15,2657   74575 0           VLOAD  VSR1
 1475   REF   1              15,2660   02715 0                  GOUT
 1476   REF  20  LAST  960   15,2661   36723 1           STCALL STARAD +12D
 1477   REF   2  LAST  961   15,2662   32722 1                  LUNG
 1478                        15,2663   74575 0           VLOAD  VSR1
 1479   REF   2  LAST  962   15,2664   02715 0                  GOUT
 1480                        15,2665   53455 0           VAD    UNIT
 1481   REF  21  LAST  962   15,2666   02723 0                  STARAD +12D
 1482   REF   7  LAST  948    15,2667    02761 0             STORE   STARSAV1
 1483                         15,2670    77641 1             DOT
 1484   REF   6  LAST  788    15,2671    02222 1                     GSAV
 1485                         15,2672    65552 0             SL1     ACOS
 1486   REF  26  LAST  925    15,2673    01045 1             STORE   DSPTEM1
 1487                         15,2674    77776 1             EXIT
 1488   REF  91  LAST  952    15,2675  0 5520 0              TC      DOWNFLAG          CLEAR FREEFLAG IN CASE OF RECYCLE
 1489   REF   7  LAST  948    15,2676    00014 1             ADRES   FREEFLAG

 1490   REF   1               15,2677  3 3015 0              CA      DISGRVER
 1491   REF 281  LAST  959    15,2700  0 4607 1              TC      BANKCALL
 1492   REF  38  LAST  959    15,2701    20471 1             CADR    GOFLASH
 1493   REF  52  LAST  957    15,2702  0 6001 0              TC      GOTOPOOH
 1494   REF   1               15,2703  1 2706 0              TCF     PROGRAV           VB33-PROCEED
 1495   REF  68  LAST  938    15,2704  0 5506 1              TC      UPFLAG            VB32-RECYCLE-STORE GRAV AND DO IT AGAIN
 1496   REF   8  LAST  963    15,2705    00014 1             ADRES   FREEFLAG          AND SET FREEFLAG TO SHOW RECYCLE

 1497   REF  95  LAST  948    15,2706  0 5355 1    PROGRAV   TC      PHASCHNG
 1498                         15,2707    04024 0             OCT     04024

 1499   REF 197  LAST  961    15,2710  0 6060 1              TC      INTPRET
 1500                         15,2711    77775 1             VLOAD
 1501   REF   8  LAST  963    15,2712    02761 0                     STARSAV1
 1502   REF   7  LAST  963    15,2713    02222 1             STORE   GSAV
 1503                         15,2714    77776 1             EXIT
 1504   REF   1               15,2715  3 4742 1              CAF     FREEFBIT          IF FREEFLAG SET, RE-COMPUTE GRAVITY.
 1505   REF  31  LAST  900    15,2716  7 0074 0              MASK    FLAGWRD0
 1506   REF 273  LAST  959    15,2717 10 000 0               CCS     A
 1507   REF   1               15,2720  1 2615 0              TCF     GVDETER           SET
 1508   REF   1               15,2721  1 3535 0              TCF     ATTCHK            EXIT FROM GVDETER

 1509                         15,2722    77220 1   LUNG      STQ     VLOAD
 1510   REF  13  LAST  956    15,2723    02745 0                     QMIN
 1511   REF   4  LAST  949    15,2724    24007 0                     ZEROVEC
 1512   REF   1               15,2725    02707 0             STORE   GACC
 1513                         15,2726    77776 1             EXIT
 1514   REF  96  LAST  963    15,2727  0 5355 1              TC      PHASCHNG
 1515                         15,2730    04024 0             OCT     04024

 1516   REF 198  LAST  963    15,2731  0 6060 1              TC      INTPRET
 1517                         15,2732    77624 1             CALL
 1518   REF   4  LAST  949    15,2733    31542 0                     COARSE
 1519                         15,2734    77776 1             EXIT
 1520   REF   1               15,2735  3 3014 1              CA      T/2SEC
 1521   REF   8  LAST  960    15,2736   55'736 0             TS      GCTR
 1522   REF   4  LAST  864    15,2737  3 7737 0              CA      PRIO31
 1523   REF  10  LAST  949    15,2740   55'074 1             TS      1/PIPADT
 1524   REF 282  LAST  963    15,2741  0 4607 1              TC      BANKCALL
 1525   REF   1               15,2742    15751 0             CADR    GCOMPZER          INITIALIZE  COMPENSATION
 1526   REF  97  LAST  963    15,2743  0 5355 1              TC      PHASCHNG
 1527                              15,2744   04024 0               OCT     04024

 1528  REF 283  LAST  963   15,2745  0 4607 1               TC      BANKCALL          DONT NEED TO INHINY  THIS USED TO
 1529  REF   1                     15,2746   77543 0               CADR    PIPSRINE         INITIALIZE PIPAS  DONT USE DATA
 1530  REF 199  LAST  963   15,2747  0 6060 1               TC      INTPRET
 1531                              15,2750   77776 1  GREED     EXIT                     = MASK 7776 IN BASIC SO DONT CARE
 1532  REF   4  LAST  860   15,2751  3 4771 1               CAF     2SECS
 1533  REF  27  LAST  903   15,2752  0 5175 1               TC      TWIDDLE          SET UP 2 SEC TASK TO READ PIPAS
 1534  REF   1                     15,2753   02755 1               ADRES   GRABGRAV

 1535  REF 134  LAST  925   15,2754  0 5146 1               TC      ENDOFJOB

 1536  REF  49  LAST  921   15,2755  0 4665 0  GRABGRAV  TC      IBNKCALL
 1537  REF   2  LAST  964   15,2756   77543 0               CADR    PIPSRINE
 1538  REF   2  LAST  741   15,2757  3 5014 1               CAF     PRIO13           RE-ESTABLISH MAINLINE JOB
 1539  REF  39  LAST  876   15,2760  0 5076 0               TC      FINDVAC
 1540  REF  22  LAST  962   E5,1706                         EBANK=  STARAD
 1541  REF   1                     15,2761   02764 0               2CADR   ADDGRAV
 1541  REF   1                     15,2762   32065 0

 1542  REF  61  LAST  903   15,2763  0 5263 0               TC      TASKOVER

 1543  REF 284  LAST  964   15,2764  0 4607 1  ADDGRAV   TC      BANKCALL
 1544  REF   3  LAST  864   15,2765   15333 0               CADR    1/PIPA
 1545  REF   9  LAST  963   15,2766  25'736 1               INCR    GCTR
 1546  REF 200  LAST  964   15,2767  0 6060 1               TC      INTPRET
 1547                              15,2770   53375 0               VLOAD   VAD
 1548  REF  12  LAST  909   15,2771   00325 0                       DELV
 1549  REF   2  LAST  963   15,2772   02707 0                       GACC
 1550  REF   3  LAST  964   15,2773   02707 0               STORE   GACC             ACCUMULATE G VECTOR
 1551                              15,2774   50135 0               SLOAD   BMN
 1552  REF  10  LAST  964   15,2775   02737 0                       GCTR
 1553  REF   1                     15,2776   32750 1                       GREED
 1554                              15,2777   53575 0               VLOAD   UNIT
 1555  REF   4  LAST  964   15,3000   02707 0                       GACC
 1556  REF   8  LAST  962   15,3001   36731 1               STCALL  STAR
 1557  REF   6  LAST  950   15,3002   47522 1                       CDUTRIG           TRANSFORM  IN NB COOR  AND  STORE
 1558                              15,3003   77624 1               CALL                        IN OUTPUT
 1559  REF   6  LAST  909   15,3004   47663 1                       *SMNB*
 1560  REF   3  LAST  962   15,3005   02715 0               STORE   GOUT
 1561                              15,3006   77776 1               EXIT
 1562  REF  98  LAST  963   15,3007  0 5355 1               TC      PHASCHNG
 1563                              15,3010   04024 0               OCT     04024

 1564  REF 201  LAST  964   15,3011  0 6060 1  QMINEXIT  TC      INTPRET
 1565                              15,3012   77650 1               GOTO
 1566  REF  14  LAST  963   15,3013   02745 0                       QMIN
 1567                              15,3014   77753 0  T/2SEC    DEC     -20
 1568                              15,3015   01404 0  DISGRVER  VN      0604
 1569                              15,3016   07357 1  42DEG     OCT     07357
 1570                       15,3017   06211 0  35DEG    OCT    06211
```

```
P1571    NAME  GYROTRIM
R1572
R1573    THIS PROGRAM COMPUTES AND SENDS GYRO COMMANDS WHICH CAUSE THE CDUS
R1574      TO ATTAIN A PRESCRIBED SET OF ANGLES. THIS ROUTINE ASSUMES THE
R1575      VEHICLES ATTITUDE REMAINS STATIONARY DURING ITS OPERATION.
R1576
R1577    CALL       CALL
R1578                      GYROTRIM
R1579
R1580    INPUT      THETAD,+1,+2 = DESIRED CDU ANGLES
R1581               CDUX,CDUY,CDUZ
R1582
R1583    OUTPUT - GYRO TORQUE PULSES
R1584
R1585    SUBROUTINES- TRG*NBSM,*NBSM*,CDUTRIG,AXISGEN,CALCGTA,IMUFINE
R1586                   IMPULSE,IMUSTALL
R1587                 -         -          -          *          *      -
R1588    DEBRIS -  CDUSPOT ,SINCDU ,COSCDU , STARAD ,VAC , XDC , OGC
 1589    REF    3 LAST  962 TO  966:   121   131*           COUNT* $$/P57
 1590                            15,3020   71220 1  GYROTRIM STQ      DLOAD
 1591    REF   15  LAST  964     15,3021   02745 0                    QMIN
 1592    REF   21  LAST  961     15,3022   00322 1                    THETAD
 1593                            15,3023   65325 0           PDDL     PDDL
 1594    REF   22  LAST  966     15,3024   00324 1                    THETAD +2
 1595    REF   23  LAST  966     15,3025   00323 0                    THETAD +1
 1596                            15,3026   77666 1           VDEF
 1597    REF   17  LAST  599     15,3027   24766 0           STOVL    CDUSPOT
 1598    REF    6  LAST  962     15,3030   24005 1                    XUNIT
 1599                            15,3031   77624 1           CALL
 1600    REF    5  LAST  600     15,3032   47656 1                    TRG*NBSM
 1601    REF   23  LAST  964     15,3033   26707 0           STOVL    STARAD
 1602    REF    2  LAST   38     15,3034   24003 1                    YUNIT
 1603                            15,3035   77624 1           CALL
 1604    REF    7  LAST  962     15,3036   47665 1                    *NBSM*
 1605    REF   24  LAST  966     15,3037   36715 1           STCALL   STARAD +6
 1606    REF    7  LAST  964     15,3040   47522 1                    CDUTRIG
 1607                            15,3041   77624 1           CALL
 1608    REF    3  LAST  950     15,3042   20030 0                    CALCSMSC
 1609                            15,3043   77775 1           VLOAD
 1610    REF    7  LAST  962     15,3044   02665 0                    XNB
 1611                            15,3045   24007 0           STOVL    6D
 1612    REF    3  LAST  386     15,3046   02673 1                    YNB
 1613                            15,3047   34015 1           STCALL   12D
 1614    REF    3  LAST  948     15,3050   47424 0                    AXISGEN
 1615                            15,3051   77624 1           CALL
 1616    REF    3  LAST  942     15,3052   47232 1                    CALCGTA
 1617                            15,3053   77776 1  JUSTTRIM EXIT
 1618    REF    1                15,3054  3 3063 1           CA       GYRCDR
 1619    REF  285  LAST  964     15,3055  0 4607 1           TC       BANKCALL
 1620    REF    6  LAST  942     15,3056   17310 0           CADR     IMUPULSE
 1621    REF 286  LAST  966   15,3057  0 4607 1              TC       BANKCALL
 1622    REF  12  LAST  949   15,3060   17735 0              CADR     IMUSTALL
 1623    REF   8  LAST  958   15,3061  0 5705 0              TC       CURTAINS
 1624    REF   1              15,3062  1 3011 0              TCF      QMINEXIT

 1625    REF  13  LAST  942   15,3063   02737 0  GYRCDR      ECADR    OGC
```

```
P1626    PERFORM STAR AQUISITION AND STAR SIGHTINGS

 1627    REF 188  LAST  957    15,3064  3 4746 0  2STARS    CAF     ZERO                    INITALIZE STARIND
 1628                          15,3065  1 3067 1            TCF     +2                      ZERO FOR 1ST STAR, ONE FOR 2ND STAR
 1629    REF  48  LAST  955    15,3066  3 4744 1  1STAR     CAF     BIT1
 1630    REF  14  LAST  960    15,3067  55'757 1            TS      STARIND

 1631    REF  99  LAST  964    15,3070  0 5355 1            TC      PHASCHNG
 1632                          15,3071   04024 0            OCT     04024

 1633    REF   5  LAST  957    15,3072  1 2402 1            TCF     R59                     GO DO STAR AQUIRE AND ADTMARK

 1634    REF  15  LAST  968    15,3073  3 1757 0  R59RET    CA      STARIND                 BACK FROM SURFACE MARKING
 1635                          15,3074  0 0006 1            EXTEND
 1636    REF   1               15,3075  1 3106 1            BZF     ASTAR                   1ST STAR MARKED

 1637    REF 100  LAST  968    15,3076  0 5355 1            TC      PHASCHNG
 1638                          15,3077   04024 0            OCT     04024

 1639    REF 202  LAST  964    15,3100  0 6060 1            TC      INTPRET
 1640                          15,3101   45145 0            DLOAD   CALL
 1641    REF  12  LAST  960    15,3102   03562 0                    TSIGHT                  TIME OF 2ND MARK
 1642    REF   8  LAST  955    15,3103   16607 1                    PLANET
 1643    REF   1               15,3104   37254 0            STCALL  VEC2                    STORE 2ND CATALOG VEC (REF)
 1644    REF   1               15,3105   33120 1                    SURELINF

 1645    REF 203  LAST  968    15,3106  0 6060 1  ASTAR     TC      INTPRET
 1646                          15,3107   77775 1            VLOAD
 1647    REF  10  LAST  948    15,3110   02767 0                    STARSAV2
 1648    REF   9  LAST  963    15,3111   02761 0            STORE   STARSAV1                1ST OBSERVED STAR (SM)
 1649                          15,3112   45145 0            DLOAD   CALL
 1650    REF  13  LAST  968    15,3113   03562 0                    TSIGHT                  TIME OF 1ST MARK
 1651    REF   9  LAST  968    15,3114   16607 1                    PLANET
 1652    REF   2  LAST  141    15,3115   03246 1            STORE   VEC1                    STORE 1ST CATALOG VEC (REF)
 1653                          15,3116   77776 1            EXIT
 1654    REF   1               15,3117  1 3066 0            TCF     1STAR                   GO GET 2ND STAR SIGHTING
```

```
P1655    DO FINE OR COARSE ALIGNMENT OF IMU

 1656                            15,3120   77131 1  SURFLINE SSP      AXT,2
 1657    REF  12  LAST  935      15,3121   00052 0                    S2
 1658                            15,3122   00006 1                    6
 1659                            15,3123   00014 1                    12D
 1660                            15,3124   64373 1  WRTDESIR VLOAD*  MXV
 1661    REF   3  LAST  968      15,3125   74515 0                    VEC1 +12D,2       PICK UP VEC IN REF, TRANS TO DESIRED SM
 1662    REF  11  LAST  951      15,3126   03607 0                    XSMD
 1663                            15,3127   77656 1           UNIT
 1664    REF  25  LAST  966      15,3130   12723 1           STORE    STARAD +12D,2     VEC IN SM
 1665                            15,3131   77773 1           VLOAD*
 1666    REF  10  LAST  968      15,3132   75002 1                    STARSAV1 +12D,2 PICK UP VEC IN PRESENT SM
 1667                            15,3133   10023 1           STORE    18D,2
 1668                            15,3134   43104 0           TIX,2    BON
 1669    REF   1                 15,3135   33124 0                    WRTDESIR
 1670    REF   1                 15,3136   04315 1                    INITALGN          IF INITIAL PASS (OPTION 0) BYPASS R54
 1671    REF   1                 15,3137   33145 1                    INITBY
 1672                            15,3140   77624 1  DOALIGN  CALL
 1673    REF   2  LAST  939      15,3141   31265 1                    R54               DO CHKSDATA
 1674                            15,3142   77614 1           BOFF
 1675    REF   9  LAST  963      15,3143   00354 0                    FREEFLAG
 1676    REF   1                 15,3144   33225 1                    P57POST           ASTRO DOES NOT LIKE DATA TEST RESULTS
 1677                            15,3145   77624 1  INITBY   CALL
 1678    REF   4  LAST  966      15,3146   47424 0                    AXISGEN           GET DESIRED ORIENT WRT PRES.XDC,YDC,ZDC
 1679                            15,3147   77624 1           CALL
 1680    REF   4  LAST  966      15,3150   47232 1                    CALCGTA           GET GYRO TORQ ANGLES, OGC,IGC,MGC
 1681                            15,3151   77776 1           EXIT
 1682    REF   1                 15,3152  3 4743 0           CAF      INITABIT          IF INITIAL PASS BYPASS NOUN 93 DISPLAY
 1683    REF  15  LAST  864      15,3153  7 0104 0           MASK     FLAGWRD3
 1684    REF 274  LAST  963      15,3154  10 000 0           CCS      A
 1685    REF   1                 15,3155  1 3164 0           TCF      5DEGTEST
 1686    REF   1                 15,3156  3 3273 1           CAF      DISPGYRO          DISPLAY GYRO TORQ ANGLES V 06N93
 1687    REF 267  LAST  967      15,3157  0 4607 1           TC       BANKCALL
 1688    REF  39  LAST  963      15,3160   20471 1           CADR     GOFLASH
 1689    REF  53  LAST  963      15,3161  0 6001 0           TC       GOTOPOOH          V34-TERMINATE
 1690    REF   2  LAST  969      15,3162  1 3164 0           TCF      5DEGTEST          VB33-PROCEED TO COARSE OR FINE
 1691    REF   2  LAST  969      15,3163  1 3226 0           TCF      P57POST +1        VB32-RECYCLE, MAYBE RE-ALIGN

 1692    REF 204  LAST  968      15,3164  0 6060 1  5DEGTEST TC       INTPRET           IF ANGLES GREATER THAN 5 DEGS, DO COARSE
 1693                            15,3165   40175 0           VLOAD    BOV
 1694    REF  14  LAST  967      15,3166   02740 0                    OGC
 1695    REF   1                 15,3167   33170 1                    SURFSUP
 1696    REF   2  LAST  128      15,3170   02750 1  SURFSUP  STORE    OGCT
 1697                            15,3171   40141 1           V/SC     BOV
 1698    REF   2  LAST  933      15,3172   30617 1                    5DEGREES
 1699    REF   1                 15,3173   31715 0                    COATRIM
 1700                            15,3174   52131 0           SSP      GOTO
 1701    REF  16  LAST  966      15,3175   02746 0                    QMIN
 1702    REF   1                 15,3176   33200 0                    SURFDISP
 1703   REF   1                15,3177   33053 1                   JUSTTRIM          ANGLES LESS THAN 5DEG, DO GYRO TORQ

 1704                          15,3200   77776 1  SURFDISP EXIT
 1705   REF 101  LAST  968     15,3201  0 5355 1           TC      PHASCHNG
 1706                          15,3202   04024 0           OCT     04024

 1707   REF 205  LAST  969     15,3203  0 6060 1           TC      INTPRET
 1708                          15,3204   75160 1           AXC,1   AXC,2
 1709   REF  12  LAST  969     15,3205   03606 1                   XSMD
 1710   REF  52  LAST  955     15,3206   01731 0                   REFSMMAT
 1711                          15,3207   45014 0           SET     CALL
 1712   REF   7  LAST  961     15,3210   01462 0                   REFSMFLG
 1713   REF   5  LAST  950     15,3211   26374 0                   MATMOVE
 1714                          15,3212   77776 1           EXIT
 1715   REF   9  LAST  926     15,3213  11 144 0           CCS     OPTION2           IF OPTION ZERO DO FINISH
 1716   REF   1                15,3214  1 3216 0           TCF     B2F8
 1717   REF   3  LAST  969     15,3215  1 3226 0           TCF     P57POST +1

 1718   REF   2  LAST  969     15,3216  3 4743 0  B2F8     CAF     INITABIT          IF INITIAL FLAG SET, RE-CYCLE.
 1719   REF  16  LAST  969     15,3217  7 0104 0           MASK    FLAGWRD8
 1720   REF 275  LAST  969     15,3220  10 000 0           CCS     A
 1721   REF   1                15,3221  1 3543 1           TCF     P57JUMP           ITS SET
 1722   REF 206  LAST  970     15,3222  0 6060 1           TC      INTPRET
 1723                          15,3223   77624 1           CALL
 1724   REF   2  LAST  788     15,3224   33470 1                   REFMF             GO GET ATTITUDE VEC IN MF(YNBSAV,XNBSAV)
 1725                          15,3225   77776 1  P57POST  EXIT
 1726   REF   3  LAST  939     15,3226  3 5745 1           CAF     OCT14             DISPLAY V50N25 CHK CODE 14
 1727   REF 288  LAST  969     15,3227  0 4607 1           TC      BANKCALL
 1728   REF   9  LAST  947     15,3230   20635 0           CADR    GOPERF1
 1729   REF  54  LAST  969     15,3231  1 6001 1           TCF     GOTOPOOH          VB34-TERMINATE
 1730   REF   2  LAST  970     15,3232  1 3543 1           TCF     P57JUMP           VB33-PROCEED TO RE-ALIGN
 1731   REF  44  LAST  926     15,3233  4 4743 1           CS      BIT2              TEST TO SE IF ALIGNED BY OPTION 2
 1732   REF  10  LAST  970     15,3234  6 1144 1           AD      OPTION2
 1733                          15,3235  0 0006 1           EXTEND
 1734                          15,3236  1 3240 0           BZF     +2                YES-GO CALCULATE LANDING SITE
 1735   REF  55  LAST  970     15,3237  1 6001 1           TCF     GOTOPOOH          NO-EXIT P57
 1736   REF 102  LAST  970     15,3240  0 5355 1           TC      PHASCHNG          RESTART PLACE
 1737                          15,3241   04024 0           OCT     04024
 1738   REF 207  LAST  970     15,3242  0 6060 1           TC      INTPRET
 1739                          15,3243   45175 0           VLOAD   CALL              USE GNB
 1740   REF   8  LAST  963     15,3244   02222 1                   GSAV
 1741   REF   2  LAST  708     15,3245   47653 1                   CDU*NBSM          GO TO SM COORDS
 1742                          15,3246   43105 1           VXM     SET                         ON MOON SO SET LUNAFLAG
 1743   REF  53  LAST  970     15,3247   01732 0                   REFSMMAT                    G(REF) = (REFSMMAT)T (NBSM)GNB
 1744   REF   5  LAST  929     15,3250   01463 1                   LUNAFLAG
 1745                          15,3251   51515 1           PDVL    ABVAL
 1746   REF  11  LAST  929     15,3252   02021 0                   RLS
 1747                          15,3253   45561 1           VXSC    STADR
 1748   REF   6  LAST  929     15,3254   75745 0           STORE   ALPHAV                      ALPHAV =  RLSMAG * G(REF)
 1749                          15,3255   47014 1           CLEAR   RTB
 1750   REF   3  LAST  929   15,3256   00662 0              ERADFLAG
 1751   REF  30  LAST  955   15,3257   21603 1              LOADTIME
 1752                        15,3260   77624 1       CALL
 1753   REF   2  LAST  929   15,3261   30455 0              N89DISP          SUBROUTINE TO CALC LS AND GIVE RLS BACK
 1754   REF  16  LAST  883   15,3262   01220 0       STORE  RN               RN=RLS B-29 = LM POSITION
 1755                        15,3263   65352 0       VSL2   PDDL             R-TO-RP GETS RLS B-27 AT  0-5D IN PDLIST
 1756   REF   3  LAST  930   15,3264   01242 1              SITIME           TIME STORED IN N89DISP
 1757                        15,3265   77606 1       PUSH                    TIME AT  6-7 IN PDLIST
 1758   REF  24  LAST  896   15,3266   35234 1       STCALL PIPTIME          PIPTIME = LM STATE TIME
 1759   REF   2  LAST  787   15,3267   51644 0              R-TO-RP
 1760   REF  12  LAST  970   15,3270   02021 0       STORE  RLS              RLS IN MOON-FIXED COORDS
 1761                        15,3271   77776 1       EXIT
 1762   REF  56  LAST  970   15,3272 1 6001 1       TCF    GOTOPOOH         EXIT P57
```

```
P1763   COARSE AND FINE ALIGN IMU
 17635  REF    6  LAST  952   14,2000                          SETLOC P50S1
 17636                        14,3715                          BANK

 17637  REF    1                                               COUNT* $$/P57

 1764                         14,3715   75160 1  COATRIM  AXC,1  AXC,2
 1765   REF    5  LAST  948   14,3716   02664 1                  XDC
 1766   REF   22  LAST  962   14,3717   02642 0                  XSM
 1767                         14,3720   77624 1           CALL
 1768   REF    6  LAST  970   14,3721   26374 0                  MATMOVE
 1769                         14,3722   77624 1           CALL
 1770   REF    8  LAST  966   14,3723   47522 1                  CDUTRIG
 1771                         14,3724   77624 1           CALL
 1772   REF    4  LAST  966   14,3725   20030 0                  CALCSMSC
 1773                         14,3726   77624 1           CALL
 1774   REF    4  LAST  962   14,3727   47336 1                  CALCGA
 1775                         14,3730   77414 0           BOFF   EXIT
 1776   REF    2  LAST  969   14,3731   04355 0                  INITALGN       IF INITIAL ALGNMENT DISPLAY FINAL
 1777   REF    1              14,3732   31744 1                  CORSIT         GIMBAL ANGLES IF COARSE ANGLES GREATER
 1778   REF    4  LAST  947   14,3733  3 5001 0           CAF    V06N22         THAN 5 DEGREES
 1779   REF  289  LAST  970   14,3734  0 4607 1           TC     BANKCALL
 1780   REF   40  LAST  969   14,3735   20471 1           CADR   GOFLASH
 1781   REF   57  LAST  971   14,3736  0 6001 0           TC     GOTOPOOH
 1782                         14,3737  1 3741 1           TCF    +2
 1783                         14,3740  1 3733 1           TCF    -5
 1784   REF  103  LAST  970   14,3741  0 5355 1           TC     PHASCHNG
 1785                         14,3742   04024 0           OCT    04024

 1786   REF  208  LAST  970   14,3743  0 6060 1           TC     INTPRET
 1787                         14,3744   77624 1  CORSIT   CALL
 1788   REF    5  LAST  963   14,3745   31542 0                  COARSE
 1789                         14,3746   77624 1           CALL
 1790   REF    4  LAST  947   14,3747   31566 0                  NCOARSE
 1791                         14,3750   77624 1           CALL
 1792   REF    1              14,3751   33020 0                  GYROTRIM
 1793                         14,3752   77650 1           GOTO
 1794   REF    2  LAST  969   14,3753   23200 0                  SURFDISP
 17945  REF    6  LAST  962   15,2000                     SETLOC P50S
 17946                        15,3273                     BANK
 17947  REF    4 LAST   966 TO  972:    171    302*       COUNT* $$/P57

 1795                         15,3273   01535 0  DISPGYRO VN     0693
```

```
P1796    LUNAR SURFACE IMU ALIGNMENT PROGRAM

 1797    REF 290  LAST  972    15,3274   0 4607 1  P57        TC       BANKCALL          IS ISS ON - IF NOT, IMUCHK WILL SEND
 1798    REF   2  LAST  947    15,3275    33634 0             CADR     IMUCHK            ALARM CODE 210 AND EXIT VIA GOTOPOOH

 17981   REF  92  LAST  963    15,3276   0 5520 0             TC       DOWNFLAG
 17982   REF   8  LAST  956    15,3277    00222 0             ADRES    FLT59FLG

 1799    REF  27  LAST  925    15,3300   3 6266 0             CAF      THREE             JAM REFSMMAT OPTION 3 FOR INITIAL DISP.
 1800    REF  11  LAST  970    15,3301   55 144 0             TS       OPTION2
 1801    REF  49  LAST  968    15,3302   3 4744 1  P57OPT     CAF      BIT1
 1802    REF 291  LAST  973    15,3303   0 4607 1             TC       BANKCALL
 1803    REF   2  LAST  925    15,3304    20725 0             CADR     GOPERF4R          FLASH V04N06 FOR ALIGNMENT CODE
 1804    REF  58  LAST  972    15,3305   0 6001 0             TC       GOTOPOOH          V34 TERMINATE
 1805    REF   1               15,3306   1 3313 1             TCF      ALIGNOPT          V33 PROCEED
 1806    REF   1               15,3307   1 3302 1             TCF      P57OPT            V32 RECYCLE

 1807    REF 104  LAST  972    15,3310   0 5355 1             TC       PHASCHNG
 1808                          15,3311    00014 1             OCT      00014
 1809    REF 135  LAST  964    15,3312   0 5146 1             TC       ENDOFJOB

 1810    REF  12  LAST  973    15,3313   3 1144 1  ALIGNOPT   CA       OPTION2
 1811    REF  28  LAST  973    15,3314   7 6266 1             MASK     THREE
 1812    REF 276  LAST  970    15,3315   50 000 1             INDEX    A
 1813                          15,3316   1 3317 0             TCF      +1
 1814    REF   1               15,3317   1 3332 1             TCF      TDISP             OPTION 4 LS ORIENTATION
 1815    REF   1               15,3320   1 3373 1             TCF      PACKOPTN          OPTION 1 PREFERRED
 1816    REF   2  LAST  973    15,3321   1 3302 1             TCF      P57OPT            OPTION 2 INVALID IN P57, RECYCLE
 1817    REF 209  LAST  972    15,3322   0 6060 1             TC       INTPRET           OPTION 3 REFSMMAT
 1818                          15,3323    75160 1             AXC,1    AXC,2             JAM REFSMMAT IN XSMD LOC
 1819    REF  54  LAST  970    15,3324    01731 0                      REFSMMAT
 1820    REF  13  LAST  970    15,3325    03605 1                      XSMD
 1821                          15,3326    77624 1             CALL
 1822    REF   7  LAST  972    15,3327    26374 0                      MATMOVE
 1823                          15,3330    77650 1             GOTO
 1824    REF   2  LAST  973    15,3331    33372 1                      PACKOPTN -1

 1825    REF 210  LAST  973    15,3332   0 6060 1  TDISP      TC       INTPRET
 1826                          15,3333    77745 1             DLOAD
 1827    REF  40  LAST  839    15,3334    03442 0                      TIG               LOAD ASCENT TIME FOR DISPLAY
 1828    REF  27  LAST  963    15,3335    01045 1  P57A       STORE    DSPTEM1
 1829                          15,3336    77776 1             EXIT
 1830    REF   2  LAST  925    15,3337   3 2325 1  P57AA      CAF      V06N34*           DISPLAY TALIGN, TALIGN : DSPTEM1
 1831    REF 292  LAST  973    15,3340   0 4607 1             TC       BANKCALL
 1832    REF  41  LAST  972    15,3341    20471 1             CADR     GOFLASH
 1833    REF  59  LAST  973    15,3342   1 6001 1             TCF      GOTOPOOH          V34-TERMINATE
 1834                          15,3343   1 3345 1             TCF      +2
 1835    REF   1               15,3344   1 3337 1             TCF      P57AA             VB32-RECYCLE

 1836    REF 211  LAST  973    15,3345   0 6060 1             TC       INTPRET
 1837                          15,3346   65234 1           RTB     PDDL
 1838   REF  31  LAST  971     15,3347   21603 1                   LOADTIME        PUSH CURRENT TIME AND PICK UP KEY IN
 1839   REF  28  LAST  973     15,3350   01045 1                   DSPTEM1
 1840                          15,3351   65254 1           BZE     PDDL
 1841   REF   1                15,3352   33362 0                   P57C            IF KEY IN TIME ZERO-TALIGN=CURRENT TIME
 1842                          15,3353   51025 1           DSU     BPL             NOT ZERO SO EXCHANGE PD WITH DSPTEM1
 1843   REF  29  LAST  974     15,3354   01045 1                   DSPTEM1
 1844   REF   2  LAST  974     15,3355   33362 0                   P57C
 1845                          15,3356   45545 1           DLOAD   STADR           IF KEYIN TIME GREATER THAN CURRENT TIME
 1846   REF  41  LAST  973     15,3357   74335 1           STORE   TIG             STORE IT IN TIG
 1847   REF   9  LAST  929     15,3360   36775 1           STCALL  TALIGN
 1848   REF   1                15,3361   33364 0                   P57D
 1849                          15,3362   45545 1  P57C     DLOAD   STADR
 1850   REF  10  LAST  974     15,3363   75002 1           STORE   TALIGN
 1851   REF  49  LAST  951     15,3364   34041 0  P57D     STCALL  TDEC1
 1852   REF  11  LAST  932     15,3365   27115 1                   LEMPREC         COMPUTE DESIRED IMU ORIENTATION STORE
 1853                          15,3366   53575 0           VLOAD   UNIT            IN  X,Y,ZSMD
 1854   REF  32  LAST  951     15,3367   00001 0                   RATT
 1855   REF  14  LAST  973     15,3370   37607 1           STCALL  XSMD
 1856   REF   2  LAST  929     15,3371   11014 1                   LSORIENT
 1857                          15,3372   77776 1           EXIT
 1858   REF 139  LAST  968     15,3373  3 4746 0  PACKOPTN CAF     ZERO            PACK FLAG BITS FOR OPTION DISPLAY
 1859   REF   2  LAST  317     15,3374  55'144 0           TS      OPTION1 +1      JAM ZERO IN ALIGNMENT OPTION
 1860   REF   3  LAST  974     15,3375  55'145 1           TS      OPTION1 +2      INITIALIZE FLAG BIT CONFIGURATION
 1861   REF   4  LAST  955     15,3376  3 4730 1           CAF     REFSMBIT
 1862   REF  1   LAST  955     15,3377  7 0077 0           MASK    FLAGWRD3        REFSMFLG
 1863   REF 277  LAST  973     15,3400  10 000 0           CCS     A
 1864   REF  28  LAST  957     15,3401  3 4736 1           CAF     BIT7            SET
 1865   REF   4  LAST  974     15,3402  27'145 1           ADS     OPTION1 +2      CLEAR-JUST ZERO
 1866   REF   1                15,3403  3 4744 1           CAF     ATTFLBIT
 1867   REF  13  LAST  869     15,3404  7 0102 0           MASK    FLAGWRD6        ATTFLG
 1868   REF 278  LAST  974     15,3405  10 000 0           CCS     A
 1869   REF  44  LAST  952     15,3406  3 4741 1           CAF     BIT4            SET
 1870   REF   5  LAST  974     15,3407  27'145 1           ADS     OPTION1 +2      CLEAR-ZERO IN A
 1871   REF  45  LAST  974     15,3410  3 4741 1           CAF     BIT4
 1872   REF   6  LAST  974     15,3411  55'143 1           TS      OPTION1         JAM 00010 IN OPTION1 FOR CHECK LIST

 1873   REF   1                15,3412  3 3633 1  DSPOPTN  CAF     VB05N06         DISPLAY OPTION CODE AND FLAG BITS
 1874   REF 293  LAST  973     15,3413  0 4607 1           TC      BANKCALL
 1875   REF  42  LAST  973     15,3414   20471 1           CADR    GOFLASH
 1876   REF  60  LAST  973     15,3415  1 6001 1           TCF     GOTOPOOH        VB34-TERMINATE
 1877                          15,3416  1 3420 0           TCF     +2              V33-PROCEED
 1878   REF   1                15,3417  1 3412 1           TCF     DSPOPTN         V32-RECYCLE

 1879   REF   5  LAST  974     15,3420  3 4730 1           CAF     REFSMBIT
 1880   REF  11  LAST  974     15,3421  7 0077 0           MASK    FLAGWRD3
 1881   REF 279  LAST  974     15,3422  10 000 0           CCS     A
 1882   REF   1                15,3423  1 3523 1           TCF     GETLMATT        SET, GO COMPUTE LM ATTITUDE
 1883   REF   2  LAST  974     15,3424  3 4744 1           CAF     ATTFLBIT        CLEAR-CHECK ATTFLAG FOR STORED ATTITUDE.
 1884   REF  14  LAST  974     15,3425  7 0102 0           MASK    FLAGWRD6
 1885    REF 280  LAST  974    15,3426  10 000 0           CCS     A
 1886    REF   1               15,3427   1 3527 0           TCF     BYLMATT           ALLFLG SET, CHK OPTION FOR GRAVITY COMP
 1887    REF  45  LAST  970    15,3430   3 4743 0           CAF     BIT2              SEE IF OPTION 2 OR 3
 1888    REF  13  LAST  973    15,3431   7 1144 0           MASK    OPTION2
 1889    REF 281  LAST  975    15,3432  10 000 0           CCS     A
 1890    REF   2  LAST  975    15,3433   1 3527 0           TCF     BYLMATT           OPTION 2 OR 3 BUT DONT HAVE ATTITUDE
 1891    REF  38  LAST  957    15,3434   0 5571 1           TC      ALARM             OPTION INCONSISTANT WITH FLAGS-ALARM 701
 1892                          15,3435    00701 1           OCT     701
 1893    REF   3  LAST  957    15,3436   3 4777 1           CAF     VB05N09           DISPLAY ALARM FOR ACTION
 1894    REF 294  LAST  974    15,3437   0 4607 1           TC      BANKCALL
 1895    REF  43  LAST  974    15,3440    20471 1           CADR    GOFLASH
 1896    REF  61  LAST  974    15,3441   1 6001 1           TCF     GOTOPOOH          VB34-TERMINATE
 1897    REF   2  LAST  974    15,3442   1 3412 1           TCF     DSPOPTN           V33-PROCEED    ********TEMPORARY
 1898    REF   3  LAST  975    15,3443   1 3412 1           TCF     DSPOPTN           VB32-RECYCLE TO OPTION DISPLAY V 05N06
```

```
P1899   TRANSFORM VEC1,2 FROM MOON FIXED TO REF AND JAM BACK IN VEC1,2

 1900                              15,3444    40220 0  MFREF    STQ      SETPD
 1901   REF  11  LAST  951         15,3445    02746 0                    QMAJ
 1902                              15,3446    00001 0                    0
 1903                              15,3447    77634 0           RTB
 1904   REF  32  LAST  974         15,3450    21603 1                    LOADTIME
 1905   REF  14  LAST  968         15,3451    27562 0           STOVL    TSIGHT
 1906   REF   4  LAST  969         15,3452    03246 1                    VEC1
 1907                              15,3453    41525 0           PDDL     PUSH
 1908   REF  15  LAST  976         15,3454    03562 0                    TSIGHT
 1909                              15,3455    77624 1           CALL
 1910   REF   4  LAST  929         15,3456    55716 1                    RP-TO-R
 1911   REF   5  LAST  976         15,3457    27246 1           STOVL    VEC1
 1912   REF   2  LAST  968         15,3460    03254 1                    VEC2
 1913                              15,3461    65201 1           SETPD    PDDL
 1914                              15,3462    00001 0                    0
 1915   REF  16  LAST  976         15,3463    03562 0                    TSIGHT
 1916                              15,3464    45006 0           PUSH     CALL
 1917   REF   5  LAST  976         15,3465    55716 1                    RP-TO-R
 1918   REF   3  LAST  976         15,3466    37254 0           STCALL   VEC2
 1919   REF  12  LAST  976         15,3467    02746 0                    QMAJ
```

```
P1920   COMPUTE LM ATTITUDE IN MOON FIXED COORDINATES USING REFSMMAT AND
R1921   STORE IN YNBSAV AND ZNBSAV

 1922                          15,3470   45020 1  REFMF     STQ     CALL
 1923   REF  13  LAST  976     15,3471   02746 0                    QMAJ
 1924   REF   9  LAST  972     15,3472   47522 1                    CDUTRIG          GET SIN AND COS OF CDUS
 1925                          15,3473   40234 0            RTB     SETPD
 1926   REF  33  LAST  976     15,3474   21603 1                    LOADTIME
 1927                          15,3475   00001 0                    0
 1928   REF  17  LAST  976     15,3476   37562 1            STCALL  TSIGHT
 1929   REF   5  LAST  972     15,3477   20030 0                    CALCSMSC         GET YNB IN SM
 1930                          15,3500   61375 1            VLOAD   VXM
 1931   REF   4  LAST  966     15,3501   02673 1                    YNB
 1932   REF  55  LAST  973     15,3502   01732 0                    REFSMMAT          YNB TO REF
 1933                          15,3503   65256 0            UNIT    PDDL
 1934   REF  18  LAST  977     15,3504   03562 0                    TSIGHT
 1935                          15,3505   45006 0            PUSH    CALL
 1936   REF   3  LAST  971     15,3506   51644 0                    R-TO-RP
 1937   REF   4  LAST  214     15,3507   26230 1            STOVL   YNBSAV           YNB TO MF
 1938   REF   4  LAST  935     15,3510   02701 0                    ZNB
 1939                          15,3511   53505 1            VXM     UNIT
 1940   REF  56  LAST  977     15,3512   01732 0                    REFSMMAT         ZNB TO REF
 1941                          15,3513   41525 0            PDDL    PUSH
 1942   REF  19  LAST  977     15,3514   03562 0                    TSIGHT
 1943                          15,3515   77624 1            CALL
 1944   REF   4  LAST  977     15,3516   51644 0                    R-TO-RP          ZNB TO MF
 1945   REF   2  LAST  215     15,3517   02236 1            STORE   ZNBSAV
 1946                          15,3520   77614 1            SETGO
 1947   REF   1                15,3521   03036 1                    ATTFLAG
 1948   REF  14  LAST  977     15,3522   02746 0                    QMAJ
```

```
P1949    BRANCH TO ALIGNMENT OPTION

 1950    REF 212   LAST   973    15,3523   0 6060 1  GETLMATT TC       INTPRET
 1951                            15,3524    77624 1           CALL
 1952    REF   3   LAST   970    15,3525    33470 1                    REFMF           GO TRANSFORM TO MF IN YNBSAV,ZNBSAV
 1953                            15,3526    77776 1           EXIT

 1954    REF  69   LAST   963    15,3527   0 5506 1  BYLMATT  TC       UPFLAG          SET INITIAL ALIGN FLAG
 1955    REF   3   LAST   972    15,3530    00205 0           ADRES    INITALGN
 1956    REF  53   LAST   973    15,3531   3 4744 1           CAF      BIT1
 1957    REF  14   LAST   975    15,3532   7 1144 0           MASK     OPTION2         SEE IF OPTION 1 OR 3
 1958    REF 282   LAST   975    15,3533   10 000 0           CCS      A
 1959    REF   2   LAST   963    15,3534   1 2615 0           TCF      GVDETER         OPTION 1 OR 2, GET GRAVITY

 1960    REF 105   LAST   973    15,3535   0 5355 1  ATTCHK   TC       PHASCHNG
 1961                            15,3536    04024 0           OCT      04024

 1962    REF   3   LAST   974    15,3537   3 4744 1           CAF      ATTFLBIT        NOT 1 OR 3, CHECK ATTFLAG
 1963    REF  15   LAST   974    15,3540   7 0102 0           MASK     FLAGWRD6
 1964    REF 283   LAST   978    15,3541   10 000 0           CCS      A
 1965    REF   1                 15,3542   1 3557 1           TCF      P57OPT0         GET ALIGNMENT VECS FOR OPTION 0
 1966    REF 106   LAST   978    15,3543   0 5355 1  P57JUMP  TC       PHASCHNG
 1967                            15,3544    04024 0           OCT      04024

 1968    REF  93   LAST   973    15,3545   0 5520 0           TC       DOWNFLAG        ATTFLG CLEAR-RESET INTALIGN FLAG
 1969    REF   4   LAST   978    15,3546    00205 0           ADRES    INITALGN
 1970    REF  29   LAST   973    15,3547   3 6266 0           CAF      THREE
 1971    REF  15   LAST   978    15,3550   7 1144 0           MASK     OPTION2         BRANCH ON OPTION CODE
 1972    REF 284   LAST   978    15,3551   50 000 1           INDEX    A
 1973                            15,3552   1 3553 0           TCF      +1
 1974    REF   2   LAST   978    15,3553   1 3557 1           TCF      P57OPT0         OPTION IS 0
 1975    REF   1                 15,3554   1 3600 0           TCF      P57OPT1         OPTION IS 1
 1976    REF   1                 15,3555   1 3616 1           TCF      P57OPT2         OPTION IS 2
 1977    REF   1                 15,3556   1 3617 0           TCF      P57OPT3         OPTION IS 3
```

```
P1978   OPTION 0, GET TWO ATTITUDE VECS

 1979   REF 213  LAST  978    15,3557  0 6060 1  P57OPT0   TC      INTPRET
 1980                         15,3560   77775 1            VLOAD
 1981   REF   5  LAST  977    15,3561   02230 1                    YNBSAV          Y AND Z ATTITUDE WILL BE PUT IN REF
 1982   REF   6  LAST  976    15,3562   27246 1            STOVL   VEC1
 1983   REF   3  LAST  977    15,3563   02236 1                    ZNBSAV
 1984   REF   4  LAST  976    15,3564   37254 0            STCALL  VEC2
 1985   REF  10  LAST  977    15,3565   47522 1                    CDUTRIG
 1986                         15,3566   77624 1            CALL
 1987   REF   6  LAST  977    15,3567   20030 0                    CALCSMSC        COMPUTE SC AXIS WRT PRESENT SM
 1988                         15,3570   77775 1            VLOAD
 1989   REF   5  LAST  977    15,3571   02673 1                    YNB
 1990   REF  11  LAST  969    15,3572   26761 0  SAMETYP   STOVL   STARSAV1        Y SC AXIS WRT PRESENT SM
 1991   REF   5  LAST  977    15,3573   02701 0                    ZNB
 1992   REF  11  LAST  968    15,3574   36767 1            STCALL  STARSAV2        Z SC AXIS WRT PRESENT SM
 1993   REF   1               15,3575   33444 0                    MFREF           TRANSFORM VEC1,2 FROM MF TO REF
 1994                         15,3576   77650 1            GOTO
 1995   REF   2  LAST  968    15,3577   33120 1                    SURFLINE

R1996   OPTION 1, GET LANDING SITE AND Z-ATTITUDE VEC

 1997   REF 214  LAST  979    15,3600  0 6060 1  P57OPT1   TC      INTPRET
 1998                         15,3601   53575 0            VLOAD   UNIT
 1999   REF  13  LAST  971    15,3602   02021 0                    RLS             LANDING SITE VEC
 2000   REF   7  LAST  979    15,3603   27246 1            STOVL   VEC1
 2001   REF   4  LAST  979    15,3604   02236 1                    ZNBSAV          Z ATTITUDE VEC
 2002   REF   5  LAST  979    15,3605   37254 0            STCALL  VEC2
 2003   REF  11  LAST  979    15,3606   47522 1                    CDUTRIG
 2004                         15,3607   77624 1            CALL
 2005   REF   7  LAST  979    15,3610   20030 0                    CALCSMSC        GET ZNB AXIS WRT PRES SM FOR STARSAV2
 2006                         15,3611   45175 0            VLOAD   CALL
 2007   REF   9  LAST  970    15,3612   02222 1                    GSAV            TRANS GSAV FROM NB TO SM FOR STARSAV1
 2008   REF   3  LAST  970    15,3613   47653 1                    CDU*NBSM
 2009                         15,3614   77650 1            GOTO
 2010   REF   1               15,3615   33572 1                    SAMETYP         NOW DO SAME AS OPTION 0
```

```
P2011   OPTION 2, GET TWO-STAR SIGHTINGS

 2012   REF   1                15,3616  1 3064 1  P57OPT2  TCF     2STARS             DO SIGHTING ON 2 STARS

R2013   OPTION 3, GET LANDING SITE VEC AND ONE STAR SIGHTING

 2014   REF 215  LAST  979     15,3617  0 6060 1  P57OPT3  TC      INTPRET
 2015                          15,3620    53575 0          VLOAD   UNIT
 2016   REF  14  LAST  979     15,3621    02021 0                  RLS                LANDING SITE VEC
 2017   REF   8  LAST  979     15,3622    03246 1          STORE   VEC1
 2018   REF   6  LAST  979     15,3623    27254 1          STOVL   VEC2               DUMMY VEC2 FOR 2ND CATALOG STAR
 2019   REF  10  LAST  979     15,3624    02222 1                  GSAV               GRAVITY VEC NB
 2020                          15,3625    77624 1          CALL
 2021   REF   4  LAST  979     15,3626    47653 1                  CDU*NBSM           TRANS GSAV FROM NB TO SM FOR STARSAV1
 2022   REF  12  LAST  979     15,3627    36761 1          STCALL  STARSAV1
 2023   REF   2  LAST  979     15,3630    33444 0                  MFREF              STARSAV2 IS STORED AS 2ND OBSERVED STAR
 2024                          15,3631    77776 1          EXIT
 2025   REF   2  LAST  968     15,3632  1 3066 0          TCF     1STAR              1STAR GET VEC2,STARSAV2,GOES TO SURFLINE

 2026                          15,3633    01206 1  VB05N06  VN      506
```

```
P2027   CHECK IMODES30 TO VARIFY IMU IS ON

 2028   REF  47  LAST  485   15,3634  4 1277 0  IMUCHK   CS      IMODES30
 2029   REF  23  LAST  952   15,3635  7 4734 1           MASK    BIT9
 2030   REF 285  LAST  978   15,3636 10 0000 0           CCS     A                  IS IMU ON
 2031                        15,3637  1 3643 1           TCF     +4                 YES

 2032   REF  39  LAST  975   15,3640  0 5571 1           TC      ALARM              NO, SEND ALARM AND EXIT
 2033                        15,3641   00210 1           OCT     210
 2034   REF  62  LAST  975   15,3642  0 6001 0           TC      GOTOPOOH

 2035   REF  70  LAST  978   15,3643  0 5506 1           TC      UPFLAG
 2036   REF   5  LAST  400   15,3644   00007 0           ADRES   IMUSE              SET IMUSE FLAG

 2037   REF   5  LAST  553   15,3645  0 4622 0           TC      SWRETURN

 2039   REF   2  LAST  260   04,2000                     SETLOC  AOTMARK2
 2040                        04,3014                     BANK
 2041   REF   1                                          COUNT*  $$/P57

 2042                        04,3014   77220 1  LSORIENT STQ     VLOAD
 2043   REF  15  LAST  977   04,3015   02746 0                   QMAJ
 2044   REF   6  LAST  842   04,3016   01555 0                   RRECTCSM
 2045                        04,3017   47235 0           VXV     VXV
 2046   REF   2  LAST  842   04,3020   01563 0                   VRECTCSM
 2047   REF  15  LAST  974   04,3021   03607 0                   XSMD
 2048                        04,3022   77656 1           UNIT
 2049   REF   5  LAST  951   04,3023   03623 0           STORE   ZSMD
 2050                        04,3024   53435 0           VXV     UNIT
 2051   REF  16  LAST  981   04,3025   03607 0                   XSMD
 2052   REF   6  LAST  951   04,3026   37615 1           STCALL  YSMD
 2053   REF  16  LAST  981   04,3027   02746 0                   QMAJ
```

```
R2000   NAME - LSPOS  - LOCATE SUN AND MOON                                                       DATE - 25 OCT 67
R2002  *MOD NO.2  (DATE OCT 70)
R2004   MOD BY NEVILLE                                                                            ASSEMBLY SUNDANCE

R2006   FUNCTIONAL DESCRIPTION

R2007          COMPUTES UNIT POSITION VECTOR OF THE SUN AND MOON IN THE BASIC REFERENCE SYSTEM. THE SUN VECTOR S IS
R2009   LOCATED VIA TWO ANGLES. THE FIRST ANGLE(OBLIQUITY) IS THE ANGLE BETWEEN THE EARTH EQUATOR AND THE ECLIPTIC. THE
R2011   SECOND ANGLE IS THE LONGITUDE OF THE SUN MEASURED IN THE ECLIPTIC.
R2012   THE POSITION VECTOR OF THE SUN IS
R2013          -
R2014          S=(COS(LOS), COS(OBL)*SIN(LOS), SIN(OBL)*SIN(LOS)), WHERE

R2015        LOS=LOS +LOS *T-(C *SIN(2PI*T)/365.24 +C *COS(2PI*T)/365.24)
R2016               0    R     0                     1
R2017        LOS  (RAD) IS THE LONGITUDE OF THE SUN FOR MIDNIGHT JUNE 30TH OF THE PARTICULAR YEAR.
R2019           0
R2020        LOS  (RAD/DAY) IS THE MEAN RATE FOR THE PARTICULAR YEAR.
R2021           R
R2022   LOS  AND LOS  ARE STORED AS LOSC AND LOSR IN RATESP.
R2023      0        R
R2024   COS(OBL) AND SIN(OBL) ARE STORED IN THE MATRIX KONMAT.
R2025   T, TIME MEASURED IN DAYS(24 HOURS), IS STORED IN TIMEP.
R2026   C  AND C  ARE FUDGE FACTORS TO MINIMIZE THE DEVIATION. THEY ARE STORED AS ONE CONSTANT(CMOD), SINCE
R2028    0      1                               2  2 1/2
R2029   C *SIN(X)+C *COS(X) CAN BE WRITTEN AS (C +C )   *SIN(X+PHI), WHERE PHI=ARCTAN(C /C ).
R2031    0         1                            0  1                                   1   0

R2033   THE MOON IS LOCATED VIA FOUR ANGLES. THE FIRST IS THE OBLIQUITY. THE SECOND IS THE MEAN LONGITUDE OF THE MOON,
R2035   MEASURED IN THE ECLIPTIC FROM THE MEAN EQUINOX TO THE MEAN ASCENDING NODE OF THE LUNAR ORBIT, AND THEN ALONG THE
R2037   ORBIT. THE THIRD ANGLE IS THE ANGLE BETWEEN THE ECLIPTIC AND THE LUNAR ORBIT. THE FOURTH ANGLE IS THE LONGITUDE
R2039   OF THE NODE OF THE MOON, MEASURED IN THE LUNAR ORBIT. LET THESE ANGLES BE OBL,LOM,IM, AND LON RESPECTIVELY.

R2041   THE SIMPLIFIED POSITION VECTOR OF THE MOON IS
R2042     -
R2043     M=(COS(LOM), COS(OBL)*SIN(LOM)-SIN(OBL)*SIN(IM)*SIN(LOM-LON), SIN(OBL)*SIN(LOM)+COS(OBL)*SIN(IM)*SIN(LOM-LON))

R2045     WHERE
R2046        LOM=LOM +LOM *T-(A *SIN 2PI*T/27.5545+A *COS(2PI*T/27.5545)+B *SIN 2PI*T/32+B *COS(2PI*T/32)), AND
R2048               0    R     0                    1                     0               1
R2050        LON=LON +LON
R2051               0    R
R2052   A , A , B  AND B  ARE STORED AS AMOD AND BMOD (SEE DESCRIPTION OF CMOD, ABOVE).  COS(OBL), SIN(OBL)*SIN(IM),
R2054    0   1   0      1
R2055   SIN(OBL), AND COS(OBL)*SIN(IM) ARE STORED IN KONMAT AS K1, K2, K3 AND K4, RESPECTIVELY. LOM , LOM , LON , LON
R2057   ARE STORED AS LOMO, LOMR, LONO, AND LONR IN RATESP.                                        0     R     0     R
R2059   THE THREE PHIS ARE STORED AS AARG, BARG, AND CARG(SUN).  ALL CONSTANTS ARE UPDATED BY YEAR.

R2061   CALLING SEQUENCE
```

```
R2062      CALL LSPOS.  RETURN IS VIA CPRET.

R2063    ALARMS OR ABORTS

R2064      NONE

R2065    ERASABLE INITIALIZATION REQUIRED

R2066      TEPHEM - TIME FROM MIDNIGHT 1 JULY PRECEDING THE LAUNCH TO THE TIME OF THE LAUNCH (WHEN THE AGC CLOCK WENT
R2068    TO ZERO). TEPHEM IS TP WITH UNITS OF CENTI-SECONDS.
R2069      TIME2 AND TIME1 ARE IN MPAC AND MPAC +1 WHEN PROGRAM IS CALLED.

R2070    OUTPUT

R2071      UNIT POSITIONAL VECTOR OF SUN IN VSUN.   (SCALED B-1)
R2072      UNIT POSITIONAL VECTOR OF MOON IN VMOON. (SCALED B-1)

R2073    SUBROUTINES USED

R2074      NONE

R2075    DEBRIS

R2076      CURRENT CORE SET,WORK AREA AND FREEFLAG
 2077                            04,3030                          BANK    04
 207701 REF    2  LAST    54     15,2000                          SETLOC  EPHEM
 207702                          15,3646                          BANK

 2078   REF    6  LAST   960     E5,1714                          EBANK=  VSUN
 20785  REF    1                                                  COUNT*  $$/EPHEM
 20786  REF    2  LAST   932     15,3646                 LUNPOS   EQUALS  LSPOS

 2079                            15,3646   54201 0       LSPOS    SETPD   SR
 2080                            15,3647   00001 0                        0
 2082                            15,3650   20617 0                        14D            TP
 2083                            15,3651   56371 1                TAD     DDV
 2084   REF    3  LAST   254     15,3652   01707 0                        TEPHEM         TIME OF LAUNCH
 2086  *REF    1                 15,3653   32001 1                        CSTODAY        24 HOURS-8640000 CENTI-SECS/DAY B-32
 2087   REF    1                 15,3654   00031 0                STORE   TIMEP          T IN DAYS
 2088                            15,3655   77170 1                AXT,1   AX1,2
 2089                            15,3656   00000 1                        0
 2090                            15,3657   00000 1                        0
 2091                            15,3660   77614 1                CLEAR
 2092   REF   10  LAST   969     15,3661   00274 0                        FREEFLAG       SWITCH BIT
 2093                            15,3662   77745 1       POSITA   DLOAD
 2094   REF    1                 15,3663   12004 0                        KONMAT +2      ZEROS
 2095   REF    1                 15,3664   00027 1                STORE   GTMP
 2096                            15,3665   40745 0       POSITB   DLOAD   DMP*
 2097   REF    2  LAST   983     15,3666   00031 0                        TIMEP          T
 2098   REF    1                 15,3667   12030 1                        VAL67 +4,1     1/27 OR 1/32 OR 1/365
 2099                          15,3670   42661 0           SL      DAD*
 2100  *                       15,3671   20212 1                   9D
 2101  REF   2  LAST   983     15,3672   12026 0                   VAL67 +2,1       AARG
 2102                          15,3673   40756 1           SIN     DMP*             SIN(T/27+PHI) OR T/32 OR T/365
 2103  REF   3  LAST   984     15,3674   12024 1                   VAL67,1          (A0**2+A1**2)**1/2SIN(X+PHIA)
 2104                          15,3675   62015 1           DAD     INCR,1           PLUS
 2105  REF   2  LAST   983     15,3676   00027 1                   GTMP             (B0**2+B1**2)**1/2SIN(X+PHIB)
 2106                          15,3677   77771 0           DEC     -6
 2107  REF   3  LAST   984     15,3700   00027 1           STORE   GTMP             OR (C0**2+C1**2)**1/2SIN(X+PHIC)
 2108                          15,3701   77614 1           BOFSET
 2109  REF  11  LAST   983     15,3702   00054 0                   FREEFLAG
 2110  REF   1                 15,3703   33665 1                   POSITB
 2111                          15,3704   40745 0  POSITD   DLOAD   DMP*
 2112  REF   3  LAST   983     15,3705   00031 0                   TIMEP            T
 2113  REF   1                 15,3706   67752 0                   RATESP,2         LOMR,LOSR,LONR
 2114                          15,3707   42661 0           SL      DAD*
 2115  *                       15,3710   20207 0                   6D
 2116  REF   2  LAST   984     15,3711   67744 1                   RATESP +6,2      LOMO,LOSO,LONO
 2117                          15,3712   77625 0           DSU
 2118  REF   4  LAST   984     15,3713   00027 1                   GTMP
 2119  REF   1                 15,3714   10021 0           STORE   STMP,2           LOM,LOS,LON
 2120                          15,3715   63135 0           SLOAD   INCR,2
 2121  REF  17  LAST   962     15,3716   00050 1                   X2
 2122                          15,3717   77775 1           DEC     -2
 2123                          15,3720   53015 0           DAD     BZE
 2124  REF   1                 15,3721   32003 0                   RCB-13           PLUS 2
 2125  REF   1                 15,3722   33752 1                   POSITE           2ND
 2126                          15,3723   77644 1           BPL
 2127  REF   1                 15,3724   33662 0                   POSITA           1ST
 2128                          15,3725   45345 1  POSITF   DLOAD   DSU              3RD
 2129  REF   2  LAST   984     15,3726   00021 1                   STMP             LOM
 2130  REF   3  LAST   984     15,3727   00025 0                   STMP +4          LON
 2131                          15,3730   65356 1           SIN     PDDL             SIN(LOM-LON)
 2132  REF   4  LAST   984     15,3731   00021 1                   STMP
 2133                          15,3732   65356 1           SIN     PDDL             SIN LOM
 2134  REF   5  LAST   984     15,3733   00021 1                   STMP
 2135                          15,3734   55546 0           COS     VDEF             COS LOM
 2136                          15,3735   53521 1           MXV     UNIT
 2137  REF   2  LAST   983     15,3736   12002 0                   KONMAT           K1,K2,K3,K4,
 2138  REF   8  LAST   932     15,3737   02723 0           STORE   VMOON
 2139                          15,3740   65345 0           DLOAD   PDDL
 2140  REF   3  LAST   984     15,3741   12004 0                   KONMAT +2        ZERO
 2141  REF   6  LAST   984     15,3742   00023 0                   STMP +2
 2142                          15,3743   65356 1           SIN     PDDL             SIN LOS
 2143. REF   7  LAST   984     15,3744   00023 0                   STMP +2
 2144                          15,3745   55546 0           COS     VDEF             COS LOS
 2145                          15,3746   53521 1           MXV     UNIT
 2146  REF   4  LAST   984     15,3747   12002 0                   KONMAT
 2147  REF   7  LAST   983     15,3750   02715 0           STORE   VSUN
 2148                          15,3751   77616 0           RVQ
 2149                               15,3752   77745 1  POSITE    DLOAD
 2150   REF    5  LAST   984        15,3753   12004 0                   KONMAT +2       ZEROS
 2151   REF    5  LAST   984        15,3754   00027 1            STORE  GTMP
 2152                               15,3755   77650 1            GOTO
 2153   REF    1                    15,3756   33704 1                   POSITD
 21536  REF    3  LAST    54        05,2000                      SETLOC EPHEM1
 21537                              05,3507                      BANK

 21538  REF    2 LAST    53 TO    54:     52     52*             COUNT* $$/EPHEM

 2163                                 0020             STMP      EQUALS 16D

 2164                                 0026             GTMP      EQUALS 22D

 2165                                 0030             TIMEP     EQUALS 24D


*** END OF LEMP50S .130 ***
```

```
R0001    PROGRAM NAME- DOWN TELEMETRY PROGRAM
R0002    MOD NO.- 0         TO COMPLETELY REWRITE THE DOWN TELEMETRY PROGRAM AND DOWNLINK ERASABLE DUMP PROGRAM FOR THE
R0004                       PURPOSE OF SAVING APPROXIMATELY 150 WORDS OF CORE STORAGE.
R0006                       THIS CHANGE REQUIRES AN ENTIRELY NEW METHOD OF SPECIFYING DOWNLINK LISTS.REFER TO DOWNLINK
R0008                       LISTS LOG SECTION FOR MORE DETAILS. HOWEVER THIS CHANGE WILL NOT AFFECT THE GROUND PROCESSING
R0010                       OF DOWN TELEMETRY DATA.
R0011    MOD BY-  KILROY, SMITH, DEWITT
R0012    DATE-    02OCT67
R0013    AUTHORS- KILROY, SMITH, DEWITT, DEWOLF, FAGIN
R0014    LOG SECTION- DOWN-TELEMETRY PROGRAM
R0015    FUNCTIONAL DESCRIPTION- THIS ROUTINE IS INITIATED BY TELEMETRY END
R0016             PULSE FROM THE DOWNLINK TELEMETRY CONVERTER. THIS PULSE OCCURS
R0017             AT 50 TIMES PER SEC(EVERY 20 MS) THEREFORE DODOWNTM IS
R0018             EXECUTED AT THESE RATES. THIS ROUTINE SELECTS THE APPROPRIATE
R0019             AGC DATA TO BE TRANSMITTED DOWNLINK AND LOADS IT INTO OUTPUT
R0020             CHANNELS 34 AND 35. THE INFORMATION IS THEN GATED OUT FROM THE
R0021             LGC IN SERIAL FASHION.
R0022             THIS PROGRAM IS CODED FOR A 2 SECOND DOWNLIST. SINCE DOWNRUPTS
R0023             OCCUR EVERY 20MS AND 2 AGC COMPUTER WORDS CAN BE PLACED IN
R0024             CHANNELS 34 AND 35 DURING EACH DOWNRUPT THE PROGRAM IS CAPABLE
R0025             OF SENDING 200 AGC WORDS EVERY 2 SECONDS.
R0026    CALLING SEQUENCE- NONE
R0027             PROGRAM IS ENTERED VIA TCF DODOWNTM WHICH IS EXECUTED AS A
R0028             RESULT OF A DOWNRUPT. CONTROL IS RETURNED VIA TCF RESUME WHICH
R0029             IN EFFECT IS A RESUME.
R0030    SUBROUTINES CALLED- NONE
R0031    NORMAL EXIT MODE- TCF RESUME
R0032    ALARM OR ABORT EXIT MODE- NONE
R0033    RESTART PROTECTION:
R0034             ON A FRESH START AND RESTART THE 'STARTSUB' SUBROUTINE WILL INITIALIZE THE DOWNLIST POINTER(ACTUALLY
R0036             DNTMGOTO) TO THE BEGINNING OF THE CURRENT DOWNLIST(I.E. CURRENT CONTENTS OF DNLSTADR). THIS HAS THE
R0038             EFFECT OF IGNORING THE REMAINDER OF THE DOWNLIST WHICH THE DOWN-TELEMETRY PROGRAM WAS WORKING ON WHEN
R0040             THE RESTART(OR FRESH START) OCCURRED AND RESUME DOWN TELEMETRY FROM THE BEGINNING OF THE CURRENT
R0042             DOWNLIST.
R0043             ALSO OF INTEREST IS THE FACT THAT ON A RESTART THE AGC WILL ZERO DOWNLINK CHANNELS 13, 34 AND 35.
R0047    DOWNLINK LIST SELECTION:
R0048             THE APPROPRIATE DOWNLINK LISTS ARE SELECTED BY THE FOLLOWING:
R0049             1. FRESH START
R0050             2. V37EXXE  WHERE XX = THE MAJOR MODE BEING SELECTED.
R0051             3. UPDATE PROGRAM(P27)
R0052             4.     NON-V37 SELECTABLE TYPE PROGRAMS(E.G. AGS INITIALIZATION(SUNDANCE,LUMINARY) AND P61-P62
R00522                   TRANSITION(COLOSSUS) ETC.).
R00525   DOWNLINK LIST RULES AND LIMITATIONS:
R00526            READ SECTION(S) WHICH FOLLOW 'DEBRIS' WRITEUP.
R0053    OUTPUT-  EVERY 2 SECONDS 100 DOUBLE PRECISION WORDS(I.E. 200 LGC
R0054             COMPUTER WORDS) ARE TRANSMITTED VIA DOWNLINK.
R0055    ERASABLE INITIALIZATION REQUIRED- NONE
R0056             'DNTMGOTO' AND 'DNLSTADR' ARE INITIALIZED BY THE FRESH START PROGRAM.
R0058    DEBRIS(ERASABLE LOCATIONS DESTROYED BY THIS PROGRAM)-
R0059             LDATALST,DNTMBUFF TO DNTMBUFF +21D,TMINDEX,DNQ.
```

```
R0060
```

```
R0065   DODOWNTM IS ENTERED EVERY 20 MS BY AN INTERRUPT TRIGGERED BY THE
R0066   RECEIPT OF AN ENDPULSE FROM THE SPACECRAFT TELEMETRY PROGRAMMER.

R0067   NOTES REGARDING DOWNLINK LISTS ASSOCIATED WITH THIS PROGRAM:
R0068   1. DOWNLISTS. - DOWNLISTS MUST BE COMPILED IN THE SAME BANK AS THE
R0069      DOWN-TELEMETRY PROGRAM. THIS IS DONE FOR EASE OF CODING, FASTER
R0070      EXECUTION.
R0075   2. EACH DOWNLINK LIST CONSISTS OF A CONTROL LIST AND A NUMBER OF
R0076      SUBLISTS.
R0077   3. A SUBLIST REFERS TO A SNAPSHOT OR DATA COMMON TO THE SAME OR OTHER
R0078      DOWNLINK LISTS.  ANY SUBLIST CONTAINING COMMON DATA NEEDS TO BE
R0079      CODED ONLY ONCE FOR THE APPLICABLE DOWNLINK LISTS.
R0080   4. SNAPSHOT SUBLISTS REFER SPECIFICALLY TO HOMOGENOUS DATA WHICH MUST BE
R0081      SAVED IN A BUFFER DURING ONE DOWNRUPT.
R0082   5. THE 1DNADR FOR THE 1ST WORD OF SNAPSHOT DATA IS FOUND AT THE END
R0083      OF EACH SNAPSHOT SUBLIST, SINCE THE PROGRAM CODING SENDS THIS DP WORD
R0084      IMMEDIATELY AFTER STORING THE OTHERS IN THE SNAPSHOT BUFFER.
R0085   6. ALL LISTS ARE COMBINATIONS OF CODED ERASABLE ADDRESS CONSTANTS
R0086      CREATED FOR THE DOWNLIST PROGRAM.
R0087      A. 1DNADR                 1-WORD DOWNLIST ADDRESS.
R0088           SAME AS ECADR, BUT USED WHEN THE WORD ADDRESSED IS THE LEFT
R0089           HALF OF A DOUBLE-PRECISION WORD FOR DOWN TELEMETRY.
R0090      B. 2DNADR - 6DNADR        N-WORD DOWNLIST ADDRESS, N = 2 - 6.
R0091           SAME AS 1DNADR, BUT WITH THE 4 UNUSED BITS OF THE ECADR FORMAT
R0092           FILLED IN WITH 0001-0101.  USED TO POINT TO A LIST OF N DOUBLE-
R0093           PRECISION WORDS, STORED CONSECUTIVELY, FOR DOWN TELEMETRY.
R0094      C. DNCHAN                 DOWNLIST CHANNEL ADDRESS.
R0095           SAME AS 1DNADR, BUT WITH PREFIX BITS 0111.  USED TO POINT TO
R0096           A PAIR OF CHANNELS FOR DOWN TELEMETRY.
R0097      D. DNPTR                  DOWN TELEMETRY SUBLIST POINTER.
R0098       SAME AS CAF BUT TAGGED AS A CONSTANT. USED IN CONTROL LIST TO POINT TO A SUBLIST.
R0100       CAUTION--- A DNPTR CANNOT BE USED IN A SUBLIST.
R0101   7. THE WORD ORDER CODE IS SET TO ZERO AT THE BEGINNING OF EACH DOWNLIST (I.E. CONTROL LIST) AND WHEN
R0103      A '1DNADR TIME2' IS DETECTED IN THE CONTROL LIST(ONLY).
R0104   8. IN THE SNAPSHOT SUBLIST ONLY, THE DNADR'S CANNOT POINT TO THE FIRST WORD OF ANY EBANK.

R0106   DOWNLINK LIST RESTRICTIONS:
R0107     (THE FOLLOWING POINTS MAY BE LISTED ELSEWHERE BUT ARE LISTED HERE SO  IT IS CLEAR THAT THESE THINGS CANNOT BE
R0109     DONE)

R0110   1. SNAPSHOT DOWNLIST:
R0111     (A) CANNOT CONTAIN THE FOLLOWING ECADRS(I.E. 1DNADR'S): 0, 400, 1000, 1400, 2000, 2400, 3000, 3400.
R0113     (B) CAN CONTAIN ONLY 1DNADR'S

R0114   2. ALL DOWNLINKED DATA(EXCEPT CHANNELS) IS PICKED UP BY A <DCA<SO DOWNLINK LISTS CANNOT CONTAIN THE
R0116      EQUIVALENT OF THE FOLLOWING ECADRS(I.E. 1DNADRS): 377, 777, 1377, 1777, 2377, 27777, 3377, 3777.

R0118      (NOTE: THE TERM EQUIVALENT ' MEANT THAT THE 1DNADR  TO 6DNADR  WILL BE PROCESSED LIKE 1 TO 6 ECADRS)

R0120   3. CONTROL LISTS AND SUBLISTS CANNOT HAVE ENTRIES = OCTAL 00000 OR OCTAL 77777
```

```
R0122   4. THE 'IDNADR TIME2' WHICH WILL CAUSE THE DOWNLINK PROGRAM TO SET THE WORDER CODE TO 3 MUST APPEAR IN THE
R0124      CONTROL SECTION OF THE DOWNLIST.

R0125   5. 'DNCHAN 0' CANNOT BE USED.

R0126   6. 'DNPTR 0' CANNOT BE USED.

R0127   7. DNPTR CANNOT APPEAR IN A SUBLIST.

R0128


R0129   EBANK SETTINGS
R0130              IN THE PROCESS OF SETTING THE EBANK(WHEN PICKING UP DOWNLINK DATA) THE DOWN TELEMETRY PROGRAM PUTS
R0132              'GARBAGE' INTO BITS15-12 OF EBANK. HUGH BLAIR-SMITH WARNS US THAT BITS15-12 OF EBANK MAY BECOME
R0134              SIGNIFICANT SOMEDAY IN THE FUTURE. IF/WHEN THAT HAPPENS, THE PROGRAM SHOULD INSURE(BY MASKING ETC.)
R0136              THAT BITS15-12 OF EBANK ARE ZERO.
R0137   INITIALIZATION REQUIRED- TO INTERRUPT CURRENT LIST AND START A NEW ONE..
R0138        1.    ADRES OF DOWNLINK LIST INTO DNLSTADR
R0139        2.    NEGONE INTO SUBLIST
R0140        3.    NEGONE INTO DNECADR

 0142                          22,3712                        BANK    22
 0143   REF   2  LAST  204     05,2000                        SETLOC  DOWNTELM
 0144                          05,3507                        BANK

 0145   REF  18  LAST  216        0340                        EBANK=  DNTMBUFF

 0146   REF   1                                               COUNT*  $$/DPROG
 0147   REF   5  LAST  822     05,3507  54 016 1  DODOWNTM  TS      BANKRUPT
 0148                          05,3510  0 0006 1            EXTEND
 0149   REF   5  LAST  822     05,3511  22 012 1            QXCH    QRUPT             SAVE Q
 0150   REF  29  LAST  974     05,3512  3 4736 1            CA      BIT7              AT THE BEGINNING OF THE LIST THE WORD
 01502                         05,3513  0 0006 1            EXTEND                    ORDER BIT WILL BE SET BACK TO ZERO.
 01503  REF  15  LAST  823     05,3514  02 013 1            RAND    CHAN13
 01504  REF 286  LAST  981     05,3515  10 000 0            CCS     A
 01505  REF   4  LAST  300     05,3516  0 0335 1            TC      DNTMGOTO
 015055 REF   6  LAST  823     05,3517  0 6040 0            TC      C13STALL
 01506  REF  30  LAST  989     05,3520  3 4736 1            CA      BIT7
 0151                          05,3521  0 0006 1            EXTEND                    SET WORD ORDER BIT TO 1 ONLY IF IT
 0152   REF  16  LAST  989     05,3522  05 013 0            WOR     CHAN13            ALREADY ISN'T.
 0153   REF   5  LAST  989     05,3523  0 0335 1            TC      DNTMGOTO          GO TO APPROPRIATE PHASE OF PROGRAM

 01532  REF   3  LAST  985     05,2000                        SETLOC  DOWNTELM
 01534                         05,3524                        BANK

 0154   REF   3  LAST  575     05,3524  3 7770 0  DNPHASE1  CA      NEGONE            INITIALIZE ALL CONTROL WORDS
 0155   REF   2  LAST  102     05,3525  54 337 1            TS      SUBLIST           WORDS TO MINUS ONE
 0156   REF   4  LAST  102     05,3526  54 336 0            TS      DNECADR
 0157   REF   1                05,3527  3 3654 0            CA      LDNPHAS2          SET DNTMGOTO =0 ALL SUBSEQUENT DOWNRUPTS
```

```
REF   6  LAST  989    05,3530   54 335 0            TS      DNTMGOTO         GO TO DNPHASE2
REF   1               05,3531   1 3545 1            TCF     NEWLIST
REF   5  LAST  989    05,3532   10 336 0  DNPHASE2  CCS     DNECADR          SENDING OF DATA IN PROGRESS
REF   1               05,3533   0 3667 0  DODNADR   TC      FETCH2WD         YES - THEN FETCH THE NEXT 2 SP WORDS
REF  29  LAST  925    05,3534    77753 0  MINTIME2-1DNADR   TIME2            NEGATIVE OF TIME2 1DNADR
                      05,3535   1 3536 0            TCF     +1               (ECADR OF  3776 + 74001 = 77777)

REF   3  LAST  989    05,3536   10 337 1            CCS     SUBLIST          IS THE SUBLIST IN CONTROL
REF   1               05,3537   1 3702 0            TCF     NEXTINSL         YES
                      05,3540    74001 0  DNADRDCR  OCT     74001            DNADR COUNT AND ECADR DECREMENTER

REF   2  LAST  102    05,3541   3 0334 0  CHKLIST   CA      CTLIST
                      05,3542   0 0006 1            EXTEND
REF   2  LAST  990    05,3543   6 3545 0            BZMF    NEWLIST          IT WILL BE NEGATIVE AT END OF LIST
REF   1               05,3544   1 3552 1            TCF     NEXTINCL
REF   8  LAST  241    05,3545   50 333 1  NEWLIST   INDEX   DNLSTCOD
REF   1               05,3546   3 2446 0            CA      DNTABLE          INITIALIZE CTLIST WITH
REF   3  LAST  990    05,3547   54 334 1            TS      CTLIST             STARTING ADDRESS OF NEW LIST
REF   9  LAST  990    05,3550   4 0333 0            CS      DNLSTCOD
REF   1               05,3551   1 3771 1            TCF     SENDID +3
REF   4  LAST  990    05,3552   50 334 0  NEXTINCL  INDEX   CTLIST
                      05,3553   3 0000 1            CA      0
REF 287  LAST  989    05,3554   10 000 0            CCS     A
REF   5  LAST  990    05,3555   24 334 0            INCR    CTLIST           SET POINTER TO PICK UP NEXT CTLIST WORD
                      05,3556   1 3562 1            TCF     +4               ON NEXT ENTRY TO PROG. (A SHOULD NOT =0)
REF   6  LAST  990    05,3557   56 334 0            XCH     CTLIST           SET CTLIST TO NEGATIVE AND PLACE(CODING)
                      05,3560   4 0000 0            COM                      UNCOMPLEMENTED DNADR INTO A.    (FOR LA)
REF   7  LAST  990    05,3561   56 334 0            XCH     CTLIST                                           (ST IN )
REF 288  LAST  990    05,3562   24 000 1    +4      INCR    A                                                (CTLIST)
REF   6  LAST  990    05,3563   54 336 0            TS      DNECADR          SAVE DNADR
REF   1               05,3564   6 3534 0            AD      MINTIME2         TEST FOR TIME2 (NEG. OF ECADR)
REF 289  LAST  990    05,3565   10 000 0            CCS     A
REF   1               05,3566   1 3572 0            TCF     SETWO +1         DON'T SET WORD ORDER CODE
                      05,3567    47777 0  MINB1314  OCT     47777            MINUS BIT 13 AND 14  (CAN'T GET HERE)
REF   2  LAST  990    05,3570   1 3572 0            TCF     SETWO +1         DON'T SET WORD ORDER CODE
REF   1               05,3571   0 3614 1  SETWO     TC      WOZERO           GO SET WORD ORDER CODE TO ZERO.
REF   7  LAST  990    05,3572   3 0336 1    +1      CA      DNECADR          RELOAD A WITH THE DNADR.
REF   1               05,3573   6 3567 0    +2      AD      MINB1314         IS THIS A REGULAR DNADR?
                      05,3574   0 0006 1            EXTEND
REF   2  LAST  990    05,3575   6 3667 0            BZMF    FETCH2WD         YES. (A MUST NEVER BE ZERO)
REF   1               05,3576   6 7762 0            AD      MINB12           NO- IS IT A POINTER (DNPTR) OR A
                      05,3577   0 0006 1            EXTEND                       CHANNEL(DNCHAN)
REF   1               05,3600   6 3625 0            BZMF    DODNPTR          IT'S A POINTER. (A MUST NEVER BE ZERO)

                      05,3601   0 0006 1  DODNCHAN  TC      6                (EXECUTED AS EXTEND) IT S A CHANNEL
REF   8  LAST  990    05,3602   50 336 1            INDEX   DNECADR
                      05,3603   44 000 1            INDEX   0 -4000          (EXECUTED AS READ)
REF 183  LAST  959    05,3604   54 001 1            TS      L
                      05,3605   0 0006 1            TC      6                (EXECUTED AS EXTEND)
REF   9  LAST  990    05,3606   50 336 1            INDEX   DNECADR
```

```
 0206                              05,3607  43'777 1            INDEX  0 -4001        (EXECUTED AS READ)
 0207    REF  10  LAST  990        05,3610  54 336 0            TS     DNECADR        SET DNECADR
 0208    REF   4  LAST  989        05,3611  3 7770 0            CA     NEGONE             TO MINUS
 0209    REF  11  LAST  991        05,3612  56 336 1            XCH    DNECADR                 WHILE PRESERVING A.
 0210    REF   1                   05,3613  1 3715 0            TCF    DNTMEXIT       GO SEND CHANNELS

 0211                              05,3614  0 0006 1  WOZERO    EXTEND
 02111   REF   1                   05,3615  23'265 1            QXCH   C13QSAV
 021115  REF  22  LAST  817        05,3616  22 070 0            LXCH   RUPTREG1
 02112   REF   7  LAST  989        05,3617  0 6040 0            TC     C13STALL

 021125  REF  23  LAST  991        05,3620  22 070 0            LXCH   RUPTREG1
 02113   REF  31  LAST  989        05,3621  4 4736 0            CS     BIT7
 0212                              05,3622  0 0006 1            EXTEND
 0213    REF  17  LAST  989        05,3623  03 013 0            WAND   CHAN13         SET WORD ORDER CODE TO ZERO
 0214    REF   2  LAST  991        05,3624  0 1265 1            TC     C13QSAV

 0215    REF  12  LAST  991        05,3625  50 336 1  DODNPTR   INDEX  DNECADR        DNECADR CONTAINS ADRES OF SUBLIST
 0216                              05,3626  0 0000 1            0      0              CLEAR AND ADD LIST ENTRY INTO A.
 0217    REF 290  LAST  990        05,3627  10 000 0            CCS    A              IS THIS A SNAPSHOT SUBLIST
 0218    REF  13  LAST  991        05,3630  3 0336 1            CA     DNECADR        NO, IT IS A REGULAR SUBLIST.
 0219    REF   1                   05,3631  1 3701 0            TCF    DOSUBLST       A MUST NOT BE ZERO.

 0220    REF  14  LAST  991        05,3632  56 336 1            XCH    DNECADR        YES, IT IS A SNAPSHOT SUBLIST.
 0221    REF   4  LAST  990        05,3633  54 337 1            TS     SUBLIST        C(DNECADR) INTO SUBLIST
 0222    REF 190  LAST  974        05,3634  3 4746 0            CAF    ZERO                A    INTO    A
 0223    REF   1                   05,3635  56 336 1            XCH    TMINDEX        (NOTE.. TMINDEX = DNECADR)

R0224    THE FOLLOWING CODING (FROM SNAPLOOP TO SNAPEND)IS FOR THE PURPOSE OF TAKING A SNAPSHOT OF 12 DP REGISTERS.
R0226    THIS IS DONE BY SAVING 11 DP REGISTERS IN DNTMBUFF AND SENDING THE FIRST DP WORD IMMEDIATELY.
R0228    THE SNAPSHOT PROCESSING IS THE MOST TIME CONSUMING AND THEREFORE THE CODING AND LIST STRUCTURE WERE DESIGNED
R0230    TO MINIMIZE TIME. THE TIME OPTIMIZATION RESULTS IN RULES UNIQUE TO THE SNAPSHOT PORTION OF THE DOWNLIST.
R0232    THESE RULES ARE......
R0233                1.    ONLY 1DNADR'S CAN APPEAR IN THE SNAPSHOT SUBLIST
R0234                2.    THE 1DNADR'S CANNOT REFER TO THE FIRST LOCATION IN ANY  BANK.

 0236    REF  61  LAST  955        05,3636  54 003 0  SNAPLOOP  TS     EBANK          SET EBANK
 0237    REF   5  LAST  792        05,3637  7 4350 1            MASK   LOW8           ISOLATE RELATIVE ADDRESS
 0238                              05,3640  0 0006 1            EXTEND
 0239    REF 291  LAST  991        05,3641  5 0000 1            INDEX  A
 0240                              E3,1401                      EBANK= 1401
 0241                              05,3642  3 1402 0            DCA    1401           PICK UP 2 SNAPSHOT WORDS.
 0242    REF  19  LAST  959           0340                      EBANK= DNTMBUFF
 0243    REF   2  LAST  991        05,3643  50 336 1            INDEX  TMINDEX
 0244    REF  20  LAST  991        05,3644  52 341 0            DXCH   DNTMBUFF       STORE 2 SNAPSHOT WORDS IN BUFFER
 0245    REF   3  LAST  991        05,3645  24 336 1            INCR   TMINDEX        SET BUFFER INDEX FOR NEXT 2 WORDS.
 0246    REF   4  LAST  991        05,3646  24 336 1            INCR   TMINDEX
 0247    REF   5  LAST  991        05,3647  24 337 0  SNAPAGN   INCR   SUBLIST        SET POINTER TO NEXT 2 WORDS OF SNAPSHOT
 0248   REF   6  LAST  991   05,3650  50 337 0            INDEX  SUBLIST
 0249                        05,3651  0 0000 1            0      0                 = CA SSSS (SSSS = NEXT ENTRY IN SUBLIST)
 0250   REF 292  LAST  991   05,3652  10 000 0            CCS    A                 TEST FOR LAST TWO WORDS OF SNAPSHOT.
 0251   REF   1              05,3653  1 3636 0            TCF    SNAPLOOP          NOT LAST TWO.
 0252   REF   1              05,3654   03532 0  LDNPHAS2  GENADR DNPHASE2
 0253   REF   7  LAST  992   05,3655  54 337 1            TS     SUBLIST           YES, LAST.  SAVE A.
 0254   REF   5  LAST  991   05,3656  3 7770 0            CA     NEGONE            SET DNECADR AND
 0255   REF  15  LAST  991   05,3657  54 336 0            TS     DNECADR               SUBLIST POINTERS
 0256   REF   8  LAST  992   05,3660  56 337 0            XCH    SUBLIST                   TO NEGATIVE VALUES.
 0257   REF  62  LAST  991   05,3661  54 003 0            TS     EBANK
 0258   REF   6  LAST  991   05,3662  7 4350 1            MASK   LOW8
 0259                        05,3663  0 0006 1            EXTEND
 0260   REF 293  LAST  992   05,3664  5 0000 1            INDEX  A
 0261                        E3,1401                      EBANK= 1401
 0262                        05,3665  3 1402 0            DCA    1401              PICK UP FIRST 2 WORDS OF SNAPSHOT.
 0263   REF  21  LAST  991     0340                       EBANK= DNTMBUFF
 0264   REF   2  LAST  991   05,3666  1 3715 0  SNAPEND   TCF    DNTMEXIT             NOW GO SEND THEM.

 0265   REF  16  LAST  992   05,3667  3 0336 1  FETCH2WD  CA     DNECADR
 0266   REF  63  LAST  992   05,3670  54 003 0            TS     FBANK             SET EBANK
 0267   REF   7  LAST  992   05,3671  7 4350 1            MASK   LOW8              ISOLATE RELATIVE ADDRESS
 0268   REF 184  LAST  990   05,3672  54 001 1            TS     L
 0269   REF   1              05,3673  3 3540 0            CA     DNADRDCR          DECREMENT COUNT AND ECADR
 0270   REF  17  LAST  992   05,3674  26 336 0            ADS    DNECADR
 0271                        05,3675  0 0006 1            EXTEND
 0272   REF 185  LAST  992   05,3676  5 0001 0            INDEX  L
 0273                        E3,1400                      EBANK= 1400
 0274                        05,3677  3 1401 0            DCA    1400              PICK UP 2 DATA WORDS
 0275   REF  22  LAST  992     0340                       EBANK= DNTMBUFF
 0276   REF   3  LAST  992   05,3700  1 3715 0            TCF    DNTMEXIT             NOW GO SEND THEM.

 0277   REF   9  LAST  992   05,3701  54 337 1  DOSUBLST  TS     SUBLIST           SET SUBLIST POINTER
 0278   REF  10  LAST  992   05,3702  50 337 0  NEXTINSL  INDEX  SUBLIST
 0279                        05,3703  0 0000 1            0      0                 = CA SSSS (SSSS = NEXT ENTRY IN SUBLIST)
 0280   REF 294  LAST  992   05,3704  10 000 0            CCS    A                 IS IT THE END OF THE SUBLIST
 0281   REF  11  LAST  992   05,3705  24 337 0            INCR   SUBLIST           NO-
 0282                        05,3706  1 3712 1            TCF    +4
 0283   REF  12  LAST  992   05,3707  54 337 1            TS     SUBLIST           SAVE A.
 0284   REF   6  LAST  992   05,3710  3 7770 0            CA     NEGONE            SET SUBLIST TO MINUS
 0285   REF  13  LAST  992   05,3711  56 337 0            XCH    SUBLIST           RETRIEVE A.
 0286   REF 295  LAST  992   05,3712  24 000 1    +4      INCR   A
 0287   REF  18  LAST  992   05,3713  54 336 0            TS     DNECADR           SAVE DNADR
 0288   REF   3  LAST  990   05,3714  1 3573 1            TCF    SETWO +2          GO USE COMMON CODING(PROBLEMS WOULD
A0289                                                                              OCCUR IF THE PROGRAM ENCOUNTERED A
A0290                                                                              DNPTR NOW)

 0291                        05,3715  0 0006 1  DNTMEXIT  EXTEND                   DOWN-TELEMETRY EXIT
 0292   REF   1              05,3716  01 034 1            WRITE  DNTM1             TO SEND A + L TO CHANNELS 34 + 35
 0293   REF 186  LAST  992   05,3717  3 0001 0            CA     L                 RESPECTIVELY
 0294                        05,3720  0 0006 1  TMEXITL   EXTEND
 0295    REF    1                  05,3721  01 035 0           WRITE  DNTM2
 0296    REF   19  LAST  822       05,3722  1 5272 1  TMRESUME TCF    RESUME            EXIT TELEMETRY PROGRAM VIA RESUME.

 0297    REF    2  LAST  544          7762            MINB12   EQUALS -1/8
```

```
P0301    SUBROUTINE NAME- DNDUMP
R0302    FUNCTIONAL DESCRIPTION - TO SEND (DUMP) ALL 8 BANKS OF ERASABLE STORAGE TWICE.  BANKS ARE SENT ONE AT A TIME
R0304              EACH BANK IS PRECEEDED BY AN ID WORD, SYNCH BITS, ECADR AND TIME1 FOLLOWED BY THE 256D WORDS OF EACH
P0306              EBANK. EBANKS ARE DUMPED IN ORDER(I.E. EBANK 0 FIRST, THEN EBANK1 ETC.)
R0308    CALLING SEQUENCE- THE GROUND OR ASTRONAUT BY KEYING V74E CAN INITIALIZE THE DUMP.
R0310              AFTER KEYING IN V74E THE CURRENT DOWNLIST WILL BE IMMEDIATELY TERMINATED AND THE DOWNLINK ERASABLE DUMP
R0312              WILL BEGIN.
R0313              ONCE INITIATED THE DOWNLINK ERASABLE DUMP CAN BE TERMINATED (AND INTERRUPTED DOWNLIST REINSTATED) ONLY
R0315              BY THE FOLLOWING:
R0316               1. A FRESH START
R0317               2. COMPLETION OF BOTH COMPLETE DUMPS
R0320               3. AND INVOLUNTARILY BY A RESTART.
R0321    NORMAL EXIT MODE- TCF DNPHASE1
R0322    ALARM OR ABORT MODE- NONE
R0323    *SUBROUTINES CALLED- NONE.
R0324    ERASABLE INITIALIZATION REQUIRED-
R0325              NONE
R0328    DEBRIS- DUMPLOC, DUMPSW, DNTMGOTC, EBANK AND CENTRAL REGISTERS
R0329    TIMING-    TIME(IN SECS) = ((NO.DUMPS)*(NO.EBANKS)* (WDSPEREBANK + NO.IDWDS)) / NO.WDSPERSEC
R0331               TIME(IN SECS) =  (    4     )*(     8     )* (     256      +      4    )  /      100
R0333          THUS TIME(IN SECS TO SEND DUMP OF ERASABLE 4 TIMES VIA DOWNLINK) = 83.2 SECONDS

R0335    STRUCTURE OF ONE EBANK AS IT IS SENT BY DOWNLINK PROGRAM-
R0336       (REMINDER-THIS ONLY DESCRIBES ONE OF THE 8 EBANKS X 4 (DUMPS) = 32 EBANKS WHICH WILL BE SENT BY DNDUMP)
R0338            DOWNLIST                                       W
R0339              WORD   TAKEN FROM CONTENTS OF    EXAMPLE 0  COMMENTS

R0340                1    ERASID                      0177X  0  DOWNLIST I.D. FOR DOWNLINK ERASABLE DUMP (X=7 CSM, 6 LM)
R0342                2    LOWIDCOD                    77340  1  DOWNLINK SYNCH BITS.(SAME ONE USED IN ALL OTHER DOWNLISTS)
R0344                3    DUMPLOC                     13400  1  (SEE NOTES ON DUMPLOC)1= 3RD ERAS DUMP, 3400=ECADR OF 5TH WD
R0346                4    TIME1                       14120  1  TIME IN CENTISECONDS
R0347                5    FIRST WORD OF EBANK X       03400  1  IN THIS EXAMPLE THIS WORD = CONTENTS OF E7,1400 (ECADR 3400)
R0349                6    2ND   WORD OF EBANK X       00142  1  IN THIS EXAMPLE THIS WORD = CONTENTS OF E7,1401 (ECADR 3401)
R0351                7    3RD   WORD OF EBANK X       00142  1  IN THIS EXAMPLE THIS WORD = CONTENTS OF E7,1402 (ECADR 3402)
R0353                .                                       1
R0354                .                                       1
R0355                .                                       1
R0356              260D   256TH WORD OF EBANK X       03777  1  IN THIS EXAMPLE THIS WORD = CONTENTS OF E7,1777 (ECADR 3777)

R0358    NOTE- DUMPLOC CONTAINS THE COUNTER AND ECADR FOR EACH WORD BEING SENT.
R0359           THE BIT STRUCTURE OF DUMPLOC IS FOLLOWS---
R0360                                                 X = NOT USED
R0361              X ABC EEE RRRRRRRR           ABC = ERASABLE DUMP COUNTER(I.E. ABC = 0,1,2 OR 3 WHICH MEANS THAT
R0363                                                   COMPLETE ERASABLE DUMP NUMBER  1,2,3 OR 4 RESPECTIVELY IS IN PROGRESS)
R0365                                           EEE = EBANK BITS
R0366                                      RRRRRRRR = RELATIVE ADDRESS WITHIN AN EBANK.

 0368    REF 191  LAST  991   05,3723  3 4746 0  DNDUMPI  CA      ZERO              INITIALIZE DOWNLINK
 0369    REF   1              05,3724  54 336 0           TS      DUMPLOC           ERASABLE DUMP
 0370    REF   2  LAST  990   05,3725  0 3766 0   +2      TC      SENDID            GO SEND ID AND SYNCH BITS
```

```
0371  REF   1                 05,3726  3 3735 0            CA       LDNDUMP1       SET DNTMGOTO
0372  REF   7  LAST  990      05,3727  54 335 0            TS       DNTMGOTO       TO LOCATION FOR NEXT PASS
0373  REF  23  LAST  949      05,3730  3 0025 0            CA       TIME1          PLACE TIME1
0374  REF 187  LAST  992      05,3731  56 001 0            XCH      L              INTO L
0375  REF   2  LAST  994      05,3732  3 0336 1            CA       DUMPLOC        AND ECADR OF THIS FBANK INTO A
0376  REF   4  LAST  992      05,3733  1 3715 0            TCF      DNTMEXIT       SEND DUMPLOC AND TIME1

0377  REF   1                 05,3734   03736 0  LDNDUMP   ADRES    DNDUMP
0378  REF   1                 05,3735   03750 0  LDNDUMP1  ADRES    DNDUMP1

0379  REF  61  LAST  915      05,3736  3 4743 0  DNDUMP    CA       TWO            INCREMENT ECADR IN DUMPLOC
0380  REF   3  LAST  995      05,3737  26 336 0            ADS      DUMPLOC        TO NEXT DP WORD TO BE
0381  REF   8  LAST  992      05,3740  7 4350 1            MASK     LOW8           DUMPED AND SAVE IT.
0382  REF 296  LAST  992      05,3741  10 000 0            CCS      A              IS THIS THE BEGINNING OF A NEW EBANK
0383  REF   1                 05,3742  1 3752 0            TCF      DNDUMP2        NO- THEN CONTINUE DUMPING
0384  REF   4  LAST  995      05,3743  3 0336 1            CA       DUMPLOC        YES- IS THIS THE END OF THE
0385  REF  35  LAST  955      05,3744  7 4730 0            MASK     BIT13          SECOND COMPLETE ERASABLE DUMP?
0386                          05,3745  0 0006 1            EXTEND
0387  REF   2  LAST  300      05,3746  1 3725 0            BZF      DNDUMPI +2     NO - GO BACK AND INITIALIZE NEXT BANK
0390  REF   2  LAST  234      05,3747  1 3524 0            TCF      DNPHASE1       YES - SEND DOWNLIST AGAIN
0391  REF   1                 05,3750  3 3734 1  DNDUMP1   CA       LDNDUMP        SET DNTMGOTO
0392  REF   8  LAST  995      05,3751  54 335 0            TS       DNTMGOTO       FOR WORDS 3 TO 256D OF CURRENT FBANK

0393  REF   5  LAST  995      05,3752  3 0336 1  DNDUMP2   CA       DUMPLOC
0394  REF  64  LAST  992      05,3753  54 003 0            TS       EBANK          SET EBANK
0395  REF   9  LAST  995      05,3754  7 4350 1            MASK     LOW8           ISOLATE RELATIVE ADDRESS.
0396  REF 226  LAST  921      05,3755  54 002 1            TS       Q              (NOTE: MASK INSTRUCTION IS USED TO PICK
0397  REF  24  LAST  925      05,3756  3 4745 0            CA       NEG0           UP ERASABLE REGISTERS SO THAT EDITING
0398  REF 188  LAST  995      05,3757  54 001 1            TS       L              REGISTERS 20-23 WILL NOT BE ALTERED.)
0399  REF 227  LAST  995      05,3760  50 002 0            INDEX    Q
0400                          E3,1400                      EBANK=   1400           PICK UP LOW ORDER REGISTER OF PAIR
0401                          05,3761  7 1401 1            MASK     1401           OF ERASABLE REGISTERS.
0402  REF 189  LAST  995      05,3762  56 001 0            XCH      L
0403  REF 228  LAST  995      05,3763  50 002 0            INDEX    Q              PICK UP HIGH ORDER REGISTER OF PAIR
0404                          05,3764  7 1400 0            MASK     1400           OF ERASABLE REGISTERS.
0405  REF  23  LAST  992        0340                       EBANK=   DNTMBUFF
0406  REF   5  LAST  995      05,3765  1 3715 0            TCF      DNTMEXIT       GO SEND THEM


0407                          05,3766  0 0006 1  SENDID    EXTEND                  **ENTRANCE USED BY ERASABLE DUMP PROG.**
0408  REF   9  LAST  995      05,3767  22 335 1            QXCH     DNTMGOTO       SET DNTMGOTO SO NEXT TIME PROG WILL GO
0409  REF   1                 05,3770  3 5002 0            CAF      ERASID         TO LOCATION FOLLOWING :TC SENDID:

0410  REF 190  LAST  995      05,3771  54 001 1            TS       L              **ENTRANCE USED BY REGULAR DOWNLINK PG**
0411  REF   2  LAST  990      05,3772  0 3614 1            TC       WOZERO         GO SET WORD ORDER CODE TO ZERO
0412  REF   1                 05,3773  3 2045 1            CAF      LOWIDCOD       PLACE SPECIAL ID CODE INTO L
0413  REF 191  LAST  995      05,3774  56 001 0            XCH      L              AND ID BACK INTO A
0414  REF   6  LAST  995      05,3775  1 3715 0            TCF      DNTMEXIT       SEND DOWNLIST ID CODE(S).
```

```
R0001           THE FOLLOWING ROUTINE CAN BE USED TO CALL A SUBRCUTINE IN ANOTHER BANK. IN THE BANKCALL VERSION, THF
R0003      CADR OF THE SUBROUTINF IMMEDIATELY FOLLOWS THE  TC BANKCALL  INSTRUCTION, WITH C(A) AND C(L) PRESERVED.

 0005                             4607                          BLOCK  02
 00055  REF   1                                                 COUNT* $$/BANK
 0006   REF   6  LAST  506        4607  52 134 0  BANKCALL DXCH   BUF2                SAVE INCOMING A,L.
 0007   REF 229  LAST  995        4610  50 002 0           INDEX  Q                   RICK UP CADR.
 0008                             4611  3 0000 1           CA     0
 0009   REF 230  LAST  996        4612  24 002 0           INCR   Q                   SO WE RETURN TO THF LOC. AFTER THE CADR.

R0010           SWCALL IS IDENTICAL TO BANKCALL, EXCERT THAT THE CADR ARRIVFS IN A.

 0012   REF 192  LAST  995        4613  54 001 1  SWCALL   TS     L
 0013   REF   4  LAST  578        4614  22 004 0           LXCH   FBANK               SWITCH BANKS, SAVING RETURN.
 0014   REF   8  LAST  746        4615  7 5003 0           MASK   LOW10               GET SUB-ADDRESS OF CADR.
 0015   REF 231  LAST  996        4616  56 002 0           XCH    Q                   A,L NOW CONTAINS DP RETURN.
 0016   REF   7  LAST  996        4617  52 134 0           DXCH   BUF2                RESTORING INRUTS IF THIS IS A BANKCALL.
 0017   REF 232  LAST  996        4620  50 002 0           INDEX  Q
 0018                             4621  0 2000 0           TC     10000               SETTING Q TO SWRETURN.

 0019   REF   8  LAST  996        4622  56 134 1  SWRETURN XCH    BUF2 +1             COMES HERE TO RETURN TO CALLER. C(A,L)
 0020   REF   5  LAST  996        4623  56 004 0           XCH    FBANK               ARE PRESERVED FOR PETURN.
 0021   REF   9  LAST  996        4624  56 134 1           XCH    BUF2 +1
 0022   REF  10  LAST  996        4625  0 0133 0           TC     BUF2


R0023           THE FOLLOWING ROUTINE CAN BE USED AS A UNILATERAL JUMP WITH C(A,L) RRESERVED AND THE CADR IMMEDIATELY
R0025      FOLLOWING THE TC POSTJUMP INSTRUCTION.

 0026   REF 233  LAST  996        4626  56 002 0  POSTJUMP XCH    Q                   SAVE INCOMING C(A).
 0027   REF 297  LAST  995        4627  50 000 1           INDEX  A                   GET CADR.
 0028                             4630  3 0000 1           CA     0

R0029           BANKJUMP IS THE SAME AS POSTJUMR, EXCEPT THAT THE CADR ARRIVES IN A.

 0031   REF   6  LAST  996        4631  54 004 1  BANKJUMP TS     FBANK
 0032   REF   9  LAST  996        4632  7 5003 0           MASK   LOW10
 0033   REF 234  LAST  996        4633  56 002 0           XCH    Q                   RESTORING INRUT C(A) IF THIS WAS A
 0034   REF 235  LAST  996        4634  50 002 0  Q+10000  INDEX  Q                   POSTJUMP.
 0035                             4635  1 2000 1  RRIO12   TCF    10000               PRIO12 = TCF   10000 = 12000
```

```
P0036            THE FOLLOWING ROUTINE GETS THE RETURN CADR SAVED BY SWCALL OR BANKCALL AND LEAVES IT IN A.

 0038    REF  10  LAST  996       4636  3 5003 1  MAKECADR CAF     LOW10
 0039    REF  11  LAST  996       4637  7 0133 1           MASK    BUF2
 0040    REF  12  LAST  997       4640  6 0134 1           AD      BUF2 +1
 0041    REF 236  LAST  996       4641  0 0002 0           TC      Q


 00465   REF   5  LAST  888       4642  54 135 1  SUPDACAL TS      MPTEMP
 0047    REF   7  LAST  996       4643  56 004 0           XCH     FBANK             SET FBANK FOR DATA.
 00475                            4644  0 0006 1           EXTEND
 0048    REF  11  LAST  571       4645  04 007 1           ROR     SUPERBNK          SAVE EBANK IN BITS 15-11, AND
 00485   REF   6  LAST  997       4646  56 135 0           XCH     MPTEMP             SUPERBANK IN BITS  7-5.
 0049    REF  11  LAST  997       4647  7 5003 0           MASK    LOW10
 00495   REF 193  LAST  996       4650  56 001 0           XCH     L                 SAVE REL. ADR. IN BANK, FETCH SUPERBITS.
 0050                             4651  0 0004 0           INHINT                    BECAUSE RUPT DOES NOT SAVE SUPERBANK.
 00505                            4652  0 0006 1           EXTEND
 0051    REF  12  LAST  997       4653  01 007 1           WRITE   SUPERBNK          SET SUPERBANK FOR DATA.
 0052    REF 194  LAST  997       4654  50 001 0           INDEX   L
 00525                            4655  3 2000 0           CA      10000             PINBALL (FIX MEM DISP) PREVENTS DCA HERE
 0053    REF   7  LAST  997       4656  56 135 0           XCH     MPTEMP            SAVE 1ST WD, FETCH OLD FBANK AND SBANK.
 00534                            4657  0 0006 1           EXTEND
 00535   REF  13  LAST  997       4660  01 007 1           WRITE   SUPERBNK          RESTORE SUPERBANK.
 0054                             4661  0 0003 1           RELINT
 00545   REF   8  LAST  997       4662  54 004 1           TS      FBANK             RESTORE FBANK.
 0055    REF   8  LAST  997       4663  3 0135 0           CA      MPTEMP            RECOVER FIRST WORD OF DATA.
 00555                            4664  0 0002 0           RETURN                    24 WDS. DATACALL 516 MU, SUPDACAL 432 MU
```

```
P0056            THE FOLLOWING ROUTINES ARE IDENTICAL TO BANKCALL AND SWCALL EXCEPT THAT THEY ARE USED IN INTERRUPT.

 0058    REF   5  LAST  818       4665  52 073 1  IBNKCALL DXCH   RUPTREG3         USES RUPTREG3,4 FOR DP RETURN ADDRESS.
 0059    REF 237  LAST  997       4666  50 002 0           INDEX  Q
 0060                             4667  3 0000 1           CAF    0
 0061    REF 238  LAST  998       4670  24 002 0           INCR   Q

 0062    REF 155  LAST  997       4671  54 001 1  ISWCALL  TS     L
 0063    REF   9  LAST  997       4672  22 004 0           LXCH   FBANK
 0064    REF  12  LAST  997       4673  7 5003 0           MASK   LOW10
 0065    REF 239  LAST  998       4674  56 002 0           XCH    Q
 0066    REF   6  LAST  998       4675  52 073 1           DXCH   RUPTREG3
 0067    REF 240  LAST  998       4676  50 002 0           INDEX  Q
 0068                             4677  0 2000 0           TC     10000

 0069    REF   3  LAST   97       4700  56 073 0  ISWRETRN XCH    RUPTREG4
 0070    REF  10  LAST  998       4701  56 004 0           XCH    FBANK
 0071    REF   4  LAST  998       4702  56 073 0           XCH    RUPTREG4
 0072    REF   7  LAST  998       4703  0 0072 1           TC     RUPTREG3

R0090    2. USPRCADR ACCESSES INTERPRETIVE CODING IN OTHER THAN THE USER'S FBANK. THE CALLING SEQUENCE IS AS FOLLOWS:

A0092                                             L        TC     USPRCADR
A0093                                             L+1      CADR   INTPRETX         INTPRETX IS THE INTERPRETIVE CODING
A0094                                                                              RETURN IS TO L+2

 0103    REF   5  LAST  473       4704  54 164 0  USPRCADR TS     LOC              SAVE A
 0104    REF  36  LAST  952       4705  3 4735 1           CA     BIT8
 0105    REF   7  LAST  468       4706  54 023 1           TS     EDOP             EXIT INSTRUCTION TO EDOP
 0106    REF  24  LAST  902       4707  3 0006 1           CA     BBANK
 0107    REF   1                  4710  54 165 1           TS     BANKSET          USER'S BBANK TO BANKSET
 0108    REF 241  LAST  998       4711  50 002 0           INDEX  Q
 0109                             4712  3 0000 1           CA     0
 0110    REF  11  LAST  998       4713  54 004 1           TS     FBANK            INTERPRETIVE BANK TO FBANK
 0111    REF  13  LAST  998       4714  7 5003 0           MASK   LOW10            YIELDS INTERPRETIVE RELATIVE ADDRESS
 0112    REF 242  LAST  998       4715  56 002 0           XCH    Q                INTERPRETIVE ADDRESS TO Q, FETCHING L+1
 0113    REF   6  LAST  998       4716  56 164 1           XCH    LOC              L+1 TO LOC, RETRIEVING ORIGINAL A
 0114    REF   1                  4717  1 4634 0           TCF    Q+10000
```

```
P0117   THERE ARE FOUR POSSIBLE SETTINGS FOR CHANNEL 07. (CHANNEL 07 CONTAINS THE SUPERBANK SETTING.)
R0119                                                  PSEUDO-FIXED      OCTAL PSEUDO
R0120   SUPERBANK     SETTING     S-REG. VALUE      BANK NUMBERS      ADDRESSES
R0121   ----------    -------     ------------       ------------      ------------

R0122   SUPERBANK 3     0XX       2000 - 3777         30 - 37         70000 - 107777   (WHERE XX CAN BE ANYTHING AND
R0124                                                                                  WILL USUALLY BE SEEN AS 11)
R0126   SUPERBANK 4     100       2000 - 3777         40 - 47         110000 - 127777  (AS FAR AS IT CAN BE SEEN,
P0128                                                                                  ONLY BANKS 40-43 WILL EVER BE
R0130                                                                                  AND ARE PRESENTLY AVAILABLE)
R0132   SUPERBANK 5     101       2000 - 3777         50 - 57         130000 - 147777  (PRESENTLY NOT AVAILABLE TO
R0134                                                                                  THE USER)
R0136   SUPERBANK 6     110       2000 - 3777         60 - 67         150000 - 167777  (PRESENTLY NOT AVAILABLE TO
R0138                                                                                  THE USER)
R0142   ***  THIS ROUTINE MAYBE CALLED BY ANY PROGRAM LOCATED IN BANKS 00 - 27.  I.E., NO PROGRAM LIVING IN ANY
R0144   SUPERBANK SHOULD USE SUPERSW.  ***

R0145   SUPERSW MAYBE CALLED IN THIS FASHION:

R0146             CAF     ABBCON           WHERE  --  ABBCON   BBCON  SOMETHIN  --
R0147             TCR     SUPERSW          (THE SUPERBNK BITS ARE IN THE BBCON)
R0148             ...       ...
R0149              .         .
R0150              .         .

R0151   OR IN THIS FASHION :

R0152             CAF     SUPERSET         WHERE SUPERSET IS ONE OF THE FOUR AVAILABLE
R0154             TCR     SUPERSW          SUPERBANK BIT CONSTANTS:
R0155             ...       ...                                SUPER011 OCTAL  60
R0157              .         .                                 SUPER100 OCTAL 100
R0159              .         .                                 SUPER101 OCTAL 120
R0161                                                          SUPER110 OCTAL 140

 0163                               4720  0 0006 1  SUPERSW  EXTEND
 0164   REF  14  LAST  997          4721  01 007 1           WRITE   SUPERBNK         WRITE BITS 7-6-5 OF THE ACCUMULATOR INTO
A0165                                                                                 CHANNEL 07
 0166   REF 243  LAST  998          4722  0 0002 0           TC      Q                TC TO INSTRUCTION FOLLOWING
A0167                                                                                   TC  SUPERSW
```

```
L        INTERPRETER                                                                             USER'S PAGE NO.   1      EO S3

R0001    SECTION 1  DISPATCHER

R0002             ENTRY TO THE INTERPRETER. INTPRET SETS LOC TO THE FIRST  INSTRUCTION, BANKSET TO THE BBANK OF THE
R0004    OBJECT INTERPRETIVE PROGRAM, AND INTBIT15 TO THE BIT15 CONTENTS OF FBANK. INTERPRETIVE PROGRAMS MAY BE IN
R0006    VIRTUALLY ALL BANKS PRESENT UNDER ANY SUPER-BANK SETTING, WITH THE RESTRICTION THAT PROGRAMS IN HIGH BANKS
R0008    (BIT15 OF EBANK = 1) DO NOT REFER TO LOWBANKS, AND VICE-VERSA. THE INTERPRETER DOES NOT SWITCH SUPERBANKS.
R0010    E-BANK SWITCHING OCCURS WHENEVER GENERAL ERASABLE (100 - 3777) IS ADDRESSED.


 0012                                 6060                         BLOCK  03

 0013    REF    1                                                  COUNT* $$/INTER
 00135                                6060   0 0003 1   INTPRET    RELINT
 0014                                 6061   0 0006 1              EXTEND                   SET LOC TO THE WORD FOLLOWING THE TC.
 0015    REF    7  LAST   998         6062  22 164  1              QXCH    LOC

 0016    REF   25  LAST   998         6063   3 0006 1    +2        CA      BBANK            INTERPRETIVE BRANCHES FINISH HERE.
 0017    REF    2  LAST   998         6064  54 165  1              TS      BANKSET
 0018    REF   37  LAST   899         6065   7 4726 1              MASK    BIT15            GET 15TH BIT FOR INDEXABLE ADDRESSES.
 0019    REF    4  LAST    98         6066  54 115  0              TS      INTBIT15

 0020    REF    8  LAST   998         6067  54 023  1              TS      EDOP             MAKE SURE NO INSTRUCTIONS LEFT OVER

 0021    REF    1                     6070   1 6111 1              TCF     NEWOPS           PICK UP OP CODE PAIR AND BEGIN.


 0022    REF   26  LAST 1000          6071  22 006  1   INTRSM     LXCH    BBANK            RESUME SUSPENDED INTERPRETIVE JOB
 0023    REF  216  LAST   980         6072   1 6063 0              TCF     INTPRET +3
R0024              DLOAD LOADS MPAC, MPAC +1, LEAVING ZERO IN MPAC +2.

 0025                                 6073   0 0006 1   DLOAD      EXTEND
 0026    REF    4  LAST   918         6074   5 0116 1              INDEX   ADDRWD
 0027                                 6075   3 0001 0              DCA     0                LOAD DP C(C(ADDRWD)) INTO MPAC,MPAX +1
 0028    REF  365  LAST   960         6076  52 155  1   SLOAD2     DXCH    MPAC
 0029    REF  192  LAST   994         6077   3 4746 0              CAE     ZERO             ZERO MPAC +2
```

```
P0030              AT THE END OF MOST INSTRUCTIONS, CONTROL IS GIVEN TO DANZIG TO DISPATCH THE NEXT OPERATION.

 0032   REF 366  LAST 1000      6100  54 156 1            TS       MPAC +2          AND DECLARE OP MODE

 0033   REF  10  LAST  827      6101  54 163 1  NEWMODE   TS       MODE             PROLOGUE FOR MODE-CHANGING INSTRUCTIONS.

 0034   REF   3  LAST 1000      6102  3 0165 0  DANZIG    CA       BANKSET          SET BBANK BEFORE TESTING NEWJOB SO THAT
 0035   REF  27  LAST 1000      6103  54 006 0            TS       BBANK            IT MAY BE SAVED DIRECTLY BY CHANJOB.

 0036   REF   9  LAST 1000      6104  10 023 1  NOIBNKSW  CCS      EDOP             SEE IF AN ORDER CODE IS LEFT OVER FROM
 0037   REF   1                 6105  1 6120 0            TCF      OPJUMP           THE LAST PAIR RETRIEVED. IF SO, EXECUTE.
A0038                                                                               EDOP IS SET TO ZERO ON ITS RE-EDITING.

 0039   REF   7  LAST  889      6106  10 067 1            CCS      NEWJOB           SEE IF A JOB OF HIGHER PRIORITY IS
 0040   REF   1                 6107  1 5117 1            TCF      CHANG2           PRESENT, AND IF SO, CHANGE JOBS.

 0041   REF   8  LAST 1000      6110  24 164 1            INCR     LOC              ADVANCE THE LOCATION COUNTER.
R0042            ITRACE (1) REFERS TO "NEWOPS".
 0043   REF   9  LAST 1001      6111  50 164 1  NEWOPS    INDEX    LOC              ENTRY TO BEGIN BY PICKING OP CODE PAIR.
 0044                           6112  3 0000 1            CA       0                MAY BE AN OPCODE PAIR OR A STORE CODE.
 0045   REF 258  LAST  996      6113  10 000 0            CCS      A                TEST SIGN AND GET DABS(A).
 0046   REF   1                 6114  1 6403 1            TCF      DOSTORE          PROCESS STORE CODE.

 0047                           6115   00177 0  LOW7      OCT      177

 0048   REF  10  LAST 1001      6116  54 023 1            TS       EDOP             OP CODE PAIR. LEAVE THE OTHER IN EDOP
 0049   REF   6  LAST  468      6117  7 6115 0            MASK     LOW7             WHERE  CCS EDOP  WILL HONOR IT NEXT.

 0050   REF   9  LAST  475      6120  54 020 1  OPJUMP    TS       CYR              LOWWD ENTERS HERE IF A RIGHT-HAND OP
 0051   REF  10  LAST 1001      6121  10 020 1            CCS      CYR              CODE IS TO BE PROCESSED. TEST PREFICES.
 0052   REF   1                 6122  1 6270 0            TCF      OPJUMP2          TEST SECOND PREFIX BIT.

 0053   REF   1                 6123  1 6764 0            TCF      EXIT             +0 OP CODE IS EXIT.
```

```
P0054           PROCESS ADDRESSES WHICH MAY BE DIRECT, INDEXED, OR REFERENCE THE PUSHDOWN LIST.

 0056   REF  51  LAST  978      6124  7 4744 0  ADDRESS  MASK    BIT1             SEE IF ADDRESS IS INDEXED. CYR CONTAINED
 0057   REF 299  LAST 1001      6125  10 000 0           CCS     A                400XX, SO BIT 1 IS NOW AS IT WAS IN CYR.
 0058   REF   1                 6126  1 6167 0           TCF     INDEX            FORM INDEXED ADDRESS.

 0059   REF  10  LAST 1001      6127  50 164 1  DIRADRES INDEX   LOC              LOOK AHEAD TO NEXT WORD TO SEE IF
 0060                           6130  4 0001 1  OCT40001 CS      1                ADDRESS IS GIVEN.
 0061   REF 300  LAST 1002      6131  10 000 0           CCS     A
 0062   REF   1                 6132  1 6236 1           TCF     PUSHUP           IF NOT.

 0063                           6133   77773 1  NEG4     DEC     -4

 0064   REF  11  LAST 1002      6134  24 164 1           INCR    LOC              IF SO, TO SHOW WE PICKED UP A WORD.
 0065   REF   5  LAST 1000      6135  54 116 0           TS      ADDRWD
```

```
P0066            FINAL DIGESTION OF DIRECT ADDRESSES OF OP CODES WITH 01 PREFIX IS DONE HERE. IN EACH CASE, THE
R0068   REQUIRED 12-BIT SUB-ADDRESS IS LEFT IN ADDRWD, WITH ANY REQUIRED E OR F BANK SWITCHING DONE. ADDRESSES LESS
R0070   THAN 45D ARE TAKEN TO BE RELATIVE TO THE WORK AREA. THE OP CODE IS NOW IN BITS 1-5 OF CYR WITH BIT 14 = 1.

 0072   REF   1                    6136  6 6272 0             AD      -ENDVAC          SEE IF ADDRESS RELATIVE TO WORK AREA.
 0073   REF 301  LAST 1002         6137  10 000 0             CCS     A
 0074   REF   1                    6140  6 7764 0             AD      -ENDERAS         IF NOT, SEE IF IN GENERAL ERASABLE.
 0075   REF   1                    6141  1 6146 0             TCF     IERASTST

 0076   REF  43  LAST  959         6142  3 0120 1  NETZERO    CA      FIXLOC           IF SO, LEAVE THE MODIFIED ADDRESS IN
 0077   REF   6  LAST 1002         6143  26 116 0             ADS     ADDRWD           ADDRWD AND DISPATCH.
 0078   REF  11  LAST 1001         6144  50 020 0  ITR15      INDEX   CYR              THIS INDEX MAKES THE NEXT INSTRUCTION
 0079   REF   1                    6145  7 6314 0             7       INDJUMP -1       TCF INDJUMP + OP, EDITING CYR.

 0080                              6146  0 0006 1  IERASTST   EXTEND
 0081   REF   1                    6147  6 6157 1             BZMF    GEADDR           GO PROCESS GENERAL-ERASABLE ADDRESS.

 0082   REF  14  LAST  998         6150  7 5003 0             MASK    LOW10            FIXED BANK ADDRESS. RESTORE AND ADD B15.
 0083   REF  15  LAST 1003         6151  6 5003 1             AD      LOW10            SWITCH BANKS AND LEAVE SUBADDRESS IN
 0084   REF   7  LAST 1003         6152  56 116 1             XCH     ADDRWD           ADDRWD FOR OPERAND RETRIEVAL. (THIS
 0085   REF   5  LAST 1000         6153  6 0115 1             AD      INTBIT15         METHOD PRECLUDES USE OF THE LAST
 0086   REF  12  LAST  998         6154  54 004 1             TS      FBANK            LOCATION IN EACH FBANK.)
 0087   REF  12  LAST 1003         6155  50 020 0  ITR12      INDEX   CYR
 0088   REF   2  LAST 1003         6156  7 6314 0             7       INDJUMP -1

 0089   REF  10  LAST  995         6157  7 4350 1  GEADDR     MASK    LOW8
 0090   REF   3  LAST  475         6160  6 5000 1             AD      OCT1400
 0091   REF   8  LAST 1003         6161  56 116 1             XCH     ADDRWD
 0092   REF  65  LAST  995         6162  54 003 0             TS      EBANK
 0093   REF  13  LAST 1003         6163  50 020 0  ITR10      INDEX   CYR
 0094   REF   3  LAST 1003         6164  7 6314 0             7       INDJUMP -1
```

```
P0095           THE FOLLOWING ROUTINE PROCESSES INTERPRETIVE INDEXED ADDRESSES. AN INTERPRETER INDEX REGISTER MAY
R0097     CONTAIN THE ADDRESS OF ANY ERASABLE REGISTER (0-42 BEING RELATIVE TO THE VAC AREA) OR ANY INTERPRETIVE PROGRAM
R0099     BANK, OR ANY INTEGER IN THAT RANGE.

 0100     REF   1                6165  3 7754 0  DODLOAD* CAF     DLOAD*          STODL* COMES HERE TO PROCESS LOAD ADR.
 0101     REF  14  LAST 1003     6166  54 020 1           TS      CYR             (STOVL* ENTERS HERE).

 0102     REF  44  LAST 1003     6167  3 0120 1  INDEX    CA      FIXLOC          SET UP INDEX LOCATION.
 0103     REF   1                6170  54 130 1           TS      INDEXLOC
 0104     REF  12  LAST 1002     6171  24 164 1           INCR    LOC             (ADDRESS ALWAYS GIVEN).
 0105     REF  13  LAST 1004     6172  50 164 1           INDEX   LOC
 0106                            6173  4 0000 0           CS      0
 0107     REF 302  LAST 1003     6174  10 000 0           CCS     A               INDEX 2 IF ADDRESS STORED COMPLEMENTED.
 0108     REF   2  LAST 1004     6175  24 130 0           INCR    INDEXLOC
 0109                            6176  16 177 1           NOOP

 0110     REF   5  LAST 1003     6177  54 116 0           TS      ADDRWD          14 BIT ADDRESS TO ADDRWD.
 0111     REF   1                6200  7 7763 0           MASK    HIGH4           IF ADDRESS GREATER THAN 2K, ADD INTBIT15
 0112                            6201  0 0006 1           EXTEND
 0113     REF   1                6202  1 6205 1           BZF     INDEX2
 0114     REF   6  LAST 1003     6203  3 0115 1           CA      INTBIT15
 0115     REF  10  LAST 1004     6204  26 116 0           ADS     ADDRWD

 0116     REF   3  LAST 1004     6205  50 130 0  INDEX2   INDEX   INDEXLOC
 0117     REF  27  LAST  959     6206  4 0046 1           CS      X1
 0118     REF  11  LAST 1004     6207  26 116 0           ADS     ADDRWD          DO AUGMENT, IGNORING AND CORRECTING OVF.

 0119     REF   7  LAST  959     6210  7 7765 0           MASK    HIGH9           SEE IF ADDRESS IS IN WORK AREA.
 0120                            6211  0 0006 1           EXTEND
 0121     REF   1                6212  1 6225 0           BZF     INDWORK
 0122     REF   2  LAST 1004     6213  7 7763 0           MASK    HIGH4           SEE IF IN FIXED BANK.
 0123                            6214  0 0006 1           EXTEND
 0124     REF   1                6215  1 6227 1           BZF     INDERASE

 0125     REF  12  LAST 1004     6216  3 0116 1           CA      ADDRWD          IN FIXED - SWITCH BANKS AND CREATE
 0126     REF  13  LAST 1003     6217  54 004 1           TS      FBANK           SUB-ADDRESS.
 0127     REF  16  LAST 1003     6220  7 5003 0           MASK    LOW10
 0128     REF   1                6221  6 4732 0           AD      2K
 0129     REF  13  LAST 1004     6222  54 116 0           TS      ADDRWD
 0130     REF  15  LAST 1004     6223  50 020 0  ITR11    INDEX   CYR
 0131     REF   4  LAST 1003     6224  3 6314 1           3       INDJUMP -1

 0132     REF  45  LAST 1004     6225  3 0120 1  INDWORK  CA      FIXLOC          MAKE ADDRWD RELATIVE TO WORK AREA.
 0133     REF   1                6226  1 6233 1           TCF     ITR13 -1

 0134     REF   4  LAST 1003     6227  3 5000 1  INDERASE CA      OCT1400
 0135     REF  14  LAST 1004     6230  56 116 1           XCH     ADDRWD
 0136     REF  66  LAST 1003     6231  54 003 0           TS      EBANK
 0137     REF  11  LAST 1003     6232  7 4350 1           MASK    LOW8
 0138     REF  15  LAST 1004     6233  26 116 0    -1     ADS     ADDRWD
 0139    REF  16  LAST 1004       6234  50 020 0  ITR13     INDEX  CYR
 0140    REF   5  LAST 1004       6235   3 6314 1           3      INDJUMP -1
```

```
R0141            PUSH-UP ROUTINES. WHEN NO OPERAND ADDRESS IS GIVEN, THE APPROPRIATE OPERAND IS TAKEN FROM THE PUSH-DOWN
R0143      LIST. IN MOST CASES THE MODE OF THE RESULT (VECTOR OR SCALAR) OF THE LAST ARITHMETIC OPERATION PERFORMED
R0145      IS THE SAME AS THE TYPE OF OPERAND DESIRED (ALL ADD/SUBTRACT ETC.). EXCEPTIONS TO THIS GENERAL RULE ARE LISTED
R0147      BELOW (NOTE THAT IN EVERY CASE THE MODE REGISTER IS LEFT INTACT):

R0148            1.  VXSC AND V/SC WANT THE OPPOSITE TYPE OF OPERAND, E.G., IF THE LAST OPERATION YIELDED A VECTOR
R0150      RESULT, VXSC WANTS A SCALAR.

R0151            2.  THE LOAD CODES SHOULD LOAD THE ACCUMULATOR INDEPENDENT OF THE RESULT OF THE LAST OPERATION. THIS
R0153      INCLUDES VLOAD, DLOAD, TLOAD, PDDL, AND PDVL (NO PUSHUP WITH SLOAD).

R0154            3.  SOME ARITHMETIC OPERATIONS REQUIRE A STANDARD TYPE OF OPERAND REGARDLESS OF THE PREVIOUS OPERATION.
R0156      THIS INCLUDES SIGN WANTING DP AND TAD REQUIRING TP.

 0157      REF   2  LAST  742          6236  3 4351 1  PUSHUP     CAF      OCT23                IF THE LOW 5 BITS OF CYR ARE LESS THAN
 0158      REF  17  LAST 1005          6237  7 0020 1             MASK     CYR                  20, THIS OP REQUIRES SPECIAL ATTENTION.
 0159      REF   1                     6240  6 6243 1             AD       -OCT10               (NO -0).
 0160      REF 303  LAST 1004          6241  10 000 0             CCS      A
 0161      REF   1                     6242  1 6254 0             TCF      REGUP                FOR ALL CODES GREATER THAN OCT 7.

 0162                                  6243   77767 1  -OCT10     OCT      -10

 0163      REF   1                     6244  6 6133 0             AD       NEG4                 WE NOW HAVE 7 - OP CODE(MOD4). SEE IF
 0164      REF 304  LAST 1006          6245  10 000 0             CCS      A                    THE OP CODE (MOD4) IS THREE (REVERSE).
 0165      REF 305  LAST 1006          6246  50 000 1             INDEX    A                    NO - THE MODE IS DEFINITE. PICK UP THE
 0166      REF   1                     6247  4 6265 1             CS       NO.WDS
 0167      REF   2  LAST 1006          6250  1 6256 1             TCF      REGUP +2

 0168      REF  11  LAST 1001          6251  50 163 0             INDEX    MODE                 FOR VXSC AND V/SC WE WANT THE REQUIRED
 0169      REF   2  LAST  959          6252  4 6263 1             CS       REVCNT               PUSHLOC DECREMENT WITHOUT CHANGING THE
 0170      REF   3  LAST 1006          6253  1 6256 1             TCF      REGUP +2             MODE AT THIS TIME.

 0171      REF  12  LAST 1006          6254  50 163 0  REGUP      INDEX    MODE                 MOST ALL OP CODES PUSHUP HERE.
 0172      REF   2  LAST 1006          6255  4 6265 1             CS       NO.WDS
 0173      REF   8  LAST  892          6256  26 166 1   +2        ADS      PUSHLOC
 0174      REF  16  LAST 1004          6257  54 116 0             TS       ADDRWD
 0175      REF  18  LAST 1006          6260  50 020 0  ITR14      INDEX    CYR
 0176      REF   6  LAST 1005          6261  7 6314 0             7        INDJUMP -1           (THE INDEX MAKES THIS A TCF.)

 0177                                  6262   00002 0             OCT      2                    REVERSE PUSHUP DECREMENT. VECTOR TAKES 2
 0178                                  6263   00006 1  REVCNT     OCT      6                    WORDS, SCALAR TAKES 6.
 0179                                  6264   00006 1             OCT      6
 0180                                  6265   00002 0  NO.WDS     OCT      2                    CONVENTIONAL DECREMENT IS 6 WORDS VECTOR
 0181                                  6266   00003 1  OCTAL3     OCT      3                    2 IN DP, AND 3 IN TP.
 0182                                  6267   00006 1             OCT      6
```

```
P0183             TEST THE SECOND PREFIX BIT TO SEE IF THIS IS A MISCELLANEOUS OR A UNARY/SHORT SHIFT OPERATION.

 0185   REF  19  LAST 1006        6270  10 020 1  OPJUMP2  CCS     CYR                TEST SECOND PREFIX BIT.
 0186   REF   1                   6271  1 6304 1           TCF     OPJUMP3            TEST THIRD BIT TO SEE IF UNARY OR SHIFT.

 0187                             6272   77722 0  -ENDVAC  DEC     -45

R0188             THE FOLLOWING ROUTINE PROCESSES ADDRESSES OF SUFFIX CLASS 10. THEY ARE BASICALLY WORK AREA ADDRESSES
R0190   IN THE RANGE 0 - 52, ERASABLE ECADR CONSTANTS FROM 100 - 3777, AND ECADRS ABOVE THAT. ALL 15 BITS ARE AVAILABLE
R0192   IN CONTRAST TO SUFFIX 1, IN WHICH ONLY THE LOW ORDER 14 ARE AVAILABLE.

 0193   REF  14  LAST 1004        6273  24 164 1  15BITADR INCR    LOC                (ENTRY HERE FROM STCALL).
 0194   REF  15  LAST 1007        6274  50 164 1           INDEX   LOC                PICK UP ADDRESS WORD.
 0195                             6275  3 0000 1           CA      0
 0196   REF   6  LAST  100        6276  54 117 1           TS      POLISH             WE MAY NEED A SUBADDRESS LATER.

 0197   REF   1                   6277  3 5004 0           CAF     LOW7+2K            THESE INSTRUCTIONS ARE IN BANK 1.
 0198   REF  14  LAST 1004        6300  54 004 1           TS      FBANK
 0199   REF  20  LAST 1007        6301  7 0020 1           MASK    CYR
 0200   REF 306  LAST 1006        6302  50 000 1  ITR7     INDEX   A
 0201   REF   1                   6303  1 6355 0           TCF     MISCJUMP
```

```
P0202               COMPLETE THE DISPATCHING OF UNARY AND SHORT SHIFT OPERATIONS.

 0203    REF  15    LAST 1007       6304  54 004 1  OPJUMP3   TS      FBANK           CALL IN BANK 0 (BITS 11-15 OF A ARE 0.)
R0204               ITRACE (6) REFERS TO "OPJUMP3".
 0205    REF  21    LAST 1007       6305  10 020 1            CCS     CYR             TEST THIRD PREFIX BIT.
 0206    REF 307    LAST 1007       6306  50 000 1            INDEX   A               THE DECREMENTED UNARY CODE IS IN BITS
 0207    REF   1                    6307  1 2000 1            TCF     UNAJUMP         1-4 OF A (ZERO, EXIT, HAS BEEN DETECTED)

 0208    REF  13    LAST 1006       6310  10 163 1            CCS     MODE            ITS A SHORT SHIFT CODE. SEE IF PRESENT
 0209    REF   1                    6311  1 2017 1            TCF     SHORTT          SCALAR OR VECTOR.
 0210    REF   2    LAST 1008       6312  1 2017 1            TCF     SHORTT
 0211    REF   1                    6313  1 2121 0            TCF     SHORTV          CALLS THE APPROPRIATE ROUTINE.


 0212    REF   1                    4341                FBANKMSK  EQUALS  BANKMASK
 0213    REF  25    LAST  347       6314   00122 0  LVBUF     ADRES   VBUF
```

```
P0214              THE FOLLOWING IS THE JUMP TABLE FOR OP CODES WHICH MAY HAVE INDEXABLE ADDRESSES OR MAY PUSH UP.

 0216   REF   1                    6315  1 6526 1  INDJUMP  TCF     VLOAD            00 - LOAD MPAC WITH A VECTOR.
 0217   REF   1                    6316  1 7112 0           TCF     TAD              01 - TRIPLE PRECISION ADD TO MPAC.
 0218   REF   1                    6317  1 7676 0           TCF     SIGN             02 - COMPLEMENT MPAC (V OR SC) IF X NEG.
 0219   REF   1                    6320  1 7422 0           TCF     VXSC             03 - VECTOR TIMES SCALAR.
 0220   REF   1                    6321  1 6724 1           TCF     CGOTO            04 - COMPUTED GO TO.
 0221   REF   2  LAST   369        6322  1 6511 0           TCF     TLOAD            05 - LOAD MPAC WITH TRIPLE PRECISION.
 0222   REF   1                    6323  1 6073 1           TCF     DLOAD            06 - LOAD MPAC WITH A DP SCALAR.
 0223   REF   1                    6324  1 7645 0           TCF     V/SC             07 - VECTOR DIVIDED BY SCALAR.

 0224   REF   1                    6325  1 6522 0           TCF     SLOAD            10 - LOAD MPAC IN SINGLE PRECISION.
 0225   REF   1                    6326  1 6641 0           TCF     SSP              11 - SET SINGLE PRECISION INTO X.
 0226   REF   1                    6327  1 6544 0           TCF     PDDL             12 - PUSH DOWN MPAC AND RE-LOAD IN DP.
 0227   REF   1                    6330  1 7355 1           TCF     MXV              13 - MATRIX POST-MULTIPLIED BY VECTOR.
 0228   REF   1                    6331  1 6600 0           TCF     PDVL             14 - PUSH DOWN AND VECTOR LOAD.
 0229   REF   1                    6332  1 6647 0           TCF     CCALL            15 - COMPUTED CALL.
 0230   REF   1                    6333  1 7360 1           TCF     VXM              16 - MATRIX PRE-MULTIPLIED BY VECTOR.
 0231   REF   1                    6334  1 7637 0           TCF     TSLC             17 - NORMALIZE MPAC (SCALAR ONLY).

 0232   REF   1                    6335  1 7615 0           TCF     DMPR             20 - DP MULTIPLY AND ROUND.
 0233   REF   1                    6336  1 7620 0           TCF     DDV              21 - DP DIVIDE BY.
 0234   REF   1                    6337  1 7624 1           TCF     BDDV             22 - DP DIVIDE INTO.
 0235   REF   1                    6340  1 7642 1           TCF     GSHIFT           23 - GENERAL SHIFT INSTRUCTION.
 0236   REF   1                    6341  1 6772 1           TCF     VAD              24 - VECTOR ADD.
 0237   REF   1                    6342  1 6770 0           TCF     VSU              25 - VECTOR SUBTRACT.
 0238   REF   1                    6343  1 7057 0           TCF     BVSU             26 - VECTOR SUBTRACT FROM.
 0239   REF   1                    6344  1 7352 0           TCF     DOT              27 - VECTOR DOT PRODUCT.

 0240   REF   1                    6345  1 7501 0           TCF     VXV              30 - VECTOR CROSS PRODUCT.
 0241   REF   1                    6346  1 7446 1           TCF     VPROJ            31 - VECTOR PROJECTION.
 0242   REF   1                    6347  1 7026 0           TCF     DSU              32 - DP SUBTRACT.
 0243   REF   1                    6350  1 7103 0           TCF     BDSU             33 - DP SUBTRACT FROM.
 0244   REF   1                    6351  1 7016 0           TCF     DAD              34 - DP ADD.
 0245                              6352  1 6352 1           TCF                      35 - AVAILABLE
 0246   REF   1                    6353  1 7613 0           TCF     DMP1             36 - DP MULTIPLY.
 0247   REF   1                    6354  1 7634 0           TCF     SETPD            37 - SET PUSH DOWN POINTER (DIRECT ONLY)

R0248   CODES 10 AND 14 MUST NOT PUSH UP. CODE 04 MAY BE USED FOR VECTOR DECLARE BEFORE PUSHUP IF DESIRED.
```

```
P0250             THE FOLLOWING JUMP TABLE APPLIES TO INDEX, BRANCH, AND MISCELLANEOUS INSTRUCTIONS.

 0252   REF    1                     6355  1 2350 1  MISCJUMP TCF     AXT              00 - ADDRESS TO INDEX TRUE.
 0253   REF    1                     6356  1 2355 1           TCF     AXC              01 - ADDRESS TO INDEX COMPLEMENTED.
 0254   REF    1                     6357  1 2360 1           TCF     LXA              02 - LOAD INDEX FROM ERASABLE.
 0255   REF    1                     6360  1 2364 0           TCF     LXC              03 - LOAD INDEX FROM COMPLEMENT OF ERAS.
 0256   REF    1                     6361  1 2370 0           TCF     SXA              04 - STORE INDEX IN ERASABLE.
 0257   REF    1                     6362  1 2376 0           TCF     XCHX             05 - EXCHANGE INDEX WITH ERASABLE.
 0258   REF    1                     6363  1 2412 0           TCF     INCR             06 - INCREMENT INDEX REGISTER.
 0259   REF    1                     6364  1 2421 0           TCF     TIX              07 - TRANSFER ON INDEX.

 0260   REF    1                     6365  1 2404 1           TCF     XAD              10 - INDEX REGISTER ADD FROM ERASABLE.
 0261   REF    1                     6366  1 2415 1           TCF     XSU              11 - INDEX SUBTRACT FROM ERASABLE.
 0262   REF    1                     6367  1 2473 1           TCF     BZE/GOTO         12 - BRANCH ZERO AND GOTO.
 0263   REF    1                     6370  1 2500 1           TCF     BPL/BMN          13 - BRANCH PLUS AND BRANCH MINUS.
 0264   REF    1                     6371  1 2453 0           TCF     RTB/BHIZ         14 - RETURN TO BASIC AND BRANCH HI ZERO.
 0265   REF    1                     6372  1 2513 0           TCF     CALL/ITA         15 - CALL AND STORE QPRET.
 0266   REF    1                     6373  1 2522 1           TCF     SW/              16 - SWITCH INSTRUCTIONS AND AVAILABLE.
 0267   REF    1                     6374  1 2463 0           TCF     BOV(B)           17 - BRANCH ON OVERFLOW TO BASIC OR INT.
```

```
P0268          THE FOLLOWING JUMP TABLE APPIES TO UNARY INSTRUCTIONS.

 0269   REF   2 LAST 1000 TO 1011:   205    205*          COUNT* $$/INTER
 0270                      00,2000                        BANK    0                00 - EXIT - DETECTED EARLIER.
 0271   REF   1            00,2000  1 3207 0  UNAJUMP     TCF     SQRT             01 - SQUARE ROOT.
 0272   REF   1            00,2001  1 3530 0              TCF     SINE             02 - SIN.
 0273   REF   1            00,2002  1 3517 0              TCF     COSINE           03 - COS.
 0274   REF   1            00,2003  1 3610 1              TCF     ARCSIN           04 - ARC SIN.
 0275   REF   1            00,2004  1 3612 0              TCF     ARCCOS           05 - ARC COS.
 0276   REF   1            00,2005  1 3174 1              TCF     DSQ              06 - DP SQUARE.
 0277   REF   1            00,2006  1 2116 1              TCF     ROUND            07 - ROUND TO DP.

 0278   REF   1            00,2007  1 7711 0              TCF     COMP             10 - COMPLEMENT VECTOR OR SCALAR.
 0279   REF   1            00,2010  1 3232 0              TCF     VDEF             11 - VECTOR DEFINE.
 0280   REF   1            00,2011  1 3023 1              TCF     UNIT             12 - UNIT VECTOR.
 0281   REF   1            00,2012  1 3176 0              TCF     ABVALABS         13 - LENGTH OF VECTOR OR MAG OF SCALAR.
 0282   REF   1            00,2013  1 3245 0              TCF     VSQ              14 - SQUARE OF LENGTH OF VECTOR.
 0283   REF   1            00,2014  1 6375 1              TCF     STADR            15 - PUSH UP ON STORE CODE.
 0284   REF   1            00,2015  1 3274 1              TCF     RVQ              16 - RETURN VIA QPRET.
 0285   REF   1            00,2016  1 3247 1              TCF     PUSH             17 - PUSH MPAC DOWN.
```

```
P0286   SECTION 2  LOAD AND STORE PACKAGE.

R0287            A SET OF EIGHT STORE CODES IS PROVIDED AS THE PRIMARY METHOD OF STORING THE MULTI-PURPOSE
R0289   ACCUMULATOR (MPAC). IF IN THE DANZIG SECTION LOC REFERS TO AN ALGEBRAICALLY POSITIVE WORD, IT IS TAKEN AS A
R0291   STORE CODE WITH A CORRESPONDING ERASABLE ADDRESS. MOST OF THESE CODES ARE TWO ADDRESS, SPECIFYING THAT THE WORD
R0293   FOLLOWING THE STORE CODE IS TO BE USED AS AN ADDRESS FROM WHICH TO RE-LOAD MPAC. FOUR OPTIONS ARE AVAILABLE:

R0295            1. STORE                 STORE MPAC. THE E ADDRESS MAY BE INDEXED.
R0297            2. STODL                 STORE MPAC AND RE-LOAD IT IN DP WITH THE NEXT ADDRESS (THE LOAD MAY BE INDEXED).
R0299            3. STOVL                 STORE MPAC AND RE-LOAD A VECTOR (AS ABOVE).
R0301            4. STCALL                STORE AND DO A CALL (BOTH ADDRESSES MUST BE DIRECT HERE).

R0303            STODL AND STOVL WILL TAKE FROM THE PUSH-DOWN LIST IF NO LOAD ADDRESS IS GIVEN.


 0305                          6375                     BLOCK  3

 0306   REF   3 LAST 1011 TO 1012:   15   220*          COUNT* $$/INTER
 0307   REF   4  LAST 1001     6375  3 0165 0  STADR     CA     BANKSET          THE STADR CODE (PUSHUP UP ON STORE
 0308   REF  16  LAST 1008     6376  54 004 1            TS     FBANK            ADDRESS) ENTERS HERE.
 0309   REF  16  LAST 1007     6377  24 164 1            INCR   LOC
 0310   REF  17  LAST 1012     6400  50 164 1  ITR1      INDEX  LOC              THE STORECODE WAS STORED COMPLEMENTED TO
 0311                          6401  4 0000 0            CS     0                MAKE IT LOOK LIKE AN OPCODE PAIR.
 0312   REF   7  LAST  992     6402  6 7770 0            AD     NEGONE           (YUL CANT REMOVE 1 BECAUSE OF EARLY CCS)

 0313   REF  17  LAST 1006     6403  54 116 0  DCSTORE   TS     ADDRWD
 0314   REF   7  LAST  476     6404  7 4347 1            MASK   LOW11            ENTRY FROM DISPATCHER. SAVE THE ERASABLE
 0315   REF  18  LAST 1012     6405  56 116 1            XCH    ADDRWD           ADDRESS AND JUMP ON THE STORE CODE NO.
 0316   REF   1                6406  7 7743 1            MASK   B12T14
 0317                          6407  0 0006 1            EXTEND
 0318   REF  38  LAST  823     6410  7 4740 1            MP     BIT5             EACH TRANSFER VECTOR ENTRY IS TWO WORDS.
 0319   REF 308  LAST 1008     6411  50 000 1  ITR0      INDEX  A
 0320   REF   1                6412  1 6413 0            TCF    STORJUMP
```

```
P0321              STORE CODE JUMP TABLE. CALLS THE APPROPRIATE STORING ROUTINE AND EXITS TO DANZIG OR TO ADDRESS WITH
R0323       A SUPPLIED OPERATION CODE.

R03231             STORE STORE,1 AND STORE,2 RETURN TO DANZIG, THUS RESETTING THE EBANK TO ITS STATE AT INTPRET.

 0324    REF    1                    6413  0 6443 1  STORJUMP TC       STORE            STORE.
 0325    REF    3   LAST  945        6414  1 6102 0           TCF      DANZIG           PICK UP NEW OP CODE(S).
 0326    REF    1                    6415  0 6435 0           TC       STORE,1
 0327    REF    4   LAST 1013        6416  1 6102 0           TCF      DANZIG
 0328    REF    1                    6417  0 6440 1           TC       STORE,2
 0329    REF    5   LAST 1013        6420  1 6102 0           TCF      DANZIG

 0330    REF    2   LAST 1013        6421  0 6443 1           TC       STORE            STODL.
 0331    REF    1                    6422  1 6501 1           TCF      DODLOAD

 0332    REF    3   LAST 1013        6423  0 6443 1           TC       STORE            STODL WITH INDEXED LOAD ADDRESS.
 0333    REF    1                    6424  1 6165 1           TCF      DODLOAD*

 0334    REF    4   LAST 1013        6425  0 6443 1           TC       STORE            STOVL.
 0335    REF    1                    6426  1 6504 1           TCF      DOVLOAD

 0336    REF    5   LAST 1013        6427  0 6443 1           TC       STORE            STOVL WITH INDEXED LOAD ADDRESS.
 0337    REF    1                    6430  1 6507 1           TCF      DOVLOAD*
 0338    REF    6   LAST 1013        6431  0 6443 1           TC       STORE            STOTC.
 0339    REF    2   LAST  291        6432  3 4757 0           CAF      CALLCODE
 0340    REF   22   LAST 1008        6433  54 020 1           TS       CYR
 0341    REF    1                    6434  1 6273 0           TCF      15BITADR         GET A 15 BIT ADDRESS.
```

```
P0342             STORE CODE ADDRESS PROCESSOR.

 0343    REF  46  LAST 1004       6435  50 120 1  STORE,1  INDEX  FIXLOC
 0344    REF  28  LAST 1004       6436  4 0046 1           CS     X1
 0345    REF   1                  6437  1 6442 1           TCF    PRESTORE

 0346    REF  47  LAST 1014       6440  50 120 1  STORE,2  INDEX  FIXLOC
 0347    REF  18  LAST  984       6441  4 0047 0           CS     X2
 0348    REF  19  LAST 1012       6442  26 116 0  PRESTORE ADS    ADDRWD           RESULTANT ADDRESS IS IN ERASABLE.

 0349    REF  20  LAST 1014       6443  4 0116 0  STORE    CS     ADDRWD
 0350    REF   1                  6444  6 4763 1           AD     DEC45
 0351    REF 309  LAST 1012       6445  10 000 0           CCS    A                DOES THE ADDRESS POINT TO THE WORK AREA?
 0352    REF  48  LAST 1014       6446  3 0120 1           CA     FIXLOC           YES.
 0353    REF   1                  6447  1 6454 0           TCF    AHEAD5
 0354    REF   5  LAST 1004       6450  3 5000 1           CA     OCT1400          NO.  SET EBANK & MAKE UP SUBADDRESS.
 0355    REF  21  LAST 1014       6451  56 116 1           XCH    ADDRWD
 0356    REF  67  LAST 1004       6452  54 003 0           TS     EBANK
 0357    REF  12  LAST 1004       6453  7 4350 1           MASK   LOW8
 0358    REF  22  LAST 1014       6454  26 116 0  AHEAD5   ADS    ADDRWD
```

```
P0359             STORING ROUTINES. STORE DP, TP, OR VECTOR AS INDICATED BY MODE.

 0360                                6455  0 0006 1  STARTSTO EXTEND                    MPAC,+1 MUST BE STORED IN ANY EVENT.
R0361             ITRACE (5) REFERS TO "STARTSTO".
 0362   REF 367  LAST 1001           6456  3 0155 0           DCA      MPAC
 0363   REF  23  LAST 1014           6457  50 116 1           INDEX    ADDRWD
 0364                                6460  52 001 1           DXCH     0

 0365   REF  14  LAST 1008           6461  10 163 1           CCS      MODE
 0366   REF   1                      6462  1 6475 0           TCF      TSTORE
 0367   REF 244  LAST  999           6463  0 0002 0           TC       Q

 0368                                6464  0 0006 1  VSTORE   EXTEND
 0369   REF 368  LAST 1015           6465  3 0160 0           DCA      MPAC +3
 0370   REF  24  LAST 1015           6466  50 116 1           INDEX    ADDRWD
 0371                                6467  52 003 0           DXCH     2

 0372                                6470  0 0006 1           EXTEND
 0373   REF 369  LAST 1015           6471  3 0162 1           DCA      MPAC +5
 0374   REF  25  LAST 1015           6472  50 116 1           INDEX    ADDRWD
 0375                                6473  52 005 0           DXCH     4
 0376   REF 245  LAST 1015           6474  0 0002 0           TC       Q

 0377   REF 370  LAST 1015           6475  3 0156 0  TSTORE   CA       MPAC +2
 0378   REF  26  LAST 1015           6476  50 116 1           INDEX    ADDRWD
 0379                                6477  54 002 1           TS       2
 0380   REF 246  LAST 1015           6500  0 0002 0           TC       Q
```

```
P0381              ROUTINES TO BEGIN PROCESSING OF THE SECOND ADDRESS ASSOCIATED WITH ALL STORE-TYPE CODES EXCEPT STORE
R0383   ITSELF.

 0384   REF   1                  6501  3 7753 1  DODLOAD   CAF    DLOADCOD
 0385   REF  23  LAST 1013       6502  54 020 1            TS     CYR
 0386   REF   1                  6503  1 6127 1            TCF    DIRADRES         GO GET A DIRECT ADDRESS.

 0387   REF   1                  6504  3 4726 0  DOVLOAD   CAF    VLOADCOD
 0388   REF  24  LAST 1016       6505  54 020 1            TS     CYR
 0389   REF   2  LAST 1016       6506  1 6127 1            TCF    DIRADRES

 0390   REF   1                  6507  3 6130 0  DOVLOAD*  CAF    VLOAD*
 0391   REF   2  LAST 1013       6510  1 6166 1            TCF    DODLOAD* +1      PROLOGUE TO INDEX ROUTINE.
```

```
R0392             THE FOLLOWING LOAD INSTRUCTIONS ARE PROVIDED FOR LOADING THE MULTI-PURPOSE ACCUMULATOR MPAC.

 0394   REF  27   LAST 1015      6511  50 116 1  TLOAD     INDEX  ADDRWD
 0395                            6512  3 0002 0            CA     2                 LOAD A TRIPLE PRECISION ARGUMENT INTO
 0396   REF 371   LAST 1015      6513  54 156 1            TS     MPAC +2           THE FIRST THREE MPAC REGISTERS, WITH THE
 0397                            6514  0 0006 1            EXTEND                   CONTENTS OF THE OTHER FOUR IRRELEVANT.
 0398   REF  28   LAST 1017      6515  5 0116 1            INDEX  ADDRWD
 0399                            6516  3 0001 0            DCA    0
 0400   REF 372   LAST 1017      6517  52 155 1            DXCH   MPAC
 0401   REF  92   LAST  921      6520  3 4744 1  TMODE     CAE    ONE
 0402   REF   1                  6521  1 6101 0            TCF    NEWMODE           DECLARE TRIPLE PRECISION MODE.

 0403                            6522  22 007 0  SLOAD     ZL                       LOAD A SINGLE PRECISION NUMBER INTO
 0404   REF  29   LAST 1017      6523  50 116 1            INDEX  ADDRWD            MPAC, SETTING MPAC+1,2 TO ZERO. THE
 0405                            6524  3 0000 1            CA     0                 CONTENTS OF THE REMAINING MPAC REGISTERS
 0406   REF   1                  6525  1 6076 1            TCF    SLOAD2            ARE IRRELEVANT.

 0407                            6526  0 0006 1  VLOAD     EXTEND                   LOAD A DOUBLE PRECISION VECTOR INTO
 0408   REF  30   LAST 1017      6527  5 0116 1            INDEX  ADDRWD            MPAC,+1, MPAC+3,4, AND MPAC+5,6. THE
 0409                            6530  3 0001 0            DCA    0                 CONTENTS OF MPAC +2 ARE IRRELEVANT.
 0410   REF 373   LAST 1017      6531  52 155 1            DXCH   MPAC

 0411                            6532  0 0006 1  ENDVLOAD  EXTEND                   RDVL COMES HERE TO FINISH UP FOR DP, TP.
 0412   REF  31   LAST 1017      6533  5 0116 1            INDEX  ADDRWD
 0413                            6534  3 0003 1            DCA    2
 0414   REF 374   LAST 1017      6535  52 160 1            DXCH   MPAC +3

 0415                            6536  0 0006 1   +4       EXTEND                   TRDVL FINISHES HERE.
 0416   REF  32   LAST 1017      6537  5 0116 1            INDEX  ADDRWD
 0417                            6540  3 0005 1            DCA    4
 0418   REF 375   LAST 1017      6541  52 162 0            DXCH   MPAC +5

 0419   REF  93   LAST 1017      6542  4 4744 0  VMODE     CS     ONE               DECLARE VECTOR MODE.
 0420   REF   2   LAST 1017      6543  1 6101 0            TCF    NEWMODE
```

```
P0421               THE FOLLOWING INSTRUCTIONS ARE PROVIDED FOR STORING OPERANDS IN THE PUSHDOWN LIST:

R0423               1.  PUSH                   PUSHDOWN AND NO LOAD.
R0424               2.  PDDL                   PUSHDOWN AND DOUBLE PRECISION LOAD.
R0425               3.  PDVL                   PUSHDOWN AND VECTOR LOAD.

 0426                                6544  0 0006 1  PDDL      EXTEND
 0427   REF  33  LAST 1017           6545  5 0116 1            INDEX  ADDRWD             LOAD MPAC,+1, PUSHING THE FORMER
 0428                                6546  3 0001 0            DCA    0                  CONTENTS DOWN.
 0429   REF 376  LAST 1017           6547  52 155 1            DXCH   MPAC
 0430   REF   9  LAST 1006           6550  50 166 0            INDEX  PUSHLOC
 0431                                6551  52 001 1            DXCH   0

 0432   REF  15  LAST 1015           6552  50 163 0            INDEX  MODE               ADVANCE THE PUSHDOWN POINTER APPRO-
 0433   REF   3  LAST 1006           6553  3 6265 0            CAF    NO.WDS             PRIATELY.
 0434   REF  10  LAST 1018           6554  26 166 1            ADS    PUSHLOC

 0435   REF  16  LAST 1018           6555  10 163 1            CCS    MODE
 0436   REF   1                      6556  1 6573 1            TCF    ENDTPUSH
 0437   REF   1                      6557  1 6571 0            TCF    ENDDPUSH

 0438   REF  17  LAST 1018           6560  54 163 1            TS     MODE               NOW DP.
 0439   REF 377  LAST 1018           6561  54 156 1  ENDVPUSH  TS     MPAC +2
 0440   REF 378  LAST 1018           6562  52 160 1            DXCH   MPAC +3            PUSH DOWN THE REST OF THE VECTOR HERE.
 0441   REF  11  LAST 1018           6563  50 166 0            INDEX  PUSHLOC
 0442                                6564  51'775 0            DXCH   0 -4

 0443   REF 379  LAST 1018           6565  52 162 0            DXCH   MPAC +5
 0444   REF  12  LAST 1018           6566  50 166 0            INDEX  PUSHLOC
 0445                                6567  51'777 1            DXCH   0 -2

 0446   REF   6  LAST 1013           6570  1 6102 0            TCF    DANZIG

 0447   REF 380  LAST 1018           6571  54 156 1  ENDDPUSH  TS     MPAC +2            SET MPAC +2 TO ZERO AND EXIT ON DP.
 0448   REF   7  LAST 1018           6572  1 6102 0            TCF    DANZIG

 0449   REF  18  LAST 1018           6573  54 163 1  ENDTPUSH  TS     MODE
 0450   REF 381  LAST 1018           6574  56 156 0            XCH    MPAC +2            ON TRIPLE, SET MPAC +2 TO ZERO, PUSHING
 0451   REF  13  LAST 1018           6575  50 166 0    +2      INDEX  PUSHLOC            DOWN THE OLD CONTENTS
 0452                                6576  53'777 0            TS     0 -1
 0453   REF   8  LAST 1018           6577  1 6102 0            TCF    DANZIG
```

```
P0454              PDVL - PUSHDOWN AND VECTOR LOAD.

 0455                                    6600  0 0006 1  PDVL     EXTEND                  RELOAD MPAC AND PUSH DOWN ITS CONTENTS.
 0456   REF  34  LAST 1018               6601  5 0116 1           INDEX  ADDRWD
 0457                                    6602  3 0001 0           DCA    0
 0458   REF 382  LAST 1018               6603  52 155 1           DXCH   MPAC
 0459   REF  14  LAST 1018               6604  50 166 0           INDEX  PUSHLOC
 0460                                    6605  52 001 1           DXCH   0

 0461   REF  19  LAST 1018               6606  50 163 0           INDEX  MODE             ADVANCE THE PUSHDOWN POINTER.
 0462   REF   4  LAST 1018               6607  3 6265 0           CAF    NO.WDS
 0463   REF  15  LAST 1019               6610  26 166 1           ADS    PUSHLOC

 0464   REF  20  LAST 1019               6611  10 163 1           CCS    MODE             TEST PAST MODE.
 0465   REF   1                          6612  1 6631 1           TCF    TPDVL
 0466   REF   1                          6613  1 6532 1           TCF    ENDVLOAD         JUST LOAD LAST FOUR REGISTERS ON DP.

 0467                                    6614  0 0006 1  VPDVL    EXTEND                  PUSHDOWN AND RE-LOAD LAST TWO COMPONENTS
 0468   REF  35  LAST 1019               6615  5 0116 1           INDEX  ADDRWD
 0469                                    6616  3 0003 1           DCA    2
 0470   REF 383  LAST 1019               6617  52 160 1           DXCH   MPAC +3
 0471   REF  16  LAST 1019               6620  50 166 0           INDEX  PUSHLOC
 0472                                    6621  51'775 0           DXCH   0 -4

 0473                                    6622  0 0006 1           EXTEND
 0474   REF  36  LAST 1019               6623  5 0116 1           INDEX  ADDRWD
 0475                                    6624  3 0005 1           DCA    4
 0476   REF 384  LAST 1019               6625  52 162 0           DXCH   MPAC +5
 0477   REF  17  LAST 1019               6626  50 166 0           INDEX  PUSHLOC
 0478                                    6627  51'777 1           DXCH   0 -2

 0479   REF   9  LAST 1018               6630  1 6102 0           TCF    DANZIG

 0480                                    6631  0 0006 1  TPDVL    EXTEND                  ON TP, WE MUST LOAD THE Y COMPONENT
 0481   REF  37  LAST 1019               6632  5 0116 1           INDEX  ADDRWD           BEFORE STORING MPAC +2 INCASE THIS IS A
 0482                                    6633  3 0003 1           DCA    2                PUSHUP.
 0483   REF 385  LAST 1019               6634  52 160 1           DXCH   MPAC +3

 0484   REF 386  LAST 1019               6635  3 0156 0           CA     MPAC +2
 0485   REF  18  LAST 1019               6636  50 166 0           INDEX  PUSHLOC          IN DP.
 0486                                    6637  53'777 0           TS     0 -1
 0487   REF   2  LAST 1019               6640  1 6536 0           TCF    ENDVLOAD +4

R0488              SSP (STORE SINGLE PRECISION) IS EXECUTED HERE.

 0489   REF  18  LAST 1012               6641  24 164 1  SSP      INCR   LOC              PICK UP THE WORD FOLLOWING THE GIVEN
 0490   REF  19  LAST 1019               6642  50 164 1           INDEX  LOC              ADDRESS AND STORE IT AT X.
 0491                                    6643  3 0000 1           CA     0
 0492   REF  38  LAST 1019               6644  50 116 1  STORE1   INDEX  ADDRWD           SOME INDEX AND MISCELLANEOUS OPS END
 0493                                    6645  54 000 0           TS     0                HERE.
 0494    REF  10  LAST 1019       6646  1 6102 0          TCF     DANZIG
```

```
P0495     SEQUENCE CHANGING AND SUBROUTINE CALLING OPTIONS.

R0496               THE FOLLOWING OPERATIONS ARE AVAILABLE FOR SEQUENCING CHANGING, BRANCHING, AND CALLING SUBROUTINES:

R0498               1.  GOTO                   GO TO.
R0499               2.  CALL                   CALL SUBROUTINE SETTING QPRET.
R0500               3.  CGOTO                  COMPUTED GO TO.
R0501               4.  CCALL                  COMPUTED CALL.
R0502               7.  BPL                    BRANCH IF MPAC POSITIVE OR ZERO.
R0503               8.  BZF                    BRANCH IF MPAC ZERO.
R0504               9.  BMN                    BRANCH IF MPAC NEGATIVE NON-ZERO.

 0505     REF  20   LAST 1019      6647  24 164 1  CCALL     INCR    LOC             MAINTAIN LOC FOR QPRET COMPUTATION.
 0506     REF  21   LAST 1021      6650  50 164 1            INDEX   LOC
 0507                              6651  3 0000 1            CAF     0               GET BASE ADDRESS OF CADR LIST.
 0508     REF  39   LAST 1019      6652  50 116 1            INDEX   ADDRWD
 0509                              6653  6 0000 1            AD      0               ADD INCREMENT.
 0510     REF  17   LAST 1012      6654  54 004 1            TS      FBANK           SELECT DESIRED CADR.
 0511     REF  17   LAST 1004      6655  7 5003 0            MASK    LOW10
 0512     REF 310   LAST 1014      6656  50 000 1            INDEX   A
 0513                              6657  3 2000 0            CAF     10000
 0514     REF   7   LAST 1007      6660  54 117 1            TS      POLISH

 0515     REF   5   LAST 1012      6661  3 0165 0  CALL      CA      BANKSET         FOR ANY OF THE CALL OPTIONS, MAKE UP THE
 0516     REF   2   LAST 1008      6662  7 4341 1            MASK    BANKMASK        ADDRESS OF THE NEXT OP-CODE PAIR/STORE
 0517     REF   3   LAST 1021      6663  6 4341 0            AD      BANKMASK        CODE AND LEAVE IT IN QPRET.  NOTE THAT
 0518     REF  22   LAST 1021      6664  6 0164 1            AD      LOC             BANKMASK = -(2000 - 1).
 0519     REF  49   LAST 1014      6665  50 120 1            INDEX   FIXLOC
 0520     REF   6   LAST  936      6666  54 052 1            TS      QPRET

 0521     REF   8   LAST 1021      6667  3 0117 0  GOTO      CA      POLISH          BASIC BRANCHING SEQUENCE.
 0522     REF   3   LAST 1004      6670  7 7763 0   +1       MASK    HIGH4
 0523                              6671  0 0006 1            EXTEND
 0524     REF   1                  6672  1 6703 1            BZF     GOTOERS         SEE IF ADDRESS POINTS TO FIXED OR ERAS.
 0525     REF   6   LAST 1021      6673  3 0165 0   +4       CA      BANKSET         SET EBANK PART OF BBANK. NEXT, SET UP
 0526     REF  28   LAST 1001      6674  54 006 0            TS      BBANK           FBANK. THE COMBINATION IS PICKED UP &
 0527     REF   9   LAST 1021      6675  3 0117 0            CA      POLISH          PUT INTO BANKSET AT INTPRET +2.
 0528     REF  18   LAST 1021      6676  54 004 1            TS      FBANK
 0529     REF  18   LAST 1021      6677  7 5003 0            MASK    LOW10
 0530     REF   2   LAST 1004      6700  6 4732 0            AD      2K
 0531     REF  23   LAST 1021      6701  54 164 0            TS      LOC
 0532     REF 217   LAST 1000      6702  1 6063 0            TCF     INTPRET +3

 0533                         E3,1400                        EBANK=  1400            SO YUL DOESN'T CUSS THE "CA 1400" BELOW.

 0534     REF  10   LAST 1021      6703  3 0117 0  GOTOERS   CA      POLISH          THE GIVEN ADDRESS IS IN ERASABLE - SEE
 0535     REF   2   LAST 1003      6704  6 6272 0            AD      -ENDVAC         IF RELATIVE TO THE WORK AREA.
 0536     REF 311   LAST 1021      6705  10 000 0            CCS     A
 0537     REF  11   LAST 1021      6706  3 0117 0            CA      POLISH          GENERAL ERASABLE.
 0538     REF   1                  6707  1 6716 0            TCF     GOTOGE
 0539   REF  50  LAST 1021      6710  3 0120 1            CA       FIXLOC        WORK AREA.
 0540   REF  12  LAST 1021      6711  6 0117 0            AD       POLISH
 0541   REF 312  LAST 1021      6712  50 000 1            INDEX    A             USE THE GIVEN ADDRESS AS THE ADDRESS OF
 0542                           6713  3 0000 1            CA       0             THE BRANCH ADDRESS.
 0543   REF  13  LAST 1022      6714  54 117 1            TS       POLISH
 0544   REF   1                 6715  1 6670 1            TCF      GOTO +1       ALLOWS ARBITRARY INDIRECTNESS LEVELS.

 0545   REF  68  LAST 1014      6716  54 003 0  GOTOGE    TS       EBANK
 0546   REF  13  LAST 1014      6717  7 4350 1            MASK     LOW8
 0547   REF 313  LAST 1022      6720  50 000 1            INDEX    A             USE THE GIVEN ADDRESS AS THE ADDRESS OF
 0548                           6721  3 1400 1            CA       1400          THE BRANCH ADDRESS.
 0549   REF  14  LAST 1022      6722  54 117 1            TS       POLISH
 0550   REF   2  LAST 1022      6723  1 6670 1            TCF      GOTO +1

 0551   REF  24  LAST 1021      6724  50 164 1  CGOTO     INDEX    LOC           COMPUTED GO TO. PICK UP ADDRESS OF CADR
 0552                           6725  3 0001 0            CA       1             LIST.
 0553   REF  40  LAST 1021      6726  50 116 1            INDEX    ADDRWD        ADD MODIFIER.
 0554                           6727  6 0000 1            AD       0
 0555   REF  19  LAST 1021      6730  54 004 1            TS       FBANK         SELECT GOTO ADDRESS.
 0556   REF  19  LAST 1021      6731  7 5003 0            MASK     LOW10
 0557   REF 314  LAST 1022      6732  50 000 1            INDEX    A
 0558                           6733  3 2000 0            CA       10000
 0559   REF  15  LAST 1022      6734  54 117 1            TS       POLISH
 0560   REF   3  LAST 1022      6735  1 6670 1            TCF      GOTO +1       WITH ADDRESS IN A.

 0561   REF   7  LAST 1021      6736  3 0165 0  SWBRANCH  CA       BANKSET       SWITCH INSTRUCTIONS WHICH ELECT TO
 0562   REF  20  LAST 1022      6737  54 004 1            TS       FBANK         BRANCH COME HERE TO DO SO.
 0563   REF  25  LAST 1022      6740  50 164 1            INDEX    LOC
 0564                           6741  3 0001 0            CA       1
 0565   REF  16  LAST 1022      6742  54 117 1            TS       POLISH
 0566   REF   4  LAST 1022      6743  1 6670 1            TCF      GOTO +1
```

```
P0567                  TRIPLE PRECISION BRANCHING ROUTINE. IF CALLING TC IS AT L, RETURN IS AS FOLLOWS:

R0569                  L+1  IF MPAC IS GREATER THAN ZERO.
R0570                  L+2  IF MPAC IS EQUAL TO +0 OR -0.
R0571                  L+3  IF MPAC IS LESS THAN ZERO.


 0572   REF 387  LAST 1019       6744  10 154 0  BRANCH   CCS      MPAC
 0573   REF 247  LAST 1015       6745  0 0002 0           TC       Q
 0574                            6746  1 6750 1           TCF      +2                 ON ZERO.
 0575   REF   1                  6747  1 6762 0           TCF      NEG

 0576   REF 388  LAST 1023       6750  10 155 1           CCS      MPAC +1
 0577   REF 248  LAST 1023       6751  0 0002 0           TC       Q
 0578                            6752  1 6754 0           TCF      +2
 0579   REF   2  LAST 1023       6753  1 6762 0           TCF      NEG

 0580   REF 389  LAST 1023       6754  10 156 1           CCS      MPAC +2
 0581   REF 249  LAST 1023       6755  0 0002 0           TC       Q
 0582                            6756  1 6760 1           TCF      +2
 0583   REF   3  LAST 1023       6757  1 6762 0           TCF      NEG

 0584   REF 250  LAST 1023       6760  50 002 0  Q+1      INDEX    Q
 0585                            6761  0 0001 0           TC       1

 0586   REF 251  LAST 1023       6762  50 002 0  NEG      INDEX    Q                  IF FIRST NON-ZERO REGISTER WAS NEGATIVE.
 0587                            6763  0 0002 0           TC       2


 0588   REF   4  LAST 1023       6762            Q+2      =        NEG

R0589                  ITRACE (3) REFERS TO "EXIT".
 0590   REF   8  LAST 1022       6764  3 0165 0  EXIT     CA       BANKSET            RESTORE USER'S BANK SETTING, AND LEAVE
 0591   REF  29  LAST 1021       6765  54 006 0           TS       BBANK              INTERPRETIVE MODE.
 0592   REF  26  LAST 1022       6766  50 164 1           INDEX    LOC
 0593                            6767  0 0001 0           TC       1
```

```
P0594   SECTION 3 - ADD/SUBTRACT PACKAGE.

R0595           THE FOLLOWING OPERATIONS ARE PROVIDED FOR ADDING TO AND SUBTRACTING FROM THE MULTI-PURPOSE ACCUMULATOR
R0597   MPAC:

R0598           1.  DAD                 DOUBLE PRECISION ADD.
R0599           2.  DSU                 DOUBLE PRECISION SUBTRACT.
R0600           3.  BDSU                DOUBLE PRECISION SUBTRACT FROM.

R0601           4.  TAD                 TRIPLE PRECISION ADD.

R0602           5.  VAD                 VECTOR ADD.
R0603           6.  VSU                 VECTOR SUBTRACT.
R0604           7.  BVSU                VECTOR SUBTRACT FROM.

R0605   THE INTERPRETIVE OVERFLOW INDICATOR OVFIND IS SET NON-ZERO IF OVERFLOW OCCURS IN ANY OF THE ABOVE.


 0607   REF  38  LAST 1000      6770  3 4726 0  VSU      CAF     BIT15           CHANGES 0 TO DCS.
 0608                           6771  1 6773 0           TCF     +2

 0609   REF   9  LAST  833      6772  3 4346 1  VAD      CAF     PRIO30          CHANGES 0 TO DCA.
 0610   REF  41  LAST 1022      6773  26 116 0           ADS     ADDRWD
 0611                           6774  0 0006 1           EXTEND
 0612   REF  42  LAST 1024      6775  5 0116 1           INDEX   ADDRWD
 0613   REF   2  LAST  393      6776  00 003 1           READ    HISCALAR        DCA  2   OR   DCS  2
 0614   REF 390  LAST 1023      6777  20 160 1           DAS     MPAC +3
 0615                           7000  0 0006 1           EXTEND                  CHECK OVERFLOW.
 0616                           7001  1 7003 1           BZF     +2
 0617   REF   1                 7002  0 7035 0           TC      OVERFLWY

 0618                           7003  0 0006 1           EXTEND
 0619   REF  43  LAST 1024      7004  5 0116 1           INDEX   ADDRWD
 0620   REF   2  LAST  223      7005  00 005 1           READ    CHAN5           DCA  4   OR   DCS  4
 0621   REF 391  LAST 1024      7006  20 162 0           DAS     MPAC +5
 0622                           7007  0 0006 1           EXTEND
 0623                           7010  1 7012 1           BZF     +2
 0624   REF   1                 7011  0 7032 1           TC      OVERFLWZ

 0625                           7012  0 0006 1           EXTEND
 0626   REF  44  LAST 1024      7013  5 0116 1           INDEX   ADDRWD
 0627   REF  12  LAST  738      7014  00 001 0           READ    LCHAN           DCA  0   OR   DCS  0
 0628   REF   1                 7015  1 7021 1           TCF     ENDVXV

 0629                           7016  0 0006 1  DAD      EXTEND
 0630   REF  45  LAST 1024      7017  5 0116 1           INDEX   ADDRWD
 0631                           7020  3 0001 0           DCA     0
 0632   REF 392  LAST 1024      7021  20 155 1  ENDVXV   DAS     MPAC            VXV FINISHES HERE.
 0633                           7022  0 0006 1           EXTEND
 0634   REF  11  LAST 1020      7023  1 6102 0           BZF     DANZIG
 0635    REF   1                 7024  0 7040 1  SETOVF    TC      OVERFLOW
 0636    REF  12  LAST 1024      7025  1 6102 0            TCF     DANZIG
```

```
                        7026  0 0006 1  DSU       EXTEND
REF  46  LAST 1024      7027  5 0116 1            INDEX  ADDRWD
                        7030  4 0001 1            DCS    0
REF   2  LAST 1024      7031  1 7021 1            TCF    ENDVXV

REF 196  LAST  998      7032  54 001 1  OVERFLWZ  TS     L              ENTRY FOR THIRD COMPONENT.
REF  16  LAST  862      7033  3 4747 1            CAF    FIVE
                        7034  1 7037 0            TCF    +3

REF 197  LAST 1026      7035  54 001 1  OVERFLWY  TS     L              ENTRY FOR SECOND COMPONENT.
REF  30  LAST  978      7036  3 6266 0            CAF    THREE
REF 198  LAST 1026      7037  56 001 0            XCH    L

REF 315  LAST 1022      7040  50 000 1  OVERFLOW  INDEX  A              ENTRY FOR 1ST COMP OR DP (L=0).
REF   2  LAST  920      7041  4 4725 1            CS     LIMITS         PICK UP POSMAX OR NEGMAX.
REF  82  LAST  892      7042  54 130 1            TS     BUF
                        7043  0 0006 1            EXTEND
REF 316  LAST 1026      7044  24 000 1            AUG    A              FORCE OVERFLOW.
REF 199  LAST 1026      7045  50 001 0            INDEX  L
REF 393  LAST 1024      7046  26 155 1            ADS    MPAC +1
                        7047  54 007 1            TS     7
REF 193  LAST 1000      7050  3 4746 0            CAF    ZERO
REF  83  LAST 1026      7051  6 0130 0            AD     BUF
REF 200  LAST 1026      7052  50 001 0            INDEX  L
REF 394  LAST 1026      7053  26 154 0            ADS    MPAC
                        7054  54 007 1            TS     7
REF 252  LAST 1023      7055  0 0002 0            TC     Q              NO OVERFLOW EXIT.
REF   1                 7056  1 7173 1            TCF    SETOVF2        SET OVFIND AND EXIT.

                        7057  0 0006 1  BVSU      EXTEND
REF  47  LAST 1026      7060  5 0116 1            INDEX  ADDRWD
                        7061  3 0003 1            DCA    2
REF 395  LAST 1026      7062  52 160 1            DXCH   MPAC +3
                        7063  0 0006 1            EXTEND
                        7064  4 0001 1            DCOM
REF 396  LAST 1026      7065  20 160 1            DAS    MPAC +3
                        7066  0 0006 1            EXTEND
                        7067  1 7071 1            BZF    +2
REF   2  LAST 1024      7070  0 7035 0            TC     OVERFLWY

                        7071  0 0006 1            EXTEND
REF  48  LAST 1026      7072  5 0116 1            INDEX  ADDRWD
                        7073  3 0005 1            DCA    4
REF 397  LAST 1026      7074  52 162 0            DXCH   MPAC +5
                        7075  0 0006 1            EXTEND
                        7076  4 0001 1            DCOM
REF 398  LAST 1026      7077  20 162 0            DAS    MPAC +5
                        7100  0 0006 1            EXTEND
                        7101  1 7103 0            BZF    +2
REF   2  LAST 1024      7102  0 7032 1            TC     OVERFLWZ
```

```
 0682                               7103  0 0006 1   BCSU      EXTEND
 0683    REF  49  LAST 1026         7104  5 0116 1             INDEX   ADDRWD
 0684                               7105  3 0001 0             DCA     0
 0685    REF 399  LAST 1026         7106  52 155 1             DXCH    MPAC
 0686                               7107  0 0006 1             EXTEND
 0687                               7110  4 0001 1             DCOM
 0688    REF   3  LAST 1026         7111  1 7021 1             TCF     ENDVXV
```

```
P0689               TRIPLE PRECISION ADD ROUTINE.

 0690                                 7112  0 0006 1  TAD      EXTEND
 0691   REF  50  LAST 1027            7113  5 0116 1           INDEX  ADDRWD
 0692                                 7114  3 0002 0           DCA    1                    ADD MINOR PARTS FIRST.
 0693   REF 400  LAST 1027            7115  20 156 1           DAS    MPAC +1
 0694   REF  51  LAST 1028            7116  50 116 1           INDEX  ADDRWD
 0695                                 7117  6 0000 1           AD     0
 0696   REF 401  LAST 1028            7120  6 0154 1           AD     MPAC
 0697   REF 402  LAST 1028            7121  54 154 0           TS     MPAC
 0698   REF  13  LAST 1025            7122  1 6102 0           TCF    DANZIG

 0699   REF   1                       7123  1 7024 1           TCF    SETOVF               SET OVFIND IF SUCH OCCURS.
```

```
P0700    ARITHMETIC SUBROUTINES REQUIRED IN FIXED-FIXED.

R0701             1.  DMPSUB      DOUBLE PRECISION MULTIPLY. MULTIPLY THE CONTENTS OF MPAC,+1 BY THE DP WORD WHOSE ADDRESS
R0703                             IS IN ADDRWD AND LEAVE A TRIPLE PRECISION RESULT IN MPAC.
R0705             2.  ROUNDSUB    ROUND THE TRIPLE PRECISON CONTENTS OF MPAC TO DOUBLE PRECISION.
R0707             3.  DOTSUB      TAKE THE DOT PRODUCT OF THE VECTOR IN MPAC AND THE VECTOR WHOSE ADDRESS IS IN ADDRWD
R0709                             AND LEAVE THE TRIPLE PRECISION RESULT IN MPAC.
R0710             4.  POLY        USING THE CONTENTS OF MPAC AS A DP ARGUMENT, EVALUATE THE POLYNOMIAL WHOSE DEGREE AND
R0712                             COEFFICIENTS IMMEDIATELY FOLLOW THE TC POLY INSTRUCTION (SEE ROUTINE FOR DETAILS.)


 0714    REF 253  LAST 1026     7124  50 002 0  DMP       INDEX  Q                  BASIC SUBROUTINE FOR USE BY PINBALL, ETC
 0715                           7125  3 0000 1            CAF    0                  ADRES OF ARGUMENT FOLLOWS  TC DMP  .
 0716    REF 254  LAST 1029     7126  24 002 0            INCR   Q
 0717    REF  52  LAST 1028     7127  54 116 0   -1       TS     ADDRWD             (PROLOGUE FOR SETTING ADDRWD.)

 0718    REF  53  LAST 1029     7130  50 116 1  DMPSUB    INDEX  ADDRWD             GET MINOR PART OF OPERAND AT C(ADDRWD).
 0719                           7131  3 0001 0            CA     1
 0720    REF 403  LAST 1028     7132  54 156 1            TS     MPAC +2            THIS WORKS FOR SQUARING MPAC AS WELL.
 0721    REF 154  LAST 1026     7133  3 4746 0            CAF    ZERO               SET MPAC +1 TO ZERO SO WE CAN ACCUMULATE
 0722    REF 404  LAST 1029     7134  56 155 0            XCH    MPAC +1            THE PARTIAL PRODUCTS WITH DAS
 0723    REF   9  LAST  997     7135  54 135 1            TS     MPTEMP             INSTRUCTIONS.
 0724                           7136  0 0006 1            EXTEND
 0725    REF 405  LAST 1029     7137  7 0156 1            MP     MPAC +2            MINOR OF MPAC X MINOR OF C(ADDRWD).

 0726    REF 406  LAST 1029     7140  56 156 0            XCH    MPAC +2            DISCARD MINOR PART OF ABOVE RESULT AND
 0727                           7141  0 0006 1            EXTEND                    FORM MAJOR OF MPAC X MINOR OF C(ADDRWD).
 0728    REF 407  LAST 1029     7142  7 0154 0            MP     MPAC
 0729    REF 408  LAST 1029     7143  20 156 1            DAS    MPAC +1            GUARANTEED NO OVERFLOW.

 0730    REF  54  LAST 1029     7144  50 116 1            INDEX  ADDRWD             GET MAJOR PART OF ARGUMENT AT C(ADDRWD).
 0731                           7145  3 0000 1            CA     0
 0732    REF  10  LAST 1029     7146  56 135 0            XCH    MPTEMP             SAVE AND BRING OUT MINOR OF MPAC.
 0733                           7147  0 0006 1  DMPSUB2   EXTEND
 0734    REF  11  LAST 1029     7150  7 0135 1            MP     MPTEMP             MAJOR OF C(ADDRWD) X MINOR OF MPAC.
 0735    REF 409  LAST 1029     7151  20 156 1            DAS    MPAC +1            ACCUMULATE, SETTING A TO NET OVERFLOW.

 0736    REF 410  LAST 1029     7152  56 154 1            XCH    MPAC               SETTING MPAC TO 0 OR +-1.
 0737                           7153  0 0006 1            EXTEND
 0738    REF  12  LAST 1029     7154  7 0135 1            MP     MPTEMP             MAJOR OF MPAC X MAJOR OF C(ADDRWD).
 0739    REF 411  LAST 1029     7155  20 155 1            DAS    MPAC               GUARANTEED NO OVERFLOW.
 0740    REF 255  LAST 1029     7156  0 0002 0            TC     Q                  49 MCT = .573 MS. INCLUDING RETURN.
```

```
P0741              ROUND MPAC TO DOUBLE PRECISION, SETTING OVFIND ON THE RARE EVENT OF OVERFLOW.

 0743    REF 195   LAST 1029        7157  3 4746 0  ROUNDSUB CAF     ZERO              SET MPAC +2 = 0 FOR SCALARS AND CHANGE
 0744    REF  21   LAST 1019        7160  54 163 1   +1      TS      MODE              MODE TO DP.

 0745    REF 412   LAST 1029        7161  56 156 0  VROUND   XCH     MPAC +2           BUT WE NEEDNT TAKE THE TIME FOR VECTORS.
 0746                               7162  6 0000 1           DOUBLE
 0747    REF 201   LAST 1026        7163  54 001 1           TS      L
 0748    REF 256   LAST 1029        7164  0 0002 0           TC      Q

 0749    REF 413   LAST 1030        7165  6 0155 0           AD      MPAC +1           ADD ROUNDING BIT IF MPAC +2 WAS GREATER
 0750    REF 414   LAST 1030        7166  54 155 1           TS      MPAC +1           THAN .5 IN MAGNITUDE.
 0751    REF 257   LAST 1030        7167  0 0002 0           TC      Q

 0752    REF 415   LAST 1030        7170  6 0154 1           AD      MPAC              PROPAGATE INTERFLOW.
 0753    REF 416   LAST 1030        7171  54 154 0           TS      MPAC
 0754    REF 258   LAST 1030        7172  0 0002 0           TC      Q

 0755    REF   4   LAST  828        7173  54 121 1  SETOVF2  TS      OVFIND            (RARE).
 0756    REF 259   LAST 1030        7174  0 0002 0           TC      Q
```

```
P0757            THE DOT PRODUCT SUBROUTINE USUALLY FORMS THE DOT PRODUCT OF THE VECTOR IN MPAC WITH A STANDARD SIX
R0759     REGISTER VECTOR WHOSE ADDRESS IS IN ADDRWD. IN THIS CASE C(DOTINC) ARE SET TO 2. VXM, HOWEVER, SETS C(DOTINC) TO
R0761     6 SO THAT DOTSUB DOTS MPAC WITH A COLUMN VECTOR OF THE MATRIX IN QUESTION IN THIS CASE.

 0763    REF  62  LAST  995     7175  3 4743 0  PREDOT    CAF     TWO              PROLOGUE TO SET DOTINC TO 2.
 0764    REF   4  LAST   99     7176  54 136 1            TS      DOTINC

 0765                           7177  0 0006 1  DOTSUB    EXTEND
 0766    REF   5  LAST   99     7200  22 137 1            QXCH    DOTRET           SAVE RETURN.
 0767    REF   1                7201  0 7130 1            TC      DMPSUB           DOT X COMPONENTS.
 0768    REF 417  LAST 1030     7202  52 160 1            DXCH    MPAC +3          POSITION Y COMPONENT OF MPAC FOR
 0769    REF 418  LAST 1031     7203  52 155 1            DXCH    MPAC             MULTIPLICATION WHILE SAVING RESULT IN
 0770    REF  84  LAST 1026     7204  52 131 0            DXCH    BUF              THREE WORD BUFFER, BUF.
 0771    REF 419  LAST 1031     7205  3 0156 0            CA      MPAC +2
 0772    REF  85  LAST 1031     7206  54 132 0            TS      BUF +2

 0773    REF   5  LAST 1031     7207  3 0136 0            CA      DOTINC           ADVANCE ADDRWD TO Y COMPONENT OF
 0774    REF  55  LAST 1029     7210  26 116 0            ADS     ADDRWD           OTHER ARGUMENT.
 0775    REF   2  LAST 1031     7211  0 7130 1            TC      DMPSUB
 0776    REF 420  LAST 1031     7212  52 156 1            DXCH    MPAC +1          ACCUMULATE PARTIAL PRODUCTS.
 0777    REF  86  LAST 1031     7213  20 132 0            DAS     BUF +1
 0778    REF 421  LAST 1031     7214  6 0154 1            AD      MPAC
 0779    REF  87  LAST 1031     7215  6 0130 0            AD      BUF
 0780    REF  88  LAST 1031     7216  54 130 1            TS      BUF
 0781                           7217  1 7221 0            TCF     +2
 0782    REF   5  LAST 1030     7220  54 121 1            TS      OVFIND           IF OVERFLOW OCCURS.

 0783    REF 422  LAST 1031     7221  52 162 0            DXCH    MPAC +5          MULTIPLY Z COMPONENTS.
 0784    REF 423  LAST 1031     7222  52 155 1            DXCH    MPAC
 0785    REF   6  LAST 1031     7223  3 0136 0            CA      DOTINC
 0786    REF  56  LAST 1031     7224  26 116 0            ADS     ADDRWD
 0787    REF   3  LAST 1031     7225  0 7130 1            TC      DMPSUB
 0788    REF  89  LAST 1031     7226  52 132 0  ENDDOT    DXCH    BUF +1           LEAVE FINAL ACCUMULATION IN MPAC.
 0789    REF 424  LAST 1031     7227  20 156 1            DAS     MPAC +1
 0790    REF 425  LAST 1031     7230  6 0154 1            AD      MPAC
 0791    REF  90  LAST 1031     7231  6 0130 0            AD      BUF
 0792    REF 426  LAST 1031     7232  54 154 0            TS      MPAC
 0793    REF   6  LAST 1031     7233  0 0137 1            TC      DOTRET

 0794    REF   2  LAST 1025     7234  0 7040 1            TC      OVERFLOW         ON OVERFLOW HERE.
 0795    REF   7  LAST 1031     7235  0 0137 1            TC      DOTRET
```

```
P0796    DOUBLE PRECISION POLYNOMIAL EVALUATOR

R0797                                   N          N-1
R0798           THIS ROUTINE EVALUATES A X  + A    X     + ... + A X + A  LEAVING THE DP RESULT IN MPAC ON EXIT.
R0800                                 N       N-1                1     0

R0801    THE ROUTINE HAS TWO ENTRIES

R0802           1. ENTRY THRU POWRSERS. THE COEFFICIENTS MAY BE EITHER IN FIXED OR ERASABLE, THE CALL IS BY
R0804              TC POWRSERS, AND THE RETURN IS TO LOC(TC POWRSERS)+1. THE ENTERING DATA MUST BE AS FOLLOWS

A0806                                              A         SP      LOC-3              ADDRESS FOR REFERENCING COFF TABLE
A0807                                              L         SP      N-1                N IS THE DEGREE OF THE POWER SERIES
A0808                                              MPAC      DP      X                  ARGUMENT

A0809                                              LOC-2N    DP      A(0)
A0810                                                        ...
A0811                                              LOC       DP      A(N)

R0812           2. ENTRY THRU POLY. THE CALL TO POLY AND THE ENTERING DATA MUST BE AS FOLLOWS

A0814                                              MPAC      DP      X                  ARGUMENT

A0815                                              LOC       TC      POLY
A0816                                              LOC+1     SP      N-1
A0817                                              LOC+2     DP      A(0)
A0818                                                        ...
A0819                                              LOC+2N+2  DP      A(N)               RETURN IS TO LOC+2N+4

 0820                                  7236  0 0006 1  POWRSERS EXTEND
 0821    REF   1                       7237  22 141 0           QXCH    POLYRET            RETURN ADDRESS
 0822    REF  17  LAST 1022            7240  54 117 1           TS      POLISH             POWER SERIES ADDRESS
 0823    REF   1                       7241  22 140 1           LXCH    POLYCNT            N-1 TO COUNTER
 0824    REF   1                       7242  1 7253 0           TCF     POLYCOM            SKIP SET UP BY POLY

 0825    REF 260  LAST 1030            7243  50 002 0  POLY     INDEX   Q
 0826                                  7244  3 0000 1           CAF     0
 0827    REF   2  LAST 1032            7245  54 140 0           TS      POLYCNT            N-1 TO COUNTER
 0828                                  7246  6 0000 1           DOUBLE
 0829    REF 261  LAST 1032            7247  6 0002 0           AD      Q
 0830    REF  18  LAST 1032            7250  54 117 1           TS      POLISH             L(A(N))-3 TO POLISH
 0831    REF  17  LAST 1026            7251  6 4747 1           AD      FIVE
 0832    REF   2  LAST 1032            7252  54 141 1           TS      POLYRET            STORE RETURN ADDRESS

 0833    REF   1                       7253  3 6314 1  POLYCOM  CAF     LVBUF              INCOMING X WILL BE MOVED TO VBUF, SO
 0834    REF  57  LAST 1031            7254  54 116 0           TS      ADDRWD             SET ADDRWD SO DMPSUB WILL MPY BY VBUF.

 0835                                  7255  0 0006 1           EXTEND
 0836    REF  19  LAST 1032            7256  5 0117 0           INDEX   POLISH
 0837                                  7257  3 0004 0           DCA     3
 0838    REF 427  LAST 1031        7260  52 155 1              DXCH    MPAC              LOAD A(N) INTO MPAC,
 0839    REF  26  LAST 1008        7261  52 123 0              DXCH    VBUF              SAVING X IN VBUF
 0840    REF   1                   7262  1 7266 0              TCF     POLY2

 0841    REF   3  LAST 1032        7263  54 140 0   POLYLOOP   TS      POLYCNT           SAVE DECREMENTED LOOP COUNTER
 0842    REF  63  LAST 1031        7264  4 4743 1              CS      TWO
 0843    REF  20  LAST 1032        7265  26 117 1              ADS     POLISH            REGRESS COEFFICIENT POINTER

 0844    REF   4  LAST 1031        7266  0 7130 1   POLY2      TC      DMPSUB            MULTIPLY BY X
 0845                              7267  0 0006 1              EXTEND
 0846    REF  21  LAST 1033        7270  5 0117 0              INDEX   POLISH
 0847                              7271  3 0002 0              DCA     1                 ADD IN NEXT COEFFICIENT
 0848    REF 428  LAST 1033        7272  20 155 1              DAS     MPAC              USERS RESPONSIBILITY TO ASSURE NO OVFLOW

 0849    REF   4  LAST 1033        7273  10 140 0              CCS     POLYCNT
 0850    REF   1                   7274  1 7263 0              TCF     POLYLOOP
 0851    REF   3  LAST 1032        7275  0 0141 0              TC      POLYRET           RETURN CALLER
```

```
P0852              MISCELLANEOUS MULTI-PRECISION ROUTINES REQUIRED IN FIXED-FIXED BUT NOT USED BY THE INTERPRETER.

 085398 REF 196  LAST 1030       7276  3 4746 0  DPAGREE   CAF     ZERO              DOUBLE PRECISION ENTRY -
 085399 REF 429  LAST 1033       7277  54 156 1            TS      MPAC +2           ZERO LOW-ORDER WORD

 0854   REF 262  LAST 1032       7300  22 C02 0  TPAGREE   LXCH    Q                 FORCE SIGN AGREEMENT AMONG THE TRIPLE
 0855   REF   3  LAST  890       7301  0 6744 0            TC      BRANCH            PRECISION CONTENTS OF MPAC.  RETURNING
 0856   REF   1                  7302  1 7306 1            TCF     ARG+              WITH SIGNUM OF THE INPUT IN A.
 0857   REF   1                  7303  1 7326 0            TCF     ARGZERO

 0858   REF  26  LAST  917       7304  4 4724 0            CS      POSMAX            IF NEGATIVE.
 0859                            7305  1 7307 0            TCF     +2

 0860   REF  27  LAST 1034       7306  3 4724 1  ARG+      CAF     POSMAX
 0861   REF 263  LAST 1034       7307  54 002 1            TS      Q
 0862                            7310  0 0006 1            EXTEND
 0863   REF 317  LAST 1026       7311  24 000 1            AUG     A                 FORMS +-1.0.
 0864   REF 430  LAST 1034       7312  6 0156 0            AD      MPAC +2
 0865   REF 431  LAST 1034       7313  54 156 1            TS      MPAC +2
 0866   REF 197  LAST 1034       7314  3 4746 0            CAF     ZERO
 0867   REF 264  LAST 1034       7315  6 0002 0            AD      Q
 0868   REF 432  LAST 1034       7316  6 0155 0            AD      MPAC +1
 0869   REF 433  LAST 1034       7317  54 155 1            TS      MPAC +1
 0870   REF 198  LAST 1034       7320  3 4746 0            CAF     ZERO
 0871   REF 265  LAST 1034       7321  6 0002 0            AD      Q                 Q STILL HAS POSMAX OR NEGMAX IN IT.
 0872   REF 434  LAST 1034       7322  6 0154 1            AD      MPAC
 0873   REF 435  LAST 1034       7323  54 154 0  ARGZERO2  TS      MPAC              ALWAYS SKIPPING UNLESS ARGZERO.
 0874   REF 436  LAST 1034       7324  54 155 1            TS      MPAC +1
 0875   REF 202  LAST 1030       7325  0 0001 0            TC      L                 RETURN VIA L.

 0876   REF 437  LAST 1034       7326  54 156 1  ARGZERO   TS      MPAC +2           SET ALL THREE MPAC REGISTERS TO ZERO.
 0877   REF   1                  7327  1 7323 0            TCF     ARGZERO2

R0878              SHORTMP MULTIPLIES THE TP CONTENTS OF MPAC BY THE SINGLE PRECISION NUMBER ARRIVING IN A.

 0880   REF  13  LAST 1029       7330  54 135 1  SHORTMP   TS      MPTEMP
 0881                            7331  0 0006 1            EXTEND
 0882   REF 438  LAST 1034       7332  7 0156 1            MP      MPAC +2
 0883   REF 439  LAST 1034       7333  54 156 1            TS      MPAC +2
 0884   REF 199  LAST 1034       7334  3 4746 0  SHORTMP2  CAF     ZERO              SO SUBSEQUENT DAS WILL WORK.
 0885   REF 440  LAST 1034       7335  56 155 0            XCH     MPAC +1
 0886   REF   1                  7336  1 7147 0            TCF     DMPSUB2
```

CA
EX
MP
DXCH

CA
EX
MP
DXCH
CA
DXCH
EX
MP
DAS

HMEAS +1
.2SP
ZERO
HMEAS
-.2SP
HMEAS

```
P0887           DMPNSUB MULTIPLIES THE DP FRACTION ARRIVING IN MPAC BY THE SP
R0888    INTEGER ARRIVING IN A.  THE DP PRODUCT DEPARTS BOTH IN MPAC AND IN
R0889    A AND L.  NOTE THAT DMPNSUB NORMALLY INCREASES THE MAGNITUDE OF THE
R0890    CONTENTS OF MPAC.  THE CUSTOMER MUST INSURE THAT B(A) X B(MPAC,MPAC+1)
R0891    AND B(A) X B(MPAC) ARE LESS THAN 1 IN MAGNITUDE, WHERE B, AS IS OBVIOUS,
R0892    INDICATES THE ARRIVING CONTENTS.

 0893    REF   1                  7337  54 135 1  DMPNSUB  TS      DMPNTEMP
 0894                             7340   0 0006 1           EXTEND
 0895    REF 441  LAST 1034       7341   7 0155 1           MP      MPAC +1
 0896    REF 442  LAST 1035       7342  52 155 1            DXCH    MPAC                LOW PRODUCT TO MPAC, HIGH FACTOR TO A
 0897                             7343   0 0006 1           EXTEND
 0898    REF   2  LAST 1035       7344   7 0135 1           MP      DMPNTEMP
 0899    REF 203  LAST 1034       7345   3 0001 0           CA      L
 0900    REF 443  LAST 1035       7346  26 154 0            ADS     MPAC                COMPLETING THE PRODUCT IN MPAC
 0901                             7347   0 0006 1           EXTEND
 0902    REF 444  LAST 1035       7350   3 0155 0           DCA     MPAC                BRINGING THE PRODUCT INTO A AND L
 0903    REF 266  LAST 1034       7351   0 0002 0           TC      Q
```

```
R0904   MISCELLANEOUS VECTOR OPERATIONS. INCLUDED HERE ARE THE FOLLOWING:

R0905                1.  DOT                   DP VECTOR DOT PRODUCT.
R0906                2.  VXV                   DP VECTOR CROSS PRODUCT.
R0907                3.  VXSC                  DP VECTOR TIMES SCALAR.
R0908                4.  V/SC                  DP VECTOR DIVIDED BY SCALAR.
R0909                5.  VPROJ                 DP VECTOR PROJECTION. ( (MPAC.X)MPAC ).
R0910                6.  VXM                   DP VECTOR POST-MULTIPLIED BY MATRIX.
R0911                7.  MXV                   DP VECTOR PRE-MULTIPLIED BY MATRIX.


 0912   REF   1                    7352  0 7175 0  DOT       TC        PREDOT          DO THE DOT PRODUCT AND EXIT, CHANGING
 0913   REF 200  LAST 1034         7353  3 4746 0  DMODE     CAF       ZERO            THE MODE TO DP SCALAR.
 0914   REF   3  LAST 1017         7354  1 6101 0            TCF       NEWMODE


 0915   REF  64  LAST 1033         7355  3 4743 0  MXV       CAF       TWO             SET UP MATINC AND DOTINC FOR ROW
 0916   REF   6  LAST  100         7356 54 140 0             TS        MATINC          VECTORS.
 0917   REF   1                    7357  1 7363 1            TCF       VXM/MXV         GO TO COMMON PORTION.

 0918   REF   7  LAST  432         7360  4 4354 0  VXM       CS        TEN             SET MATINC AND DOTINC TO REFER TO MATRIX
 0919   REF   7  LAST 1036         7361 54 140 0             TS        MATINC          AS THREE COLUMN VECTORS.
 0920   REF  16  LAST  891         7362  3 6263 0            CAF       SIX
```

```
P0921            COMMON PORTION OF MXV AND VXM.

 0922   REF    7  LAST 1031       7363  54 136 1  VXM/MXV  TS       DOTINC
R0923            ITRACE (2) REFERS TO "VXM/MXV".
 0924   REF    1                  7364  0 7553 0           TC       MPACVBUF          SAVE VECTOR IN MPAC FOR FURTHER USE.

 0925   REF    1                  7365  0 7177 1           TC       DOTSUB            GO DOT TO GET X COMPONENT OF ANSWER.
 0926                             7366  0 0006 1           EXTEND
 0927   REF   27  LAST 1033       7367  3 0123 1           DCA      VBUF              MOVE MPAC VECTOR BACK INTO MPAC, SAVING
 0928   REF  445  LAST 1035       7370  52 155 1           DXCH     MPAC              NEW X COMPONENT IN BUF2.
 0929   REF   13  LAST  997       7371  52 134 0           DXCH     BUF2
 0930                             7372  0 0006 1           EXTEND
 0931   REF   28  LAST 1037       7373  3 0125 1           DCA      VBUF +2
 0932   REF  446  LAST 1037       7374  52 160 1           DXCH     MPAC +3
 0933                             7375  0 0006 1           EXTEND
 0934   REF   29  LAST 1037       7376  3 0127 0           DCA      VBUF +4
 0935   REF  447  LAST 1037       7377  52 162 0           DXCH     MPAC +5
 0936   REF    8  LAST 1036       7400  3 0140 1           CA       MATINC            INITIALIZE ADDRWD FOR NEXT DOT PRODUCT.
 0937   REF   58  LAST 1032       7401  26 116 0           ADS      ADDRWD            FORMS BASE ADDRESS OF NEXT COLUMN(ROW).

 0938   REF    2  LAST 1037       7402  0 7177 1           TC       DOTSUB
 0939   REF   30  LAST 1037       7403  52 123 0           DXCH     VBUF              MOVE GIVEN VECTOR BACK TO MPAC, SAVING Y
 0940   REF  448  LAST 1037       7404  52 155 1           DXCH     MPAC              COMPONENT OF ANSWER IN VBUF +2.
 0941   REF   31  LAST 1037       7405  52 125 0           DXCH     VBUF +2
 0942   REF  449  LAST 1037       7406  52 160 1           DXCH     MPAC +3
 0943   REF   32  LAST 1037       7407  52 127 1           DXCH     VBUF +4
 0944   REF  450  LAST 1037       7410  52 162 0           DXCH     MPAC +5
 0945   REF    9  LAST 1037       7411  3 0140 1           CA       MATINC            FORM ADDRESS OF LAST COLUMN OR ROW.
 0946   REF   59  LAST 1037       7412  26 116 0           ADS      ADDRWD

 0947   REF    3  LAST 1037       7413  0 7177 1           TC       DOTSUB
 0948   REF   14  LAST 1037       7414  52 134 0           DXCH     BUF2              ANSWER NOW COMPLETE. PUT COMPONENTS INTO
 0949   REF  451  LAST 1037       7415  52 155 1           DXCH     MPAC              PROPER MPAC REGISTERS.
 0950   REF  452  LAST 1037       7416  52 162 0           DXCH     MPAC +5
 0951   REF   33  LAST 1037       7417  52 125 0           DXCH     VBUF +2
 0952   REF  453  LAST 1037       7420  52 160 1           DXCH     MPAC +3
 0953   REF   14  LAST 1028       7421  1 6102 0           TCF      DANZIG            EXIT.
```

```
P0954              VXSC - VECTOR TIMES SCALAR.

 0955    REF  22  LAST 1030        7422  10 163 1  VXSC      CCS       MODE                TEST PRESENT MODE.
 0956    REF   1                   7423  1 7451 1            TCF       DVXSC               SEPARATE ROUTINE WHEN SCALAR IS IN MPAC.
 0957    REF   2  LAST 1038        7424  1 7451 1            TCF       DVXSC

 0958    REF   5  LAST 1033        7425  0 7130 1  VVXSC     TC        DMPSUB              COMPUTE X COMPONENT
 0959    REF   1                   7426  0 7161 0            TC        VROUND              AND ROUND IT.
 0960    REF 454  LAST 1037        7427  52 160 1            DXCH      MPAC +3             PUT Y COMPONENT INTO MPAC SAVING MPAC IN
 0961    REF 455  LAST 1038        7430  52 155 1            DXCH      MPAC                MPAC +3.
 0962    REF 456  LAST 1038        7431  52 160 1            DXCH      MPAC +3

 0963    REF   6  LAST 1038        7432  0 7130 1            TC        DMPSUB              DO SAME FOR Y AND Z COMPONENTS.
 0964    REF   2  LAST 1038        7433  0 7161 0            TC        VROUND
 0965    REF 457  LAST 1038        7434  52 162 0            DXCH      MPAC +5
 0966    REF 458  LAST 1038        7435  52 155 1            DXCH      MPAC
 0967    REF 459  LAST 1038        7436  52 162 0            DXCH      MPAC +5

 0968    REF   7  LAST 1038        7437  0 7130 1            TC        DMPSUB
 0969    REF   3  LAST 1038        7440  0 7161 0            TC        VROUND
 0970    REF 460  LAST 1038        7441  52 155 1  VROTATEX  DXCH      MPAC                EXIT USED TO RESTORE MPAC AFTER THIS
 0971    REF 461  LAST 1038        7442  52 162 0            DXCH      MPAC +5             TYPE OF ROTATION. CALLED BY VECTOR SHIFT
 0972    REF 462  LAST 1038        7443  52 160 1            DXCH      MPAC +3             RIGHT, V/SC, ETC.
 0973    REF 463  LAST 1038        7444  52 155 1            DXCH      MPAC
 0974    REF  15  LAST 1037        7445  1 6102 0            TCF       DANZIG
```

```
P0975             DP VECTOR PROJECTION ROUTINE.

 0976   REF   2   LAST 1036       7446   0 7175 0  VPROJ     TC      PREDOT          (MPAC.X)MPAC IS COMPUTED AND LEFT IN
 0977   REF  23   LAST  917       7447   4 4742 0            CS      FOUR            MPAC. DO DOT AND FALL INTO DVXSC.
 0978   REF  60   LAST 1037       7450   26 116 0            ADS     ADDRWD

R0979             VXSC WHEN SCALAR ARRIVES IN MPAC AND VECTOR IS AT X.

 0980                             7451   0 0006 1  DVXSC     EXTEND                  SAVE SCALAR IN MPAC +3 AND GET X
 0981   REF 464   LAST 1038       7452   3 0155 0            DCA     MPAC            COMPONENT OF ANSWER.
 0982   REF 465   LAST 1039       7453   52 160 1            DXCH    MPAC +3
 0983   REF   8   LAST 1038       7454   0 7130 1            TC      DMPSUB
 0984   REF   4   LAST 1038       7455   0 7161 0            TC      VROUND

 0985   REF  65   LAST 1036       7456   3 4743 0            CAF     TWO             ADVANCE ADDRWD TO Y COMPONENT OF X.
 0986   REF  61   LAST 1039       7457   26 116 0            ADS     ADDRWD
 0987                             7460   0 0006 1            EXTEND
 0988   REF 466   LAST 1039       7461   3 0160 0            DCA     MPAC +3         PUT SCALAR BACK INTO MPAC AND SAVE
 0989   REF 467   LAST 1039       7462   52 155 1            DXCH    MPAC            X RESULT IN MPAC +5.
 0990   REF 468   LAST 1039       7463   52 162 0            DXCH    MPAC +5
 0991   REF   9   LAST 1039       7464   0 7130 1            TC      DMPSUB
 0992   REF   5   LAST 1039       7465   0 7161 0            TC      VROUND

 0993   REF  66   LAST 1039       7466   3 4743 0            CAF     TWO
 0994   REF  62   LAST 1039       7467   26 116 0            ADS     ADDRWD          TO Z COMPONENT.
 0995   REF 469   LAST 1039       7470   52 160 1            DXCH    MPAC +3         BRING SCALAR BACK, PUTTING Y RESULT IN
 0996   REF 470   LAST 1039       7471   52 155 1            DXCH    MPAC            THE PROPER PLACE.
 0997   REF 471   LAST 1039       7472   52 160 1            DXCH    MPAC +3
 0998   REF  10   LAST 1039       7473   0 7130 1            TC      DMPSUB
 0999   REF   6   LAST 1039       7474   0 7161 0            TC      VROUND

 1000   REF 472   LAST 1039       7475   52 155 1            DXCH    MPAC            PUT Z COMPONENT IN PROPER PLACE, ALSO
 1001   REF 473   LAST 1039       7476   52 162 0            DXCH    MPAC +5         POSITIONING X.
 1002   REF 474   LAST 1039       7477   52 155 1            DXCH    MPAC

 1003   REF   1                   7500   1 6542 0            TCF     VMODE           MODE HAS CHANGED TO VECTOR.
```

```
P1004            THE VECTOR CROSS PRODUCT ROUTINE CALCULATES (X M -X M ,X M -X M ,X M -X M ) WHERE M IS THE VECTOR IN
R1006                                                       3 2  2 3  1 3  3 1  2 1  1 2
R1008    MPAC AND X THE VECTOR AT THE GIVEN ADDRESS.


 1009                                   7501   0 0006 1  VXV       EXTEND
 1010    REF 475  LAST 1039             7502   3 0162 1            DCA      MPAC +5          FORM UP M3X1, LEAVING M1 IN VBUF.
 1011    REF 476  LAST 1040             7503   52 155 1            DXCH     MPAC
 1012    REF  34  LAST 1037             7504   52 123 0            DXCH     VBUF
 1013    REF  11  LAST 1039             7505   0 7130 1            TC       DMPSUB           BY X1.

 1014                                   7506   0 0006 1            EXTEND
 1015    REF 477  LAST 1040             7507   4 0160 1            DCS      MPAC +3          CALCULATE -X1M2, SAVING X1M3 IN VBUF +2.
 1016    REF 478  LAST 1040             7510   52 155 1            DXCH     MPAC
 1017    REF  35  LAST 1040             7511   52 125 0            DXCH     VBUF +2
 1018    REF  12  LAST 1040             7512   0 7130 1            TC       DMPSUB

 1019    REF  67  LAST 1039             7513   3 4743 0            CAF      TWO              ADVANCE ADDRWD TO X2.
 1020    REF  63  LAST 1039             7514   26 116 0            ADS      ADDRWD
 1021                                   7515   0 0006 1            EXTEND
 1022    REF 479  LAST 1040             7516   4 0162 0            DCS      MPAC +5          PREPARE TO GET -X2M3, SAVING -X1M2 IN
 1023    REF 480  LAST 1040             7517   52 155 1            DXCH     MPAC             MPAC +5.
 1024    REF 481  LAST 1040             7520   52 162 0            DXCH     MPAC +5
 1025    REF  13  LAST 1040             7521   0 7130 1            TC       DMPSUB

 1026                                   7522   0 0006 1            EXTEND
 1027    REF  36  LAST 1040             7523   3 0123 1            DCA      VBUF             GET X2M1, SAVING -X2M3 IN VBUF +4.
 1028    REF 482  LAST 1040             7524   52 155 1            DXCH     MPAC
 1029    REF  37  LAST 1040             7525   52 127 1            DXCH     VBUF +4
 1030    REF  14  LAST 1040             7526   0 7130 1            TC       DMPSUB

 1031    REF  68  LAST 1040             7527   3 4743 0            CAF      TWO              ADVANCE ADDRWD TO X3.
 1032    REF  64  LAST 1040             7530   26 116 0            ADS      ADDRWD
 1033                                   7531   0 0006 1            EXTEND
 1034    REF  38  LAST 1040             7532   4 0123 0            DCS      VBUF             GET -X3M1, ADDING X2M1 TO MPAC +5 TO
 1035    REF 483  LAST 1040             7533   52 155 1            DXCH     MPAC             COMPLETE THE Z COMPONENT OF THE ANSWER.
 1036    REF 484  LAST 1040             7534   20 162 0            DAS      MPAC +5

 1037                                   7535   0 0006 1            EXTEND
 1038                                   7536   1 7540 0            BZF      +2
 1039    REF   3  LAST 1026             7537   0 7032 1            TC       OVERFLWZ

 1040    REF  15  LAST 1040             7540   0 7130 1            TC       DMPSUB
 1041    REF  39  LAST 1040             7541   52 125 0            DXCH     VBUF +2          MOVE X1M3 TO MPAC +3 SETTING UP FOR X3M2
 1042    REF 485  LAST 1040             7542   52 160 1            DXCH     MPAC +3          AND ADD -X3M1 TO MPAC +3 TO COMPLETE THE
 1043    REF 486  LAST 1040             7543   52 155 1            DXCH     MPAC             Y COMPONENT OF THE RESULT.
 1044    REF 487  LAST 1040             7544   20 160 1            DAS      MPAC +3

 1045                                   7545   0 0006 1            EXTEND
 1046                                   7546   1 7550 1            BZF      +2
 1047   REF   3  LAST 1026     7547  0 7035 0                 TC      OVERFLWY

 1048   REF  16  LAST 1040     7550  0 7130 1                 TC      DMPSUB
 1049   REF  40  LAST 1040     7551  52 127 1                 DXCH    VBUF +4            GO ADD -X2M3 TO X3M2 TO COMPLETE THE X
 1050   REF   4  LAST 1027     7552  1 7021 1                 TCF     ENDVXV             COMPONENT (TAIL END OF OAD).

R1051                THE MPACVBUF SUBROUTINE SAVES THE VECTOR IN MPAC IN VBUF WITHOUT CLOBBERING MPAC.

 1053                          7553  0 0006 1  MPACVBUF EXTEND                     CALLED BY MXV, VXM, AND UNIT.
 1054   REF 488  LAST 1040     7554  3 0155 0                 DCA     MPAC
 1055   REF  41  LAST 1041     7555  52 123 0                 DXCH    VBUF
 1056                          7556  0 0006 1                 EXTEND
 1057   REF 489  LAST 1041     7557  3 0160 0                 DCA     MPAC +3
 1058   REF  42  LAST 1041     7560  52 125 0                 DXCH    VBUF +2
 1059                          7561  0 0006 1                 EXTEND
 1060   REF 490  LAST 1041     7562  3 0162 1                 DCA     MPAC +5
 1061   REF  43  LAST 1041     7563  52 127 1                 DXCH    VBUF +4
 1062   REF 267  LAST 1035     7564  0 0002 0                 TC      Q                  RETURN TO CALLER.


R1063                DOUBLE PRECISION SIGN AGREE ROUTINE. ARRIVE WITH INPUT IN A+L. OUTPUT IS IN A + L.

 1065   REF 318  LAST 1034     7565  10 000 0  ALSIGNAG CCS     A                  TEST UPPER PART.
 1066   REF   1                7566  1 7572 1                 TCF     UPPOS              IT IS POSITIVE
 1067   REF 268  LAST 1041     7567  0 0002 0                 TC      Q                  ZERO
 1068   REF   1                7570  1 7602 0                 TCF     UPNEG              NEGATIVE
 1069   REF 269  LAST 1041     7571  0 0002 0                 TC      Q                  ZERO

 1070   REF 204  LAST 1035     7572  56 001 0  UPPOS    XCH     L                  SAVE DECREMENTED UPPER PART.
 1071   REF  14  LAST  919     7573  6 4727 1                 AD      HALF
 1072   REF  15  LAST 1041     7574  6 4727 1                 AD      HALF
 1073   REF 319  LAST 1041     7575  54 000 0                 TS      A                  SKIPS ON OVERFLOW
 1074                          7576  1 7600 1                 TCF     +2
 1075   REF 205  LAST 1041     7577  24 001 0                 INCR    L                  RESTORE UPPER TO ROIGINAL VALUE
 1076   REF 206  LAST 1041     7600  56 001 0                 XCH     L                  SWAP A + L BACK.
 1077   REF 270  LAST 1041     7601  0 0002 0                 TC      Q

 1078   REF 207  LAST 1041     7602  56 001 0  UPNEG    XCH     L                  SAVE COMPLEMENTED + DECREMENTED UPPER PT
 1079   REF   6  LAST  919     7603  6 4726 0                 AD      NEGMAX
 1080   REF   8  LAST 1012     7604  6 7770 0                 AD      NEGONE
 1081   REF 320  LAST 1041     7605  54 000 0                 TS      A
 1082                          7606  1 7610 0                 TCF     +2                 DONT INCREMENT IF NO OVERFLOW.
 1083   REF 208  LAST 1041     7607  24 001 0                 INCR    L
 1084   REF 209  LAST 1041     7610  56 001 0                 XCH     L
 1085                          7611  4 0000 0                 COM                        MAKE NEGATIVE AGAIN.
 1086   REF 271  LAST 1041     7612  0 0002 0                 TC      Q
```

```
P1087              INTERPRETIVE INSTRUCTIONS WHOSE EXECUTION CONSISTS OF PRINCIPALLY CALLING SUBROUTINES.

 1089   REF  17  LAST 1041       7613  0 7130 1  DMP1      TC      DMPSUB           DMP INSTRUCTION.
 1090   REF  16  LAST 1038       7614  1 6102 0            TCF     DANZIG

 1091   REF  18  LAST 1042       7615  0 7130 1  DMPR      TC      DMPSUB
 1092   REF   1                  7616  0 7160 1            TC      ROUNDSUB +1      (C(A) = +0).
 1093   REF  17  LAST 1042       7617  1 6102 0            TCF     DANZIG

 1094                            7620  0 0006 1  DDV       EXTEND
 1095   REF  65  LAST 1040       7621  5 0116 1            INDEX   ADDRWD           MOVE DIVIDEND INTO BUF.
 1096                            7622  3 0001 0            DCA     0
 1097   REF   2  LAST 1009       7623  1 7630 1            TCF     BDDV +4

 1098                            7624  0 0006 1  BDDV      EXTEND                   MOVE DIVISOR INTO MPAC SAVING MPAC, THE
 1099   REF  66  LAST 1042       7625  5 0116 1            INDEX   ADDRWD           DIVIDEND, IN BUF.
 1100                            7626  3 0001 0            DCA     0
 1101   REF 491  LAST 1041       7627  52 155 1            DXCH    MPAC
 1102   REF  91  LAST 1031       7630  52 131 0    +4      DXCH    BUF
 1103   REF 201  LAST 1036       7631  3 4746 0            CAF     ZERO             DIVIDE ROUTINES IN BANK 0.
 1104   REF  21  LAST 1022       7632  54 004 1            TS      FBANK
 1105   REF   2  LAST  826       7633  1 2353 1            TCF     DDV/BDDV

 1106   REF  67  LAST 1042       7634  3 0116 1  SETPD     CA      ADDRWD           MUST SET TO WORK AREA, OR FBANK TROUBLE.
 1107   REF  19  LAST 1019       7635  54 166 1            TS      PUSHLOC
 1108   REF   1                  7636  1 6104 0            TCF     NOIBNKSW         NO FBANK SWITCH REQUIRED.

 1109   REF 202  LAST 1042       7637  3 4746 0  TSLC      CAF     ZERO             SHIFTING ROUTINES LOCATED IN BANK 00.
 1110   REF  22  LAST 1042       7640  54 004 1            TS      FBANK
 1111   REF   1                  7641  1 2172 0            TCF     TSLC2

 1112   REF   7  LAST 1001       7642  3 6115 1  GSHIFT    CAF     LOW7             USED AS MASK AT GENSHIFT. THIS PROCESSES
 1113   REF  23  LAST 1042       7643  54 004 1            TS      FBANK            ANY SHIFT INSTRUCTION (EXCEPT TSLC) WITH
 1114   REF   1                  7644  1 2214 0            TCF     GENSHIFT         AN ADDRESS (ROUTINES IN BANK 0).
```

922553

```
P1115            THE FOLLOWING IS THE PROLOGUE TO V/SC. IF THE PRESENT MODE IS VECTOR, IT SAVES THE SCALAR AT X IN BUF
R1117   AND CALLS THE V/SC ROUTINE IN BANK 0. IF THE PRESENT MODE IS SCALAR, IT MOVES THE VECTOR AT X INTO MPAC, SAVING
R1119   THE SCALAR IN MPAC IN BUF BEFORE CALLING THE V/SC ROUTINE IN BANK 0.


 1120   REF  23  LAST 1038       7645  10 163 1  V/SC      CCS     MODE
 1121   REF   1                  7646  1 7657 0            TCF     DV/SC              MOVE VECTOR INTO MPAC.
 1122   REF   2  LAST 1043       7647  1 7657 0            TCF     DV/SC

 1123                            7650  0 0006 1  VV/SC     EXTEND
 1124   REF  68  LAST 1042       7651  5 0116 1            INDEX   ADDRWD
 1125                            7652  3 0001 0            DCA     0
 1126   REF  92  LAST 1042       7653  52 131 0  V/SC1     DXCH    BUF                IN BOTH CASES, VECTOR IS NOW IN MPAC AND
 1127   REF 203  LAST 1042       7654  3 4746 0            CAF     ZERO               SCALAR IN BUF.
 1128   REF  24  LAST 1042       7655  54 004 1            TS      FBANK
 1129   REF   1                  7656  1 2654 0            TCF     V/SC2

 1130                            7657  0 0006 1  DV/SC     EXTEND
 1131   REF  69  LAST 1043       7660  5 0116 1            INDEX   ADDRWD
 1132                            7661  3 0003 1            DCA     2
 1133   REF 492  LAST 1042       7662  52 160 1            DXCH    MPAC +3
 1134                            7663  0 0006 1            EXTEND
 1135   REF  70  LAST 1043       7664  5 0116 1            INDEX   ADDRWD
 1136                            7665  3 0005 1            DCA     4
 1137   REF 493  LAST 1043       7666  52 162 0            DXCH    MPAC +5

 1138   REF  94  LAST 1017       7667  4 4744 0            CS      ONE                CHANGE MODE TO VECTOR.
 1139   REF  24  LAST 1043       7670  54 163 1            TS      MODE

 1140                            7671  0 0006 1            EXTEND
 1141   REF  71  LAST 1043       7672  5 0116 1            INDEX   ADDRWD
 1142                            7673  3 0001 0            DCA     0
 1143   REF 494  LAST 1043       7674  52 155 1            DXCH    MPAC
 1144   REF   1                  7675  1 7653 1            TCF     V/SC1              FINISH PROLOGUE AT COMMON SECTION.
```

```
P1145             SIGN AND COMPLEMENT INSTRUCTIONS.

 1146   REF  72  LAST 1043      7676  50 116 1  SIGN      INDEX  ADDRWD         CALL COMP INSTRUCTION IF WORD AT X IS
 1147                           7677  10 000 0            CCS    0              NEGATIVE NON-ZERO.
 1148   REF  18  LAST 1042      7700  1 6102 0            TCF    DANZIG
 1149                           7701  1 7703 0            TCF    +2
 1150   REF   2  LAST 1011      7702  1 7711 0            TCF    COMP           DO THE COMPLEMENT.

 1151   REF  73  LAST 1044      7703  50 116 1            INDEX  ADDRWD
 1152                           7704  10 001 1  CCSL      CCS    1
 1153   REF  19  LAST 1044      7705  1 6102 0            TCF    DANZIG
 1154   REF  20  LAST 1044      7706  1 6102 0            TCF    DANZIG
 1155   REF   3  LAST 1044      7707  1 7711 0            TCF    COMP
 1156   REF  21  LAST 1044      7710  1 6102 0            TCF    DANZIG
 1157                           7711  0 0006 1  COMP      EXTEND                COMPLEMENT DP MPAC IN EVERY CASE.
 1158   REF 495  LAST 1043      7712  4 0155 1            DCS    MPAC
 1159   REF 496  LAST 1044      7713  52 155 1            DXCH   MPAC

 1160   REF  25  LAST 1043      7714  10 163 1            CCS    MODE           EITHER COMPLEMENT MPAC +3 OR THE REST OF
 1161   REF   1                 7715  1 7726 1            TCF    DCOMP          THE VECTOR ACCUMULATOR.
 1162   REF   2  LAST 1044      7716  1 7726 1            TCF    DCOMP

 1163                           7717  0 0006 1            EXTEND                VECTOR COMPLEMENT.
 1164   REF 497  LAST 1044      7720  4 0160 1            DCS    MPAC +3
 1165   REF 498  LAST 1044      7721  52 160 1            DXCH   MPAC +3
 1166                           7722  0 0006 1            EXTEND
 1167   REF 499  LAST 1044      7723  4 0162 0            DCS    MPAC +5
 1168   REF 500  LAST 1044      7724  52 162 0            DXCH   MPAC +5
 1169   REF  22  LAST 1044      7725  1 6102 0            TCF    DANZIG

 1170   REF 501  LAST 1044      7726  4 0156 1  DCOMP     CS     MPAC +2
 1171   REF 502  LAST 1044      7727  54 156 1            TS     MPAC +2
 1172   REF  23  LAST 1044      7730  1 6102 0            TCF    DANZIG
```

```
P1173              THE FOLLOWING SHORT SHIFT CODES REQUIRE NO ADDRESS WORD:

R1174              1.  SR1 TO SR4         SCALAR SHIFT RIGHT.
R1175              2.  SR1R TO SR4R       SCALAR SHIFT RIGHT AND ROUND.
R1176              3.  SL1 TO SL4         SCALAR SHIFT LEFT.
R1177              4.  SL1R TO SL4R       SCALAR SHIFT LEFT AND ROUND.

R1178              5.  VSR1 TO VSR8       VECTOR SHIFT RIGHT (ALWAYS ROUNDS).
R1179              6.  VSL1 TO VSL8       VECTOR SHIFT LEFT (NEVER ROUNDS).

R1180              THE FOLLOWING CODES REQUIRE AN ADDRESS WHICH MAY BE INDEXED:*

R1181              1.  SR                 SCALAR SHIFT RIGHT.
R1182              2.  SRR                SCALAR SHIFT RIGHT AND ROUND.
R1183              3.  SL                 SCALAR SHIFT LEFT.
R1184              4.  SLR                SCALAR SHIFT LEFT AND ROUND.

R1185              5.  VSR                VECTOR SHIFT RIGHT.
R1186              6.  VSL                VECTOR SHIFT LEFT.

R1187   *  IF THE ADDRESS IS INDEXED, AND THE INDEX MODIFICATION RESULTS IN A NEGATIVE SHIFT COUNT, A SHIFT OF THE
R1189   ABSOLUTE VALUE OF THE COUNT IS DONE IN THE OPPOSITE DIRECTION.


 1190                          00,2017                       BANK    00

 1191   REF   1                                              COUNT*  $$/INTER
 1192   REF  17  LAST 1036     00,2017  3 6263 0  SHORTT     CAF     SIX            SCALAR SHORT SHIFTS COME HERE. THE SHIFT
 1193   REF  25  LAST 1016     00,2020  7 0020 1             MASK    CYR            COUNT-1 IS NOW IN BITS 2-3 OF CYR. THE
 1194   REF  11  LAST  920     00,2021  54 021 0             TS      SR             ROUNDING BIT IS IN BIT1 AT THIS POINT.

 1195   REF  26  LAST 1045     00,2022  10 020 1             CCS     CYR            SEE IF RIGHT OR LEFT SHIFT DESIRED.
 1196   REF   1                00,2023  1 2101 1             TCF     TSSL           SHIFT LEFT.

 1197                          00,2024   00024 1  SRDDV      DEC     20             MPTEMP SETTING FOR SR BEFORE DDV.

 1198   REF  12  LAST 1045     00,2025  50 021 1  TSSR       INDEX   SR             GET SHIFTING BIT.
 1199   REF  58  LAST  912     00,2026  3 4727 1             CAF     BIT14
 1200   REF  14  LAST 1034     00,2027  54 135 1             TS      MPTEMP

 1201   REF  27  LAST 1045     00,2030  10 020 1             CCS     CYR            SEE IF A ROUND IS DESIRED.
 1202   REF   1                00,2031  0 2050 0  RIGHTR     TC      MPACSRND       YES - SHIFT RIGHT AND ROUND.
 1203   REF   4  LAST 1036     00,2032  1 6101 0             TCF     NEWMODE        SET MODE TO DP (C(A) = 0).
 1204   REF  15  LAST 1045     00,2033  3 0135 0  MPACSHR    CA      MPTEMP         DO A TRIPLE PRECISION SHIFT RIGHT.
 1205                          00,2034  0 0006 1             EXTEND
 1206   REF 503  LAST 1044     00,2035  7 0156 1             MP      MPAC +2
 1207   REF 504  LAST 1045     00,2036  54 156 1   +3        TS      MPAC +2        (EXIT FROM SQRT AND ABVAL).
 1208   REF  16  LAST 1045     00,2037  3 0135 0             CA      MPTEMP
 1209                          00,2040  0 0006 1             EXTEND
 1210   REF 505  LAST 1045     00,2041  7 0154 0             MR      MPAC           SHIFT MAJOR PART INTO A,L AND PLACE IN
 1211    REF 506  LAST 1045    00,2042  52 155 1            DXCH    MPAC           MPAC,+1.
 1212    REF  17  LAST 1045    00,2043  3 0135 0            CA      MPTEMP
 1213                          00,2044  0 0006 1            EXTEND
 1214    REF 210  LAST 1041    00,2045  7 0001 1            MP      L              ORIGINAL C(MPAC +1).
 1215    REF 507  LAST 1046    00,2046  20 156 1            DAS     MPAC +1        GUARANTEED NO OVERFLOW.
 1216    REF  24  LAST 1044    00,2047  1 6102 0            TCF     DANZIG

R1217                  MPAC SHIFT RIGHT AND ROUND SUBROUTINES.

 1218    REF 508  LAST 1046    00,2050  3 0156 0  MPACSRND CA      MPAC +2        WE HAVE TO DO ALL THREE MULTIPLIES SINCE
 1219                          00,2051  0 0006 1            EXTEND                 MPAC +1 AND MPAC +2 MIGHT HAVE SIGN
 1220    REF  18  LAST 1046    00,2052  7 0135 1            MP      MPTEMP         DISAGREEMENT WITH A SHIFT RIGHT OF 1.
 1221    REF 509  LAST 1046    00,2053  56 155 0            XCH     MPAC +1
 1222                          00,2054  0 0006 1            EXTEND
 1223    REF  19  LAST 1046    00,2055  7 0135 1            MP      MPTEMP
 1224    REF 510  LAST 1046    00,2056  56 155 0            XCH     MPAC +1        TRIAL MINOR PART.
 1225    REF 211  LAST 1046    00,2057  6 0001 0            AD      L

 1226                          00,2060  6 0000 1  VSHR2     DOUBLE                 (FINISH VECTOR COMPONENT SHIFT RIGHT
 1227    REF 511  LAST 1046    00,2061  54 156 1            TS      MPAC +2        AND ROUND.
 1228                          00,2062  1 2064 0            TCF     +2
 1229    REF 512  LAST 1046    00,2063  26 155 1            ADS     MPAC +1        GUARANTEED NO OVERFLOW.

 1230    REF 204  LAST 1043    00,2064  3 4746 0            CAF     ZERO
 1231    REF 513  LAST 1046    00,2065  54 156 1            TS      MPAC +2
 1232    REF 514  LAST 1046    00,2066  56 154 1            XCH     MPAC           SETTING TO ZERO SO FOLLOWING DAS WORKS.
 1233                          00,2067  0 0006 1            EXTEND
 1234    REF  20  LAST 1046    00,2070  7 0135 1            MP      MPTEMP
 1235    REF 515  LAST 1046    00,2071  20 155 1            DAS     MPAC           AGAIN NO OVERFLOW.
 1236    REF 272  LAST 1041    00,2072  0 0002 0            TC      Q

 1237    REF  21  LAST 1046    00,2073  3 0135 0  VSHRRND   CA      MPTEMP         ENTRY TO SHIFT RIGHT AND ROUND MPAC WHEN
 1238                          00,2074  0 0006 1            EXTEND                 MPAC CONTAINS A VECTOR COMPONENT.
 1239    REF 516  LAST 1046    00,2075  7 0155 1            MP      MPAC +1
 1240    REF 517  LAST 1046    00,2076  54 155 1            TS      MPAC +1
 1241    REF 212  LAST 1046    00,2077  56 001 0            XCH     L
 1242    REF   1               00,2100  1 2060 1            TCF     VSHR2          GO ADD ONE IF NECESSARY AND FINISH.
```

```
P1243                 ROUTINE FOR SHORT SCALAR SHIFT LEFT (AND MAYBE ROUND).

 1244    REF  13  LAST 1045   00,2101  3 0021 1  TSSL       CA      SR                    GET SHIFT COUNT FOR SR.
 1245    REF  22  LAST 1046   00,2102  54 135 1   +1        TS      MPTEMP

 1246                         00,2103  0 0006 1   +2        EXTEND                        ENTRY HERE FROM SL FOR SCALARS.
 1247    REF 518  LAST 1046   00,2104  3 0156 0             DCA     MPAC +1               SHIFTING LEFT ONE PLACE AT A TIME IS
 1248    REF 519  LAST 1047   00,2105  20 156 1             DAS     MPAC +1               FASTER THAN DOING THE WHOLE SHIFT WITH
 1249    REF 520  LAST 1047   00,2106  6 0154 1             AD      MPAC                  MULTIPLIES ASSUMING THAT FREQUENCY OF
 1250    REF 521  LAST 1047   00,2107  6 0154 1             AD      MPAC                  SHIFT COUNTS GOES DOWN RAPIDLY AS A
 1251    REF 522  LAST 1047   00,2110  54 154 0             TS      MPAC                  FUNCTION OF THEIR MAGNITUDE.
 1252                         00,2111  1 2113 1             TCF     +2
 1253    REF   6  LAST 1031   00,2112  54 121 1             TS      OVFIND                OVERFLOW. (LEAVES OVERFLOW-CORRECTED
A1254                                                                                     RESULT ANYWAY).
 1255    REF  23  LAST 1047   00,2113  10 135 1             CCS     MPTEMP                LOOP ON DECREMENTED SHIFT COUNT.
 1256    REF   2  LAST 1045   00,2114  1 2102 1             TCF     TSSL +1

 1257    REF  28  LAST 1045   00,2115  10 020 1             CCS     CYR                   SEE IF ROUND WANTED.
 1258    REF   2  LAST 1042   00,2116  0 7157 0  ROUND      TC      ROUNDSUB              YES - ROUND AND EXIT.
 1259    REF  25  LAST 1046   00,2117  1 6102 0             TCF     DANZIG                SL LEAVES A ZERO IN CYR FOR NO ROUND.
 1260    REF  26  LAST 1047   00,2120  1 6102 0             TCF     DANZIG                NO - EXIT IMMEDIATL
```

```
P1261   VECTOR SHIFTING ROUTINES.

 1262   REF    2  LAST  243   00,2121  3 4750 1  SHORTV    CAF     LOW3              SAVE 3 BIT SHIFT COUNT - 1 WITHOUT
 1263   REF   29  LAST 1047   00,2122  7 0020 1            MASK    CYR               EDITING CYR.
 1264   REF   24  LAST 1047   00,2123  54 135 1            TS      MPTEMP
 1265   REF   30  LAST 1048   00,2124  10 020 1            CCS     CYR               SEE IF LEFT OR RIGHT SHIFT.
 1266   REF    1              00,2125  1 2145 1            TCF     VSSL              VECTOR SHIFT LEFT.
 1267                         00,2126   00176 1  OCT176    OCT     176               USED IN PROCESSED SHIFTS WITH - COUNT.

 1268   REF   25  LAST 1048   00,2127  50 135 0  VSSR      INDEX   MPTEMP            (ENTRY FROM SR). PICK UP SHIFTING BIT.
 1269   REF   59  LAST 1045   00,2130  3 4727 1            CAF     BIT14             MPTEMP CONTAINS THE SHIFT COUNT - 1.
 1270   REF   26  LAST 1048   00,2131  54 135 1            TS      MPTEMP
 1271   REF    1              00,2132  0 2073 1            TC      VSHRRND           SHIFT X COMPONENT.

 1272   REF  523  LAST 1047   00,2133  52 155 1            DXCH    MPAC              SWAP X AND Y COMPONENTS.
 1273   REF  524  LAST 1048   00,2134  52 160 1            DXCH    MPAC +3
 1274   REF  525  LAST 1048   00,2135  52 155 1            DXCH    MPAC
 1275   REF    2  LAST 1048   00,2136  0 2073 1            TC      VSHRRND           SHIFT Y COMPONENT.

 1276   REF  526  LAST 1048   00,2137  52 155 1            DXCH    MPAC              SWAP Y AND Z COMPONENTS.
 1277   REF  527  LAST 1048   00,2140  52 162 0            DXCH    MPAC +5
 1278   REF  528  LAST 1048   00,2141  52 155 1            DXCH    MPAC
 1279   REF    3  LAST 1048   00,2142  0 2073 1            TC      VSHRRND           SHIFT Z COMPONENT.

 1280   REF    1              00,2143  1 7441 0            TCF     VROTATEX          RESTORE COMPONENTS TO PROPER PLACES.
```

```
P1281   VECTOR SHIFT LEFT - DONE ONE PLACE AT A TIME.

 1282   REF  27  LAST 1048   00,2144  54 135 1   -1      TS     MPTEMP          SHIFTING LOOP.

 1283                        00,2145  0 0006 1  VSSL     EXTEND
 1284   REF 529  LAST 1048   00,2146  3 0155 0           DCA    MPAC
 1285   REF 530  LAST 1049   00,2147  20 155 1           DAS    MPAC
 1286                        00,2150  0 0006 1           EXTEND
 1287                        00,2151  1 2153 0           BZF    +2
 1288   REF   3  LAST 1031   00,2152  0 7040 1           TC     OVERFLOW

 1289                        00,2153  0 0006 1           EXTEND
 1290   REF 531  LAST 1049   00,2154  3 0160 0           DCA    MPAC +3
 1291   REF 532  LAST 1049   00,2155  20 160 1           DAS    MPAC +3
 1292                        00,2156  0 0006 1           EXTEND
 1293                        00,2157  1 2161 1           BZF    +2
 1294   REF   4  LAST 1041   00,2160  0 7035 0           TC     OVERFLWY

 1295                        00,2161  0 0006 1           EXTEND
 1296   REF 533  LAST 1049   00,2162  3 0162 1           DCA    MPAC +5
 1297   REF 534  LAST 1049   00,2163  20 162 0           DAS    MPAC +5
 1298                        00,2164  0 0006 1           EXTEND
 1299                        00,2165  1 2167 1           BZF    +2
 1300   REF   4  LAST 1040   00,2166  0 7032 1           TC     OVERFLWZ

 1301   REF  28  LAST 1049   00,2167  10 135 1           CCS    MPTEMP          LOOP ON DECREMENTED SHIFT COUNTER.
 1302   REF   2  LAST 1048   00,2170  1 2144 0           TCF    VSSL -1
 1303   REF  27  LAST 1047   00,2171  1 6102 0           TCF    DANZIG          EXIT.
```

```
P1304              TSLC - TRIPLE SHIFT LEFT AND COUNT. SHIFTS MPAC LEFT UNTIL GREATER THAN .5 IN MAGNITUDE, LEAVING
R1306    THE COMPLEMENT OF THE NUMBER OF SHIFTS REQUIRED IN X.

 1307    REF  29  LAST 1049   00,2172  54 135 1  TSLC2     TS      MPTEMP            START BY ZEROING SHIFT COUNT (IN A NOW).
 1308    REF   4  LAST 1034   00,2173  0 6744 0            TC      BRANCH            EXIT WITH NO SHIFTING IF ARGUMENT ZERO.
 1309                         00,2174  1 2176 1            TCF     +2
 1310    REF   1              00,2175  1 2212 0            TCF     ENDTSLC           STORES ZERO SHIFT COUNT IN THIS CASE.

 1311    REF  12  LAST  853   00,2176  0 7300 0            TC      TPAGREE           MAY CAUSE UPSHIFT OF ONE EXTRA PLACE.

 1312    REF 535  LAST 1049   00,2177  3 0154 1            CA      MPAC              BEGIN NORMALIZATION LOOP.
 1313    REF   1              00,2200  1 2207 1            TCF     TSLCTEST

 1314    REF  30  LAST 1050   00,2201  24 135 0  TSLCLOOP  INCR    MPTEMP            INCREMENT SHIFT COUNTER.
 1315                         00,2202  0 0006 1            EXTEND
 1316    REF 536  LAST 1050   00,2203  3 0156 0            DCA     MPAC +1
 1317    REF 537  LAST 1050   00,2204  20 156 1            DAS     MPAC +1
 1318    REF 538  LAST 1050   00,2205  6 0154 1            AD      MPAC
 1319    REF 539  LAST 1050   00,2206  26 154 0            ADS     MPAC
 1320                         00,2207  6 0000 1  TSLCTEST  DOUBLE                    SEE IF (ANOTHER) SHIFT IS REQUIRED.
 1321                         00,2210  54 000 0            OVSK
 1322    REF   1              00,2211  1 2201 1            TCF     TSLCLOOP          YES - INCREMENT COUNT AND SHIFT AGAIN.

 1323    REF  31  LAST 1050   00,2212  4 0135 1  ENDTSLC   CS      MPTEMP
 1324    REF   1              00,2213  1 6644 0            TCF     STORE1            STORE SHIFT COUNT AND RETURN TO DANZIG.
```

```
P1325             THE FOLLOWING ROUTINES PROCESSES THE GENERAL SHIFT INSTRUCTIONS SR, SRP, SL, AND SLR.
R1327   THE GIVEN ADDRESS IS DECODED AS FOLLOWS:

R1328             BITS 1-7     SHIFT COUNT (SUBADDRESS) LESS THAN 125 DECIMAL.
R1329             BIT 8        PSEUDO SIGN BIT (DETECTS CHANGE IN SIGN IN INDEXED SHIFTS).
R1331             BIT 9        0 FOR LEFT SHIFT, AND 1 FOR RIGHT SHIFT.
R1332             BIT 10       1 FOR TERMINAL ROUND ON SCALAR SHIFTS, 0 OTHERWISE.
R1333             BITS 11-13   0.
R1334             BIT 14       1.
R1335             BIT 15       0.

R1336   THE ABOVE ENCODING IS DONE BY THE YUL SYSTEM.


 1337   REF  74  LAST 1044   00,2214  7 0116 0  GENSHIFT MASK    ADDRWD          GET SHIFT COUNT, TESTING FOR ZERO.
 1338   REF 321  LAST 1041   00,2215  10 000 0           CCS     A               (ARRIVES WITH C(A) = LOW7).
 1339   REF   1              00,2216  1 2224 0           TCF     GENSHFT2        IF NON-ZERO, PROCEED WITH DECREMENTED CT

 1340   REF  31  LAST  908   00,2217  3 4733 1           CAF     BIT10           ZERO SHIFT COUNT. NO SHIFTS NEEDED BUT
 1341   REF  75  LAST 1051   00,2220  7 0116 0           MASK    ADDRWD          WE MIGHT HAVE TO ROUND MPAC ON SLR AND
 1342   REF 322  LAST 1051   00,2221  10 000 0           CCS     A               SRR (SCALAR ONLY).
 1343   REF   3  LAST 1047   00,2222  0 7157 0           TC      ROUNDSUB
 1344   REF  28  LAST 1049   00,2223  1 6102 0           TCF     DANZIG

 1345   REF  32  LAST 1050   00,2224  54 135 1  GENSHFT2 TS      MPTEMP          DECREMENTED SHIFT COUNT TO MPTEMP.
 1346   REF  37  LAST  992   00,2225  3 4735 1           CAF     BIT8            TEST MEANING OF LOW SEVEN BIT COUNT IN
 1347                        00,2226  0 0006 1           EXTEND                  MPTEMP NOW.
 1348   REF  76  LAST 1051   00,2227  7 0116 0           MP      ADDRWD
 1349   REF   1              00,2230  7 6266 1           MASK    LOW2            JUMPS ON SHIFT DIRECTION (BIT8) AND
 1350   REF 323  LAST 1051   00,2231  50 000 1           INDEX   A
 1351                        00,2232  1 2233 0           TCF     +1              ORIGINAL SHIFT DIRECTION (BIT 9).
 1352   REF   1              00,2233  1 2332 0           TCF     RIGHT-          NEGATIVE SHIFT COUNT FOR SL OR SLR.
 1353   REF   1              00,2234  1 2342 1           TCF     LEFT            SL OR SLR.
 1354   REF   1              00,2235  1 2336 1           TCF     LEFT-           NEGATIVE SHIFT COUNT WITH SR OR SRR.
```

```
P1355              GENERAL SHIFT RIGHT.

 1356   REF  26  LAST 1044   00,2236  10 163 1  RIGHT    CCS    MODE              SEE IF VECTOR OR SCALAR.
 1357   REF   1              00,2237  1 2277 0           TCF    GENSCR
 1358   REF   2  LAST 1052   00,2240  1 2277 0           TCF    GENSCR

 1359   REF  33  LAST 1051   00,2241  3 0135 0           CA     MPTEMP            SEE IF SHIFT COUNT LESS THAN 14D.
 1360   REF   1              00,2242  6 3733 0  VRIGHT2  AD     NEG12
 1361                        00,2243  0 0006 1           EXTEND
 1362   REF   1              00,2244  6 2127 1           BZMF   VSSR              IF SO, BRANCH AND SHIFT IMMEDIATELY.

 1363   REF   9  LAST 1041   00,2245  6 7770 0           AD     NEGONE            IF NOT, REDUCE MPTEMP BY A TOTAL OF 14,
 1364   REF  34  LAST 1052   00,2246  54 135 1           TS     MPTEMP            AND DO A SHIFT RIGHT AND ROUND BY 14.
 1365   REF 205  LAST 1046   00,2247  3 4746 0           CAF    ZERO              THE ROUND AT THIS STAGE MAY INTRODUCE A
 1366   REF 213  LAST 1046   00,2250  54 001 1           TS     L                 ONE BIT ERROR IN A SHIFT RIGHT 15D.
 1367   REF 540  LAST 1050   00,2251  56 154 1           XCH    MPAC
 1368   REF 541  LAST 1052   00,2252  56 155 0           XCH    MPAC +1
 1369   REF   1              00,2253  0 2272 1           TC     SETROUND          X COMPONENT NOW SHIFTED, SO MAKE UP THE
 1370   REF 542  LAST 1052   00,2254  20 155 1           DAS    MPAC              ROUNDING QUANTITY (0 IN A AND 0 OR +-1
A1371                                                                             IN L).
 1372   REF 543  LAST 1052   00,2255  56 157 1           XCH    MPAC +3           REPEAT THE ABOVE PROCESS FOR Y AND Z.
 1373   REF 544  LAST 1052   00,2256  56 160 0           XCH    MPAC +4
 1374   REF   2  LAST 1052   00,2257  0 2272 1           TC     SETROUND
 1375   REF 545  LAST 1052   00,2260  20 160 1           DAS    MPAC +3           NO OVERFLOW ON THESE ADDS.

 1376   REF 546  LAST 1052   00,2261  56 161 1           XCH    MPAC +5
 1377   REF 547  LAST 1052   00,2262  56 162 1           XCH    MPAC +6
 1378   REF   3  LAST 1052   00,2263  0 2272 1           TC     SETROUND
 1379   REF 548  LAST 1052   00,2264  20 162 0           DAS    MPAC +5

 1380   REF  35  LAST 1052   00,2265  10 135 1           CCS    MPTEMP            SEE IF DONE, DOING FINAL DECREMENT.
 1381   REF  36  LAST 1052   00,2266  54 135 1           TS     MPTEMP
 1382   REF   1              00,2267  1 2242 0           TCF    VRIGHT2
 1383                        00,2270   04604 1  BIASLO   DEC    .2974 B-1         SQRT CONSTANT

 1384   REF  29  LAST 1051   00,2271  1 6102 0           TCF    DANZIG


 1385                        00,2272  6 0000 1  SETROUND DOUBLE                   MAKES UP ROUNDING QUANTITY FROM ARRIVING
 1386   REF 549  LAST 1052   00,2273  54 156 1           TS     MPAC +2           C(A). L IS ZERO INITIALLY.
 1387   REF 206  LAST 1052   00,2274  3 4746 0           CAF    ZERO
 1388   REF 214  LAST 1052   00,2275  56 001 0           XCH    L
 1389   REF 273  LAST 1046   00,2276  0 0002 0           TC     Q                 RETURN AND DO THE DAS, RESETTING L TO 0.
```

```
P1390             PROCESS SR AND SRR ECR SCALARS.

 1391   REF  37  LAST 1052   00,2277  3 0135 0  GENSCR   CA      MPTEMP            SEE IF THE ORIGINAL SHIFT COUNT WAS LESS
 1392   REF   2  LAST 1052   00,2300  6 3733 0   +1      AD      NEG12             THAN 14D.
 1393                        00,2301  0 0006 1           EXTEND
 1394   REF   1              00,2302  6 2322 0           BZMF    DOSSHFT           DO THE SHIFT IMMEDIATELY IF SO.

 1395   REF  10  LAST 1052   00,2303  6 7770 0   +4      AD      NEGONE            IF NOT, DECREMENT SHIFT COUNT BY 14D AND
 1396   REF  38  LAST 1053   00,2304  54 135 1           TS      MPTEMP            SHIFT MPAC RIGHT 14 PLACES.
 1397   REF 207  LAST 1052   00,2305  3 4746 0           CAF     ZERO
 1398   REF 550  LAST 1052   00,2306  56 154 1           XCH     MPAC
 1399   REF 551  LAST 1053   00,2307  56 155 0           XCH     MPAC +1
 1400   REF 552  LAST 1053   00,2310  54 156 1           TS      MPAC +2
 1401   REF  39  LAST 1053   00,2311  10 135 1           CCS     MPTEMP            SEE IF FINISHED, DO FINAL DECREMENT.
 1402   REF  40  LAST 1053   00,2312  54 135 1           TS      MPTEMP
 1403   REF   3  LAST 1052   00,2313  0 2300 0           TC      GENSCR +1
 1404                        00,2314   22650 1  SLOPEHI  DEC     .5884             SQRT CONSTANT.
 1405   REF  32  LAST 1051   00,2315  3 4733 1           CAF     BIT10             FINISHED WITH SHIFT. SEE IF ROUND
 1406   REF  77  LAST 1051   00,2316  7 0116 0           MASK    ADDRWD            WANTED.
 1407   REF 324  LAST 1051   00,2317  10 000 0           CCS     A
 1408   REF   4  LAST 1051   00,2320  0 7157 0           TC      ROUNDSUB
 1409   REF  30  LAST 1052   00,2321  1 6102 0           TCF     DANZIG            DO SO AND/OR EXIT.

 1410   REF  41  LAST 1053   00,2322  50 135 0  DOSSHFT  INDEX   MPTEMP            PICK UP SHIFTING BIT.
 1411   REF  60  LAST 1048   00,2323  3 4727 1           CAF     BIT14
 1412   REF  42  LAST 1053   00,2324  54 135 1           TS      MPTEMP
 1413   REF  33  LAST 1053   00,2325  3 4733 1           CAF     BIT10             SEE IF TERMINAL ROUND DESIRED.
 1414   REF  78  LAST 1053   00,2326  7 0116 0           MASK    ADDRWD
 1415   REF 325  LAST 1053   00,2327  10 000 0           CCS     A
 1416   REF   1              00,2330  1 2031 0           TCF     RIGHTR            YES.
 1417   REF   1              00,2331  1 2033 1           TCF     MPACSHR           JUST SHIFT RIGHT.
```

```
P1418            PROCESS THE RIGHT- (SL(R) WITH A NEGATIVE COUNT), LEFT-, AND LEFT OPTIONS.

 1420   REF  43  LAST 1053   00,2332  4 0135 1  RIGHT-    CS      MPTEMP          GET ABSOLUTE VALUE - 1 OF SHIFT COUNT
 1421   REF   1              00,2333  6 2126 0            AD      OCT176          UNDERSTANDING THAT BIT8 (PSEUDO-SIGN)
 1422   REF  44  LAST 1054   00,2334  54 135 1            TS      MPTEMP          WAS 1 INITIALLY.
 1423   REF   1              00,2335  1 2236 0            TCF     RIGHT           DO NORMAL SHIFT RIGHT.

 1424   REF   2  LAST 1054   00,2336  4 2126 1  LEFT-     CS      OCT176          SAME PROLOGUE TO LEFT FOR INDEXED RIGHT
 1425   REF  45  LAST 1054   00,2337  6 0135 0            AD      MPTEMP          SHIFTS WHOSE NET SHIFT COUNT IS NEGATIVE
 1426                        00,2340  4 0000 0            COM
 1427   REF  46  LAST 1054   00,2341  54 135 1            TS      MPTEMP

 1428   REF  27  LAST 1052   00,2342  10 163 1  LEFT      CCS     MODE            SINCE LEFT SHIFTING IS SONE ONE PLACE AT
 1429   REF   1              00,2343  1 2346 0            TCF     GENSCL          A TIME, NO COMPARISON WITH 14 NEED BE
 1430   REF   2  LAST 1054   00,2344  1 2346 0            TCF     GENSCL          DONE. FOR SCALARS, SEE IF TERMINAL ROUND
 1431   REF   3  LAST 1049   00,2345  1 2145 1            TCF     VSSL            DESIRED. FOR VECTORS, SHIFT IMMEDIATELY.

 1432   REF  79  LAST 1053   00,2346  4 0116 0  GENSCL    CS      ADDRWD          PUT ROUNDING BIT (BIT 10 OF ADDRWD)INTO
 1433                        00,2347  0 0006 1            EXTEND                  BIT 15 OF CYR WHERE THE ROUNDING BIT OF
 1434   REF  42  LAST  938   00,2350  7 4737 1            MP      BIT6            A SHORT SHIFT LEFT WOULD BE
 1435   REF  31  LAST 1048   00,2351  54 020 1            TS      CYR
 1436   REF   3  LAST 1047   00,2352  1 2103 0            TCF     TSSL +2         DO THE SHIFT.
```

```
P1437              SCALAR DIVISION INSTRUCTIONS, DDV AND BDDV, ARE EXECUTED HERE. AT THIS POINT, THE DIVIDEND IS IN MPAC
R1439     AND THE DIVISOR IN BUF.

 1440     REF  95  LAST 1043     00,2353  4 4744 0  DDV/BDDV CS      ONE              INITIALIZATION.
 1441     REF   1                00,2354  54 136 1           TS      DVSIGN           +-1 FOR POSITIVE QUOTIENT - -0 FOR NEG.
 1442     REF   1                00,2355  54 137 0           TS      DVNORMCT         DIVIDEND NORMALIZATION COUNT.
 1443     REF   1                00,2356  54 140 0           TS      MAXDVSW          NEAR-ONE DIVIDE FLAG.

 1444     REF  93  LAST 1043     00,2357  10 130 1           CCS     BUF              FORCE BUF POSITIVE WITH THE MAJOR PART
 1445     REF   1                00,2360  1 2516 0           TCF     BUFPOS           NON-ZERO.
 1446                            00,2361  1 2363 1           TCF     +2
 1447     REF   1                00,2362  1 2531 0           TCF     BUFNEG

 1448     REF 553  LAST 1053     00,2363  54 156 1  BUFZERO  TS      MPAC +2          ZERO THIS.
 1449     REF  13  LAST 1050     00,2364  0 7300 0           TC      TPAGREE          FORCE SIGN AGREEMENT BEFORE OVERFLOW

 1450     REF 554  LAST 1055     00,2365  10 154 0           CCS     MPAC             TEST TO SEE IF MPAC NON-ZERO.  (TOO BIG)
 1451     REF   1                00,2366  1 2414 0           TCF     OVF+             MAJOR PART OF DIVIDEND IS POSITIVE NON-0
 1452                            00,2367  1 2371 1           TCF     +2
 1453     REF   2  LAST 1055     00,2370  1 2413 1           TCF     OVF+  -1         MAJOR PART OF DIVIDEND IS NEG. NON-ZERO

 1454     REF  94  LAST 1055     00,2371  56 131 1           XCH     BUF +1           SHIFT DIVIDEND AND DIVISOR LEFT 14.
 1455     REF  95  LAST 1055     00,2372  56 130 0           XCH     BUF
 1456     REF 555  LAST 1055     00,2373  56 155 0           XCH     MPAC +1
 1457     REF 556  LAST 1055     00,2374  56 154 1           XCH     MPAC
 1458     REF  96  LAST 1055     00,2375  10 130 1           CCS     BUF              TRY AGAIN ON FORMER MINOR PART.
 1459     REF   1                00,2376  1 2422 0           TCF     BUF+
 1460                            00,2377  1 2401 1           TCF     +2               OVERFLOW ON ZERO DIVISOR.
 1461     REF   1                00,2400  1 2416 1           TCF     BUF-

 1462     REF 557  LAST 1055     00,2401  4 0154 0           CS      MPAC             SIGN OF MPAC DETERMINES SIGN OF RESULT.
 1463                            00,2402  0 0006 1  SGNDVOVF EXTEND
 1464                            00,2403  6 2405 1           BZMF    +2
 1465     REF   2  LAST 1055     00,2404  24 136 0           INCR    DVSIGN           NEGMAX IN MPAC PERHAPS.
 1466     REF  28  LAST 1034     00,2405  3 4724 1  DVOVF    CAF     POSMAX           ON DIVISION OVERFLOW OF ANY SORT, SET
 1467     REF 558  LAST 1055     00,2406  54 154 0           TS      MPAC             SET DP MPAC TO +-POSMAX.
 1468     REF   1                00,2407  0 2630 0           TC      FINALDV +3
 1469     REF  96  LAST 1055     00,2410  3 4744 1           CAF     ONE              SET OVERFLOW INDICATOR AND EXIT.
 1470     REF   7  LAST 1047     00,2411  54 121 1           TS      OVFIND
 1471     REF  31  LAST 1053     00,2412  0 6102 1           TC      DANZIG


 1472     REF   3  LAST 1055     00,2413  24 136 0  -1       INCR    DVSIGN
 1473     REF  97  LAST 1055     00,2414  4 0131 0  OVF+     CS      BUF +1           LOAD LOWER ORDER PART OF DIVISOR.
 1474     REF   1                00,2415  1 2402 1           TCF     SGNDVOVF         GET SIGN OF RESULT.

 1475                            00,2416  0 0006 1  BUF-     EXTEND                   IF BUF IS NEGATIVE, COMPLEMENT IT AND
 1476     REF  98  LAST 1055     00,2417  4 0131 0           DCS     BUF              MAINTAIN DVSIGN FOR FINAL QUOTIENT SIGN.
 1477     REF  99  LAST 1055     00,2420  52 131 0           DXCH    BUF
 1478     REF   4  LAST 1055     00,2421  24 136 0           INCR    DVSIGN           NOW -0.
```

```
1479   REF 559  LAST 1055   00,2422  10 154 0  BUF+     CCS     MPAC        FORCE MPAC POSITIVE, CHECKING FOR ZERO
1480   REF   1              00,2423   1 2437 1           TCF     MPAC+       DIVIDEND IN THE PROCESS.
1481                        00,2424   1 2426 1           TCF     +2
1482   REF   1              00,2425   1 2433 0           TCF     MPAC-
1483   REF 560  LAST 1056   00,2426  10 155 1           CCS     MPAC +1
1484   REF   2  LAST 1056   00,2427   1 2437 1           TCF     MPAC+
1485   REF  32  LAST 1055   00,2430   1 6102 0           TCF     DANZIG      EXIT IMMEDIATELY ON ZERO DIVIDEND.
1486   REF   2  LAST 1056   00,2431   1 2433 0           TCF     MPAC-
1487   REF  33  LAST 1056   00,2432   1 6102 0           TCF     DANZIG

1488                        00,2433   0 0006 1  MPAC-    EXTEND              FORCE MPAC POSITIVE AS BUF IN BUF-.
1489   REF 561  LAST 1056   00,2434   4 0155 1           DCS     MPAC
1490   REF 562  LAST 1056   00,2435  52 155 1           DXCH    MPAC
1491   REF   5  LAST 1055   00,2436  24 136 0           INCR    DVSIGN      NOW +1 OR -0.
```

```
 1492   REF 563  LAST 1056   00,2437  4 0154 0  MPAC+    CS      MPAC            CHECK FOR DIVISION OVERFLOW. IF THE
 1493   REF  11  LAST 1053   00,2440  6 7770 0           AD      NEGONE          MAJOR PART OF THE DIVIDEND IS LESS THAN
 1494   REF 100  LAST 1055   00,2441  6 0130 0           AD      BUF             THE MAJOR PART OF THE DIVISOR BY AT
 1495   REF 326  LAST 1053   00,2442  10 000 0           CCS     A               LEAST TWO, WE CAN PROCEED IMMEDIATELY
 1496   REF   1              00,2443  1 2505 1           TCF     DVNORM          WITHOUT NORMALIZATION PRODUCING A DVMAX.
 1497                        00,2444   60001 0  -1/2+2   OCT     60001           USED IN SQRTSUB.

 1498                        00,2445  1 2446 1           TCF     +1              IF THE ABOVE DOES NOT HOLD, FORCE SIGN
 1499   REF  16  LAST 1041   00,2446  3 4727 1           CAF     HALF            AGREEMENT IN NUMERATOR AND DENOMINATOR
 1500                        00,2447  6 0000 1           DOUBLE                  TO FACILITATE OVERFLOW AND NEAR-ONE
 1501   REF 564  LAST 1057   00,2450  6 0155 0           AD      MPAC +1         CHECKING.
 1502   REF 565  LAST 1057   00,2451  54 155 1           TS      MPAC +1
 1503   REF 208  LAST 1053   00,2452  3 4746 0           CAF     ZERO
 1504   REF  29  LAST 1055   00,2453  6 4724 1           AD      POSMAX
 1505   REF 566  LAST 1057   00,2454  26 154 0           ADS     MPAC

 1506   REF  17  LAST 1057   00,2455  3 4727 1           CAF     HALF            SAME FOR BUF.
 1507                        00,2456  6 0000 1           DOUBLE
 1508   REF 101  LAST 1057   00,2457  6 0131 1           AD      BUF +1
 1509   REF 102  LAST 1057   00,2460  54 131 0           TS      BUF +1
 1510   REF 209  LAST 1057   00,2461  3 4746 0           CAF     ZERO
 1511   REF  30  LAST 1057   00,2462  6 4724 1           AD      POSMAX
 1512   REF 103  LAST 1057   00,2463  26 130 1           ADS     BUF

 1513   REF 567  LAST 1057   00,2464  4 0154 0           CS      MPAC            CHECK MAGNITUDE OF SIGN-CORRECTED
 1514   REF 104  LAST 1057   00,2465  6 0130 0           AD      BUF             OPERANDS.
 1515   REF 327  LAST 1057   00,2466  10 000 0           CCS     A
 1516   REF   2  LAST 1057   00,2467  1 2505 1           TCF     DVNORM          DIVIDE OK - WILL NOT BECOME MAXDV CASE.
 1517   REF  15  LAST 1037   00,2470   00133 0  LBUF2    ADRES   BUF2
 1518   REF   1              00,2471  1 2405 0           TCF     DVOVF           DIVISOR NOT LESS THAN DIVIDEND - OVF.

 1519   REF   2  LAST 1055   00,2472  54 140 0           TS      MAXDVSW         IF THE MAJOR PARTS OF THE DIVIDEND AND
 1520   REF 568  LAST 1057   00,2473  4 0155 1           CS      MPAC +1         DIVISOR ARE EQUAL, A SPECIAL APPROXIMA-
 1521   REF 105  LAST 1057   00,2474  6 0131 1           AD      BUF +1          TION IS USED (PROVIDED THE DIVISION IS
 1522                        00,2475  0 0006 1           EXTEND                  POSSIBLE, OF COURSE).
 1523   REF   2  LAST 1057   00,2476  6 2405 1           BZMF    DVOVF
 1524   REF   3  LAST 1057   00,2477  1 2505 1           TCF     DVNORM          IF NO OVERFLOW.
```

```
1525                             00,2500  0 0006 1  BUFNORM   EXTEND                       ADD -1 TO AUGMENT SHIFT COUNT AND SHIFT
1526     REF   2  LAST 1055      00,2501  24 137 1            AUG      DVNORMCT            LEFT ONE PLACE.
1527                             00,2502  0 0006 1            EXTEND
1528     REF 106  LAST 1057      00,2503  3 0131 1            DCA      BUF
1529     REF 107  LAST 1058      00,2504  20 131 0            DAS      BUF

1530     REF 108  LAST 1058      00,2505  3 0130 0  DVNORM    CA       BUF                 SEE IF DIVISOR NORMALIZED YET.
1531                             00,2506  6 0000 1            DOUBLE
1532                             00,2507  54 000 0            OVSK
1533     REF   1                 00,2510  1 2500 1            TCF      BUFNORM             NO - SHIFT LEFT ONE AND TRY AGAIN.

1534     REF 569  LAST 1057      00,2511  52 155 1            DXCH     MPAC                CALL DIVIDEND NORMALIZATION SEQUENCE
1535     REF   3  LAST 1058      00,2512  50 137 1            INDEX    DVNORMCT            PRIOR TO DOING THE DIVIDE.
1536     REF   1                 00,2513  0 2565 0            TC       MAXTEST

1537     REF 570  LAST 1058      00,2514  54 156 1            TS       MPAC +2             RETURNS WITH DIVISION DONE AND C(A) = 0.
1538     REF  34  LAST 1056      00,2515  1 6102 0            TCF      DANZIG

1539     REF 328  LAST 1057      00,2516  10 000 0  BUFPOS    CCS      A
1540     REF   2  LAST 1055      00,2517  1 2422 0            TCF      BUF+                TO BUF+ IF BUF IS GREATER THAN +1.

1541     REF 109  LAST 1058      00,2520  4 0131 0            CS       BUF +1              IF BUF IS +1, FORCING SIGN AGREEMENT
1542                             00,2521  0 0006 1            EXTEND                       MAY CAUSE BUF TO BECOME ZERO.
1543     REF   3  LAST 1058      00,2522  6 2422 1            BZMF     BUF+                BRANCH IF SIGNS AGREE.

1544     REF  18  LAST 1057      00,2523  3 4727 1            CA       HALF                SIGNS DISAGREE.  FORCE AGREEMENT.
1545                             00,2524  6 0000 1     +6     DOUBLE
1546     REF 110  LAST 1058      00,2525  26 131 0            ADS      BUF +1
1547     REF 210  LAST 1057      00,2526  3 4746 0            CA       ZERO
1548     REF 111  LAST 1058      00,2527  54 130 1            TS       BUF
1549     REF   1                 00,2530  1 2363 1            TCF      BUFZERO


1550     REF 329  LAST 1058      00,2531  10 000 0  BUFNEG    CCS      A
1551     REF   2  LAST 1055      00,2532  1 2416 1            TCF      BUF-                TO BUF- IF BUF IS LESS THAN -1.

1552     REF 112  LAST 1058      00,2533  3 0131 1            CA       BUF +1              IF BUF IS -1, FORCING SIGN AGREEMENT
1553                             00,2534  0 0006 1            EXTEND                       MAY CAUSE BUF TO BECOME ZERO.
1554     REF   3  LAST 1058      00,2535  6 2416 0            BZMF     BUF-                BRANCH IF SIGNS AGREE.

1555     REF  19  LAST 1058      00,2536  4 4727 0            CS       HALF                SIGNS DISAGREE.  FORCE AGREEMENT.
1556     REF   2  LAST 1055      00,2537  1 2524 1            TCF      BUFPOS +6
```

```
P1557          THE FOLLOWING ARE PROLOGUES TO SHIFT THE DIVIDEND ARRIVING IN A AND L BEFORE THE DIVIDE.

 1559   REF  14  LAST 1047   00,2540  22 021 1    -210     LXCH    SR              SPECIAL PROLOGUE FOR UNIT WHEN THE
 1560                        00,2541  0 0006 1             EXTEND                  LENGTH OF THE ARGUMENT WAS NOT LESS THAN
 1561   REF  20  LAST 1058   00,2542  7 4727 0             MP      HALF            .5. IN THIS CASE, EACH COMPONENT MUST BE
 1562   REF 215  LAST 1052   00,2543  56 001 0             XCH     L               SHIFTED RIGHT ONE TO PRODUCE A HALF-UNIT
 1563   REF  15  LAST 1059   00,2544  6 0021 1             AD      SR              VECTOR.
 1564   REF 216  LAST 1059   00,2545  56 001 0             XCH     L
 1565   REF   1              00,2546  1 2571 1             TCF     GENDDV +1       WITH DP DIVIDEND IN A,L.

 1566                        00,2547  20 001 1             DDOUBL                  PROLOGUE WHICH NORMALIZES THE DIVIDEND
 1567                        00,2550  20 001 1             DDOUBL                  WHEN IT IS KNOWN THAT NO DIVISION
 1568                        00,2551  20 001 1             DDOUBL                  OVERFLOW WILL OCCUR.
 1569                        00,2552  20 001 1             DDOUBL
 1570                        00,2553  20 001 1             DDOUBL
 1571                        00,2554  20 001 1             DDOUBL
 1572                        00,2555  20 001 1             DDOUBL
 1573                        00,2556  20 001 1             DDOUBL
 1574                        00,2557  20 001 1             DDOUBL
 1575                        00,2560  20 001 1             DDOUBL
 1576                        00,2561  20 001 1             DDOUBL
 1577                        00,2562  20 001 1             DDOUBL
 1578                        00,2563  20 001 1             DDOUBL
 1579   REF 571  LAST 1058   00,2564  52 155 1             DXCH    MPAC

 1580   REF   3  LAST 1057   00,2565  10 140 0  MAXTEST    CCS     MAXDVSW         0 IF MAJORS MIGHT BE =, -1 OTHERWISE.
 1581                        00,2566   06552 0  BIASHI     DEC     .4192 B-1       SQRT CONSTANTS

 1582   REF   1              00,2567  1 2642 1             TCF     MAXDV           CHECK TO SEE IF THEY ARE NOW EQUAL.
```

```
P1583            THE FOLLOWING IS A GENERAL PURPOSE DOUBLE PRECISION DIVISION ROUTINE. IT DIVIDES MPAC BY BUF AND LEAVES
R1585     THE RESULT IN MPAC. THE FOLLOWING CONDITIONS MUST BE SATISFIED:

R1586            1.  THE DIVISOR (BUF) MUST BE POSITIVE AND NOT LESS THAN .5.

R1587            2.  THE DIVIDEND (MPAC) MUST BE POSITIVE WITH THE MAJOR PART OF MPAC STRICTLY LESS THAN THAT OF BUF
R1589     (A SPECIAL APPROXIMATION, MAXDV, IS USED WHEN THE MAJOR PARTS ARE EQUAL).

R1591            UNDERSTANDING THAT A/B = Q + S(R/B) WHERE S = 2(-14) AND Q AND R ARE QUOTIENT AND REMAINDER, RESPEC-
R1593     TIVELY, THE FOLLOWING APPROXIMATION IS OBTAINED BY MULTIPLYING ABOVE AND BELOW BY C - SD AND NEGLECTING TERMS OF
R1595     ORDER S-SQUARED (POSSIBLY INTRODUCING ERROR INTO THE LOW TWO BITS OF THE RESULT). SIGN AGREEMENT IS UNNECESSARY.

R1597            A + SB .       (R - QD)                                                 A + SB
R1599            ------ = Q + S(------) WHERE Q AND R ARE QUOTIENT AND REMAINDER OF ------ RESPECTIVELY.
R1601            C + SD         (  C   )                                                   C


 1603    REF 572  LAST 1059   00,2570  52 155 1  GENDDV   DXCH    MPAC           WE NEED A AND B ONLY FOR FIRST DV.
 1604                         00,2571  0 0006 1    +1     EXTEND                 (SPECIAL UNIT PROLOGUE ENTERS HERE).
 1605    REF 113  LAST 1058   00,2572  10 130 1           DV      BUF            A NOW CONTAINS Q AND L, R.
 1606    REF 573  LAST 1060   00,2573  52 155 1           DXCH    MPAC

 1607    REF 574  LAST 1060   00,2574  4 0154 0           CS      MPAC           FORM DIVIDEND FOR MINOR PART OF RESULT.
 1608                         00,2575  0 0006 1           EXTEND
 1609    REF 114  LAST 1060   00,2576  7 0131 0           MP      BUF +1
 1610    REF 575  LAST 1060   00,2577  6 0155 0           AD      MPAC +1        OVERFLOW AT THIS POINT IS POSITIVE SINCE
 1611                         00,2600  54 000 0           DVSK                   R IS POSITIVE IN EVERY CASE.
 1612                         00,2601  1 2606 1           TCF     +5

 1613                         00,2602  0 0006 1           EXTEND                 OVERFLOW CAN BE REMOVED BY SUBTRACTING C
 1614    REF 115  LAST 1060   00,2603  60 130 0           SU      BUF            (BUF) ONCE SINCE R IS ALWAYS LESS THAN C
 1615    REF 576  LAST 1060   00,2604  24 154 1           INCR    MPAC           IN THIS CASE. INCR COMPENSATES SUBTRACT.
 1616    REF   1              00,2605  1 2610 0           TCF     +DOWN          (SINCE C(A) IS STILL POSITIVE).

 1617                         00,2606  0 0006 1    +5     EXTEND                 C(A) CAN BE MADE LESS THAN C IN MAGNI-
 1618    REF   1              00,2607  6 2620 1           BZMF    -UP            TUDE BY DIMINISHING IT BY C (SINCE C IS
A1619                                                                            NOT LESS THAN .5) UNLESS C(A) = 0.
```

```
                            00,2610  0 0006 1  +DOWN    EXTEND
REF 116  LAST 1060          00,2611  60 130 0           SU       BUF             IF POSITIVE, REDUCE ONLY IF NECESSARY
                            00,2612  0 0006 1           EXTEND                   SINCE THE COMPENSATING INCR MIGHT CAUSE
                            00,2613  1 2616 0           BZF      +3              OVERFLOW.
                            00,2614  0 0006 1           EXTEND                   DONT SUBTRACT UNLESS RESULT IS POSITIVE
REF   1                     00,2615  6 2624 0           BZMF     ENDMAXDV        OR ZERO.

REF 577  LAST 1060          00,2616  24 154 1   +3      INCR     MPAC            KEEP SUBTRACT HERE AND COMPENSATE.
REF   2  LAST 1055          00,2617  1 2625 0           TCF      FINALDV

                            00,2620  0 0006 1  -UP      EXTEND                   IF ZERO, SET MINOR PART OF RESULT TO
REF   3  LAST 1061          00,2621  1 2630 1           BZF      FINALDV +3      ZERO.

                            00,2622  0 0006 1           EXTEND                   IF NEGATIVE, ADD C TO A, SUBTRACTING ONE
REF 578  LAST 1061          00,2623  26 154 0           DIM      MPAC            TO COMPENSATE. DIM IS OK HERE SINCE THE
REF 117  LAST 1061          00,2624  6 0130 0  ENDMAXDV AD       BUF             MAJOR PART NEVER GOES NEGATIVE.
```

```
 1633                          00,2625  22 007 0  FINALDV  ZL                   DO DV TO OBTAIN MINOR PART OF RESULT.
 1634                          00,2626  0 0006 1           EXTEND
 1635  REF 118  LAST 1061      00,2627  10 139 1           DV       BUF
 1636  REF 579  LAST 1061      00,2630  54 155 1    +3     TS       MPAC +1

 1637  REF   6  LAST 1056      00,2631  10 136 1           CCS      DVSIGN      LEAVE RESULT POSITIVE UNLESS C(DVSIGN)=
 1638  REF 274  LAST 1052      00,2632  0 0002 0           TC       Q           -0.
 1639  REF 275  LAST 1062      00,2633  0 0002 0           TC       Q
 1640  REF 276  LAST 1062      00,2634  0 0002 0           TC       Q

 1641                          00,2635  0 0006 1           EXTEND
 1642  REF 580  LAST 1062      00,2636  4 0155 1           DCS      MPAC
 1643  REF 581  LAST 1062      00,2637  52 155 1           DXCH     MPAC
 1644  REF 211  LAST 1058      00,2640  3 4746 0           CAF      ZERO        SO WE ALWAYS RETURN WITH C(A) = 0.
 1645  REF 277  LAST 1062      00,2641  0 0002 0           TC       Q
```

```
P1646              IF THE MAJOR PARTS OF THE DIVISOR AND DIVIDEND ARE EQUAL, BUT THE MINOR PARTS ARE SUCH THAT THE
R1648     DIVIDEND IS STRICTLY LESS THAN THE DIVISOR IN MAGNITUDE, THE FOLLOWING APPROXIMATION IS USED. THE ASSUMPTIONS
R1650     ARE THE SAME AS THE GENERAL ROUTINE WITH THE ADDITION THAT SIGN AGREEMENT IS NECESSARY (B, C, & D POSITIVE).

R1652                         C + SB .          (C + B - D)
R1653                         ------ = 37777 + S(---------)
R1654                         C + SD            (    C    )

R1655              THE DIVISION MAY BE PERFORMED IMMEDIATELY SINCE B IS STRICTLY LESS THAN D AND C IS NOT LESS THAN .5.


 1657    REF 582  LAST 1062    00,2642   4 0154 0  MAXDV     CS      MPAC               SEE IF MAXDV CASE STILL HOLDS AFTER
 1658    REF 119  LAST 1062    00,2643   6 0130 0            AD      BUF                NORMALIZATION.
 1659                          00,2644   0 0006 1            EXTEND
 1660                          00,2645   1 2647 1            BZF     +2
 1661    REF   2  LAST 1059    00,2646   1 2570 0            TCF     GENDDV             MPAC NOW LESS THAN BUF - DIVIDE AS USUAL

 1662    REF  31  LAST 1057    00,2647   3 4724 1    +2      CAF     POSMAX             SET MAJOR PART OF RESULT.
 1663    REF 583  LAST 1063    00,2650  54 154 0             TS      MPAC

 1664    REF 120  LAST 1063    00,2651   4 0131 0            CS      BUF +1             FORM DIVIDEND OF MINOR PART OF RESULT.
 1665    REF 584  LAST 1063    00,2652   6 0155 0            AD      MPAC +1
 1666    REF   2  LAST 1061    00,2653   1 2624 1            TCF     ENDMAXDV           GO ADD C AND DO DIVIDE, ATTACHING SIGN
A1667                                                                                   BEFORE EXITING.
```

```
P1668              VECTOR DIVIDED BY SCALAR, V/SC, IS EXECUTED HERE. THE VECTOR IS NOW IN MPAC WITH SCALAR IN BUF.

 1670   REF  97   LAST 1055    00,2654   4 4744 0   V/SC2     CS       ONE               INITIALIZE DIVIDEND NORMALIZATION COUNT
 1671   REF   4   LAST 1058    00,2655  54 137 0              TS       DVNORMCT          AND DIVISION SIGN REGISTER.
 1672   REF  44   LAST 1041    00,2656  54 127 1              TS       VBUF +5

 1673   REF   1                00,2657   0 3010 0             TC       VECAGREE          FORCE SIGN AGREEMENT IN VECTOR

 1674   REF 121   LAST 1063    00,2660  52 131 0              DXCH     BUF
 1675   REF   2   LAST  888    00,2661   0 7565 0             TC       ALSIGNAG          SIGN AGREE BUF
 1676   REF 122   LAST 1064    00,2662  52 131 0              DXCH     BUF
 1677   REF 123   LAST 1064    00,2663  10 130 1              CCS      BUF               FORCE DIVISOR POSITIVE WITH MAJOR PART
 1678   REF   1                00,2664   1 2721 0             TCF      /BUF+             NON-ZERO (IF POSSIBLE).
 1679                          00,2665   1 2667 0             TCF      +2
 1680   REF   1                00,2666   1 2715 1             TCF      /BUF-

 1681   REF 124   LAST 1064    00,2667  56 131 1              XCH      BUF +1            SHIFT VECTOR AND SCALAR LEFT 14.
 1682   REF 125   LAST 1064    00,2670  56 130 0              XCH      BUF
 1683   REF 585   LAST 1063    00,2671  56 155 0              XCH      MPAC +1
 1684   REF 586   LAST 1064    00,2672  56 154 1              XCH      MPAC
 1685                          00,2673   0 0006 1             EXTEND                     CHECK FOR OVERFLOW IN EACH CASE.
 1686                          00,2674   1 2676 0             BZF      +2
 1687   REF   3   LAST 1057    00,2675   1 2405 0             TCF      DVOVF

 1688   REF 587   LAST 1064    00,2676  56 160 0              XCH      MPAC +4
 1689   REF 588   LAST 1064    00,2677  56 157 1              XCH      MPAC +3
 1690                          00,2700   0 0006 1             EXTEND
 1691                          00,2701   1 2703 0             BZF      +2
 1692   REF   4   LAST 1064    00,2702   1 2405 0             TCF      DVOVF

 1693   REF 589   LAST 1064    00,2703  56 162 1              XCH      MPAC +6
 1694   REF 590   LAST 1064    00,2704  56 161 1              XCH      MPAC +5
 1695                          00,2705   0 0006 1             EXTEND
 1696                          00,2706   1 2710 1             BZF      +2
 1697   REF   5   LAST 1064    00,2707   1 2405 0             TCF      DVOVF

 1698   REF 126   LAST 1064    00,2710  10 130 1              CCS      BUF
 1699   REF   2   LAST 1064    00,2711   1 2721 0             TCF      /BUF+
 1700   REF   6   LAST 1064    00,2712   1 2405 0             TCF      DVOVF             ZERO DIVISOR - OVERFLOW.
 1701   REF   2   LAST 1064    00,2713   1 2715 1             TCF      /BUF-
 1702   REF   7   LAST 1064    00,2714   1 2405 0             TCF      DVOVF

 1703                          00,2715   0 0006 1   /BUF-     EXTEND                     ON NEGATIVE, COMPLEMENT BUF AND MAINTAIN
 1704   REF 127   LAST 1064    00,2716   4 0131 0             DCS      BUF               DVSIGN IN VBUF +5.
 1705   REF 128   LAST 1064    00,2717  52 131 0              DXCH     BUF
 1706   REF  45   LAST 1064    00,2720  24 127 0              INCR     VBUF +5
 1707                          00,2721  0 0006 1  /BUF+    EXTEND
 1708   REF 129  LAST 1064     00,2722  3 0131 1           DCA      BUF           LEAVE ABS(ORIG DIVISOR) IN BUF2
 1709   REF  16  LAST 1057     00,2723  52 134 0           DXCH     BUF2          FOR OVERFLOW TESTING
 1710   REF   1                00,2724  1 2732 1           TCF      /NORM         NORMALIZE DIVISOR IN BUF.

 1711                          00,2725  0 0006 1  /NORM2   EXTEND                 IF LESS THAN .5, AUGMENT DVNORMCT AND
 1712   REF   5  LAST 1064     00,2726  24 137 1           AUG      DVNORMCT      DOUBLE DIVISOR.
 1713                          00,2727  0 0006 1           EXTEND
 1714   REF 130  LAST 1065     00,2730  3 0131 1           DCA      BUF
 1715   REF 131  LAST 1065     00,2731  20 131 0           DAS      BUF

 1716   REF 132  LAST 1065     00,2732  3 0130 0  /NORM    CA       BUF           SEE IF DIVISOR NORMALIZED.
 1717                          00,2733  6 0000 1           DOUBLE
 1718                          00,2734  54 000 0           OVSK
 1719   REF   1                00,2735  1 2725 1           TCF      /NORM2        DOUBLE AND TRY AGAIN IF NOT.

 1720   REF   1                00,2736  0 2750 1           TC       V/SCDV        DO X COMPONENT DIVIDE.
 1721   REF 591  LAST 1064     00,2737  52 160 1           DXCH     MPAC +3       SUPPLY ARGUMENTS IN USUAL SEQUENCE.
 1722   REF 592  LAST 1065     00,2740  52 155 1           DXCH     MPAC
 1723   REF 593  LAST 1065     00,2741  52 160 1           DXCH     MPAC +3

 1724   REF   2  LAST 1065     00,2742  0 2750 1           TC       V/SCDV        Y COMPONENT.
 1725   REF 594  LAST 1065     00,2743  52 162 0           DXCH     MPAC +5
 1726   REF 595  LAST 1065     00,2744  52 155 1           DXCH     MPAC
 1727   REF 596  LAST 1065     00,2745  52 162 0           DXCH     MPAC +5

 1728   REF   3  LAST 1065     00,2746  0 2750 1           TC       V/SCDV        Z COMPONENT.
 1729   REF   2  LAST 1048     00,2747  1 7441 0           TCF      VROTATEX      GO RE-ARRANGE COMPONENTS BEFORE EXIT.
```

```
P1730            SUBROUTINE USED BY V/SC TO DIVIDE VECTOR COMPONENT IN MPAC,+1 BY THE SCALAR GIVEN IN BUF.

 1732    REF  46   LAST 1064    00,2750   3 0127 0   V/SCDV    CA       VBUF +5         REFLECTS SIGN OF SCALAR.
 1733    REF   7   LAST 1062    00,2751   54 136 1             TS       DVSIGN

 1734    REF 597   LAST 1065    00,2752   10 154 0             CCS      MPAC            FORCE MPAC POSITIVE, EXITING ON ZERO.
 1735    REF   1                00,2753   1 2767 1             TCF      /MPAC+
 1736                           00,2754   1 2756 0             TCF      +2
 1737    REF   1                00,2755   1 2763 0             TCF      /MPAC-

 1738    REF 598   LAST 1066    00,2756   10 155 1             CCS      MPAC +1
 1739    REF   2   LAST 1066    00,2757   1 2767 1             TCF      /MPAC+
 1740    REF 278   LAST 1062    00,2760   0 0002 0             TC       Q
 1741    REF   2   LAST 1066    00,2761   1 2763 0             TCF      /MPAC-
 1742    REF 279   LAST 1066    00,2762   0 0002 0             TC       Q

 1743                           00,2763   0 0006 1   /MPAC-    EXTEND                   USUAL COMPLEMENTING AND SETTING OF SIGN.
 1744    REF 599   LAST 1066    00,2764   4 0155 1             DCS      MPAC
 1745    REF 600   LAST 1066    00,2765   52 155 1             DXCH     MPAC
 1746    REF   8   LAST 1066    00,2766   24 136 0             INCR     DVSIGN

 1747    REF  98   LAST 1064    00,2767   4 4744 0   /MPAC+    CS       ONE             INITIALIZE NEAR-ONE SWITCH.
 1748    REF   4   LAST 1059    00,2770   54 140 0             TS       MAXDVSW

 1749    REF 601   LAST 1066    00,2771   4 0154 0             CS       MPAC            CHECK POSSIBLE OVERFLOW.
 1750    REF  17   LAST 1065    00,2772   6 0133 0             AD       BUF2            UNNORMALIZED INPUT DIVISOR.
 1751    REF 330   LAST 1058    00,2773   10 000 0             CCS      A
 1752    REF   1                00,2774   1 3004 1             TCF      DDVCALL         NOT NEAR-ONE
 1753                           00,2775   1 2777 0             TCF      +2              +0 IS JUST POSSIBLE
 1754    REF   8   LAST 1064    00,2776   1 2405 0             TCF      DVOVF           NO HOPE
 1755    REF   5   LAST 1066    00,2777   54 140 0             TS       MAXDVSW         SIGNAL POSSIBLE NEAR-ONE CASE
 1756    REF 602   LAST 1066    00,3000   4 0155 1             CS       MPAC +1         SEE IF DIVISION CAN BE DONE
 1757    REF  18   LAST 1066    00,3001   6 0134 1             AD       BUF2 +1
 1758                           00,3002   0 0006 1             EXTEND
 1759    REF   9   LAST 1066    00,3003   6 2405 1             BZMF     DVOVF

 1760    REF 603   LAST 1066    00,3004   52 155 1   DDVCALL   DXCH     MPAC            CALL PRE-DIVIDE NORMALIZATION.
 1761    REF   6   LAST 1065    00,3005   50 137 1             INDEX    DVNORMCT
 1762    REF   2   LAST 1058    00,3006   1 2565 1             TCF      MAXTEST
```

```
1763                          00,3007   32506 0  SLOPELO  DEC      .8324

1764   REF 280  LAST 1066    00,3010   56 002 0  VECAGREE XCH      Q                  SAVE Q IN A
1765   REF 604  LAST 1066    00,3011   52 155 1           DXCH     MPAC
1766   REF   3  LAST 1064    00,3012   0 7565 0           TC       ALSIGNAG           SIGNAGREE MPAC
1767   REF 605  LAST 1067    00,3013   52 155 1           DXCH     MPAC
1768   REF 606  LAST 1067    00,3014   52 160 1           DXCH     MPAC +3
1769   REF   4  LAST 1067    00,3015   0 7565 0           TC       ALSIGNAG           SIGN AGREE MPAC +3
1770   REF 607  LAST 1067    00,3016   52 160 1           DXCH     MPAC +3
1771   REF 608  LAST 1067    00,3017   52 162 0           DXCH     MPAC +5
1772   REF   5  LAST 1067    00,3020   0 7565 0           TC       ALSIGNAG           SIGNAGREE MPAC +5
1773   REF 609  LAST 1067    00,3021   52 162 0           DXCH     MPAC +5
1774   REF 331  LAST 1066    00,3022   0 0000 1           TC       A
```

```
P1775              THE FOLLOWING ROUTINE EXECUTES THE UNIT INSTRUCTION, WHICH TAKES THE UNIT OF THE VECTOR IN MPAC.

 1777   REF   2  LAST 1064   00,3023  0 3010 0  UNIT     TC      VECAGREE        FORCE SIGN AGREEMENT IN VECTOR
 1778   REF   2  LAST 1037   00,3024  0 7553 0           TC      MPACVBUF        SAVE ARGUMENT IN VBUF
 1779   REF 212  LAST 1062   00,3025  3 4746 0           CAF     ZERO            MUST SENSE OVERFLOW IN FOLLOWING DOT.
 1780   REF   8  LAST 1055   00,3026  56 121 0           XCH     OVFIND
 1781   REF  21  LAST  921   00,3027  54 141 1           TS      TEM1
 1782   REF   1              00,3030  0 3317 1           TC      VSQSUB          DOT MPAC WITH ITSELF.
 1783   REF  22  LAST 1068   00,3031  3 0141 0           CA      TEM1
 1784   REF   9  LAST 1068   00,3032  56 121 0           XCH     OVFIND
 1785                        00,3033  0 0006 1           EXTEND
 1786                        00,3034  1 3036 0           BZF     +2
 1787   REF  10  LAST 1066   00,3035  1 2405 0           TCF     DVOVF
 1788                        00,3036  0 0006 1           EXTEND
 1789   REF 610  LAST 1067   00,3037  3 0155 0           DCA     MPAC            LEAVE THE SQUARE OF THE LENGTH OF THE
 1790   REF  51  LAST 1022   00,3040  50 120 1           INDEX   FIXLOC          ARGUMENT IN LVSQUARE.
 1791   REF   1              00,3041  52 043 1           DXCH    LVSQUARE

 1792   REF   1              00,3042  0 3343 0           TC      SQRTSUB         GO TAKE THE NORMALIZED SQUARE ROOT.

 1793   REF 611  LAST 1068   00,3043  10 154 0           CCS     MPAC            CHECK FOR UNIT OVERFLOW.
 1794                        00,3044  1 3051 1           TCF     +5              MPAC IS NOT LESS THAN .5 UNLESS
 1795   REF 217  LAST 1059   00,3045  54 001 1           TS      L
 1796   REF  52  LAST 1068   00,3046  50 120 1           INDEX   FIXLOC
 1797   REF   1              00,3047  52 045 1           DXCH    LV
 1798   REF  11  LAST 1068   00,3050  1 2405 0           TCF     DVOVF           INPUT TO SQRTSUB WAS 0.

 1799   REF   1              00,3051  4 4310 0           CS      FOURTEEN        SEE IF THE INPUT WAS SO SMALL THE THE
 1800   REF  47  LAST 1054   00,3052  6 0135 0           AD      MPTEMP          FIRST TWO REGISTERS OF THE SQUARE WERE 0
 1801   REF 332  LAST 1067   00,3053  10 000 0           CCS     A
 1802                        00,3054  4 0000 0           COM                     IF SO, SAVE THE NEGATIVE OF THE SHIFT
 1803   REF   1              00,3055  1 3133 1           TCF     SMALL           COUNT -15D.

 1804   REF   1              00,3056  1 3065 0           TCF     LARGE           (THIS IS USUALLY THE CASE.)

 1805   REF   1              00,3057  4 4752 1           CS      THIRTEEN        IF THE SHIFT COUNT WAS EXACTLY 14, SET
 1806   REF  48  LAST 1068   00,3060  54 135 1           TS      MPTEMP          THE PRE-DIVIDE NORM COUNT TO -13D.

 1807   REF 612  LAST 1068   00,3061  3 0154 1           CA      MPAC            SHIFT THE LENGTH RIGHT 14 BEFORE STORING
 1808   REF 218  LAST 1068   00,3062  54 001 1  SMALL2   TS      L               (SMALL EXITS TO THIS POINT).
 1809   REF 213  LAST 1068   00,3063  3 4746 0           CAF     ZERO
 1810   REF   1              00,3064  1 3112 1           TCF     LARGE2          GO TO STORE LENGTH AND PROCEED.

 1811   REF  49  LAST 1068   00,3065  10 135 1  LARGE    CCS     MPTEMP          MOST ALL CASES COME HERE.
 1812   REF   1              00,3066  1 3074 0           TCF     LARGE3          SEE IF NO NORMALIZATION WAS REQUIRED BY

 1813   REF   1              00,3067  4 2024 1           CS      SRDDV           SQRT, AND IF SO, SET UP FOR A SHIFT
 1814   REF  50  LAST 1068   00,3070  54 135 1           TS      MPTEMP          RIGHT 1 BEFORE DIVIDING TO PRODUCE
 1815                        00,3071  0 0006 1           EXTEND                  THE DESIRED HALF UNIT VECTOR.
 1816   REF 613  LAST 1068   00,3072  3 0155 0           DCA     MPAC
 1817   REF    2  LAST 1068   00,3073  1 3112 1           TCF     LARGE2
```

```
1818                            00,3074  4 0000 0  LARGE3    COM                         LEAVE NEGATIVE OF SHIFT COUNT-1 FOR
1819    REF  51   LAST 1068    00,3075  54 135 1            TS       MPTEMP             PREDIVIDE LEFT SHIFT.

1820                            00,3076  4 0000 0            COM                         PICK UP REQUIRED SHIFTING BIT TO UNNORM-
1821    REF 333   LAST 1068    00,3077  50 000 1            INDEX    A                  ALIZE THE SQRT RESULT.
1822    REF  61   LAST 1053    00,3100  3 4727 1            CAF      BIT14
1823    REF 133   LAST 1065    00,3101  54 130 1            TS       BUF
1824                            00,3102  0 0006 1            EXTEND
1825    REF 614   LAST 1068    00,3103  7 0155 1            MP       MPAC +1
1826    REF 134   LAST 1070    00,3104  56 130 0            XCH      BUF
1827                            00,3105  0 0006 1            EXTEND                      (UNNORMALIZE THE SQRT FOR LV).
1828    REF 615   LAST 1070    00,3106  7 0154 0            MP       MPAC
1829    REF 219   LAST 1068    00,3107  56 001 0            XCH      L
1830    REF 135   LAST 1070    00,3110  6 0130 0            AD       BUF
1831    REF 220   LAST 1070    00,3111  56 001 0            XCH      L

1832    REF  53   LAST 1068    00,3112  50 120 1  LARGE2    INDEX    FIXLOC
1833    REF   2   LAST 1068    00,3113  52 045 1            DXCH     LV                 LENGTH NOW STORED IN WORK AREA.

1834    REF  99   LAST 1066    00,3114  4 4744 0            CS       ONE
1835    REF   6   LAST 1066    00,3115  54 140 0            TS       MAXDVSW            NO MAXDV CASES IN UNIT.

1836    REF  47   LAST 1066    00,3116  52 123 0            DXCH     VBUF               PREPARE X COMPONENT FOR DIVIDE, SETTING
1837    REF 616   LAST 1070    00,3117  52 155 1            DXCH     MPAC               LENGTH OF VECTOR AS DIVISOR IN BUF.
1838    REF 136   LAST 1070    00,3120  52 131 0            DXCH     BUF
1839    REF   1                00,3121  0 3151 1            TC       UNITDV

1840    REF  48   LAST 1070    00,3122  52 125 0            DXCH     VBUF +2            DO Y AND Z IN USUAL FASHION SO WE CAN
1841    REF 617   LAST 1070    00,3123  52 155 1            DXCH     MPAC               EXIT THROUGH VROTATEX.
1842    REF 618   LAST 1070    00,3124  52 160 1            DXCH     MPAC +3
1843    REF   2   LAST 1070    00,3125  0 3151 1            TC       UNITDV

1844    REF  49   LAST 1070    00,3126  52 127 1            DXCH     VBUF +4
1845    REF 619   LAST 1070    00,3127  52 155 1            DXCH     MPAC
1846    REF 620   LAST 1070    00,3130  52 162 0            DXCH     MPAC +5
1847    REF   3   LAST 1070    00,3131  0 3151 1            TC       UNITDV
1848    REF   3   LAST 1065    00,3132  1 7441 0            TCF      VROTATEX           AND EXIT.
```

```
P1849              IF THE LENGTH OF THE ARGUMENT VECTOR WAS LESS THAN 2(-28), EACH COMPONENT MUST BE SHIFTED LEFT AT LEAST
R1851     14 PLACES BEFORE THE DIVIDE. NOTE THAT IN THIS CASE, THE MAJOR PART OF EACH COMPONENT IS ZERO.

 1853     REF  52  LAST 1070   00,3133  54 135 1  SMALL     TS      MPTEMP          NEGATIVE OF PRE-DIVIDE SHIFT COUNT.

 1854     REF 214  LAST 1068   00,3134  3 4746 0            CAF     ZERO            SHIFT EACH COMPONENT LEFT 14.
 1855     REF  50  LAST 1070   00,3135  56 123 1            XCH     VBUF +1
 1856     REF  51  LAST 1071   00,3136  56 122 0            XCH     VBUF
 1857     REF  52  LAST 1071   00,3137  56 125 1            XCH     VBUF +3
 1858     REF  53  LAST 1071   00,3140  56 124 0            XCH     VBUF +2
 1859     REF  54  LAST 1071   00,3141  56 127 0            XCH     VBUF +5
 1860     REF  55  LAST 1071   00,3142  56 126 1            XCH     VBUF +4

 1861     REF  53  LAST 1071   00,3143  4 0135 1            CS      MPTEMP
 1862     REF 334  LAST 1070   00,3144  50 000 1            INDEX   A
 1863     REF  62  LAST 1070   00,3145  3 4727 1            CAF     BIT14
 1864                          00,3146  0 0006 1            EXTEND
 1865     REF 621  LAST 1070   00,3147  7 0154 0            MP      MPAC
 1866     REF   1              00,3150  1 3062 1            TCF     SMALL2

 1867     REF   4  LAST  947      4752            THIRTEEN =        OCT15
 1868     REF   2  LAST  267      4310            FOURTEEN =        OCT16
 1869     REF  13  LAST  472      4310            OCT16    =        R1D1
```

```
P1870             THE FOLLOWING ROUTINE SETS UP THE CALL TO THE DIVIDE ROUTINES.

 1871   REF 622  LAST 1071   00,3151  10 154 0  UNITDV    CCS     MPAC             FORCE MPAC POSITIVE IF POSSIBLE, SETTING
 1872   REF   1              00,3152   1 3170 0            TCF     UMPAC+           DVSIGN ACCORDING TO THE SIGN OF MPAC
 1873                        00,3153   1 3155 1            TCF     +2               SINCE THE DIVISOR IS ALWAYS POSITIVE
 1874   REF   1              00,3154   1 3162 0            TCF     UMPAC-           HERE.

 1875   REF 623  LAST 1072   00,3155  10 155 1            CCS     MPAC +1
 1876   REF   2  LAST 1072   00,3156   1 3170 0            TCF     UMPAC+
 1877   REF 281  LAST 1067   00,3157   0 0002 0            TC      Q                EXIT IMMEDIATELY ON ZERO.
 1878   REF   2  LAST 1072   00,3160   1 3162 0            TCF     UMPAC-
 1879   REF 282  LAST 1072   00,3161   0 0002 0            TC      Q

 1880   REF 215  LAST 1071   00,3162   4 4746 1  UMPAC-    CS      ZERO             IF NEGATIVE, SET -0 IN DVSIGN FOR FINAL
 1881   REF   9  LAST 1066   00,3163  54 136 1            TS      DVSIGN           COMPLEMENT.
 1882                        00,3164   0 0006 1            EXTEND
 1883   REF 624  LAST 1072   00,3165   4 0155 1            DCS     MPAC             PICK UP ABSOLUTE VALUE OF ARG AND JUMP.
 1884   REF  54  LAST 1071   00,3166  50 135 0            INDEX   MPTEMP
 1885   REF   3  LAST 1066   00,3167   1 2564 0            TCF     MAXTEST -1

 1886   REF  10  LAST 1072   00,3170  54 136 1  UMPAC+    TS      DVSIGN           SET DVSIGN FOR POSITIVE QUOTIENT.
 1887   REF 625  LAST 1072   00,3171  52 155 1            DXCH    MPAC
 1888   REF  55  LAST 1072   00,3172  50 135 0            INDEX   MPTEMP
 1889   REF   4  LAST 1072   00,3173   1 2564 0            TCF     MAXTEST -1
```

```
P1890              MISCELLANEOUS UNARY OPERATIONS.

 1891   REF   1                00,3174  0 3300 1  DSQ      TC      DSQSUB           SQUARE THE DP CONTENTS OF MPAC.
 1892   REF  35  LAST 1058     00,3175  1 6102 0           TCF     DANZIG

 1893   REF  28  LAST 1054     00,3176  10 163 1  ABVALABS CCS     MODE             ABVAL OR ABS INSTRUCTION.
 1894   REF   3  LAST  826     00,3177  1 3226 0           TCF     ABS              DO ABS ON SCALAR.
 1895   REF   4  LAST 1073     00,3200  1 3226 0           TCF     ABS

 1896   REF   2  LAST 1068     00,3201  0 3317 1  ABVAL    TC      VSQSUB           DOT MPAC WITH ITSELF.
 1897   REF  29  LAST 1073     00,3202  22 163 0           LXCH    MODE             MODE IS NOW OP (L ZERO AFTER DAS).

 1898                          00,3203  0 0006 1           EXTEND                   STORE SQUARE OF LENGTH IN WORK AREA.
 1899   REF 626  LAST 1072     00,3204  3 0155 0           DCA     MPAC
 1900   REF  54  LAST 1070     00,3205  50 120 1           INDEX   FIXLOC
 1901   REF   2  LAST 1068     00,3206  52 043 1           DXCH    LVSQUARE
```

```
P1902    PROGRAM DESCRIPTION- SUBROUTINE SQRT
R1903    FUNCTIONAL DESCRIPTION-DOUBLE PRECISION SQUARE ROOT ROUTINE
R1904        THIS PROGRAM TAKES THE SQUARE ROOT OF THE 27 OR 28 MOST SIGNIFICANT BITS IN THE TRIPLE PRECISION SET OF
R1906        NUMBERS-MPAC,MPAC+1,AND MPAC+2.  THE ROOT IS RETURNED DOUBLE        PRECISION IN MPAC AND MPAC+1.
R1908    WARNING- THIS SUBROUTINE USES A TRIPLE PRECISION INPUT. THE PROGRAMMER  MUST ASSURE THE CONTENTS OF MPAC+2
R1910        ESPECIALLY IF THE CONTENTS OF MPAC IS SMALL OR ZERO.  FOR DETAILS SEE STG MEMO NO.949.
P1912    CALLING SEQUENCE- IN INTERPRETIVE MODE I.E., FOLLOWING TC  INTPRET,SQRT   NO ADDRESS IS ALLOWED
R1914    INPUT SCALING  THE BINARY POINT IS ASSUMED TO THE RIGHT OF BIT 15. THE  ANSWER IS RETURNED WITH THE SAME SCALING
R1916    SUBROUTINES- GENSCR,MPACSHR, SQRTSUB,ABORT
R1917    ABORT EXIT MODE- ABORTS ON NEGATIVE INPUT -1.2X10E-4 (77775  OCTAL)     OR LESS.
R1919        DISPLAYS ERROR CODE 1302
R1920                    TC    ABORT
P1921                    OCT   1302
R1922    DEBRIS -  LOCATIONS BUF,MPTEMP,ADDRWD ARE USED
 1923    REF   2  LAST 1068   00,3207  0 3343 0  SQRT      TC      SQRTSUB         TAKE THE SQUARE ROOT OF MPAC.
 1924    REF  56  LAST 1072   00,3210  10 135 1            CCS     MPTEMP          RETURNED NORMALIZED SQUARE ROOT. SEE IF
 1925                         00,3211  1 3213 0            TCF     +2              ANY UN-NORMALIZATION REQUIRED AND EXIT
 1926    REF  36  LAST 1073   00,3212  1 6102 0            TCF     DANZIG          IF NOT.

 1927    REF   3  LAST 1053   00,3213  6 3733 0            AD      NEG12           A RIGHT SHIFT OF MORE THAN 13 COULD BE
 1928                         00,3214  0 0006 1            EXTEND                  REQUIRED IF INPUT WAS ZERO IN MPAC,+1.
 1929    REF   1              00,3215  6 3221 0            BZMF    SQRTSHFT        GOES HERE IN MOST CASES.
 1930                         00,3216  22 007 0            ZL                      IF A LONG SHIFT IS REQUIRED, GO TO
 1931    REF  80  LAST 1054   00,3217  22 116 1            LXCH    ADDRWD          GENERAL RIGHT SHIFT ROUTINES.
 1932    REF   4  LAST 1053   00,3220  1 2303 1            TCF     GENSCR +4       ADDRWD WAS ZERO TO PREVENT POUND.

 1933    REF  57  LAST 1074   00,3221  50 135 0  SQRTSHFT  INDEX   MPTEMP          SELECT SHIFTING BIT AND EXIT THROUGH
 1934    REF  39  LAST 1024   00,3222  3 4726 0            CAF     BIT15           SHIFT ROUTINES.
 1935    REF  58  LAST 1074   00,3223  54 135 1            TS      MPTEMP
 1936    REF 216  LAST 1072   00,3224  3 4746 0            CAF     ZERO            TO ZERO MPAC +2 IN THE PROCESS.
 1937    REF   2  LAST 1053   00,3225  1 2036 1            TCF     MPACSHR +3

 1938    REF   5  LAST 1050   00,3226  0 6744 0  ABS       TC      BRANCH          TEST SIGN OF MPAC AND COMPLEMENT IF
 1939    REF  37  LAST 1074   00,3227  1 6102 0            TCF     DANZIG
 1940    REF  38  LAST 1074   00,3230  1 6102 0            TCF     DANZIG
 1941    REF   4  LAST 1044   00,3231  1 7711 0            TCF     COMP
```

```
1942   REF  24  LAST 1039   00,3232  4 4742 0  VDEF    CS      FOUR              VECTOR DEFINE - ESSENTIALLY TREATS
1943   REF  20  LAST 1042   00,3233  26 166 1          ADS     PUSHLOC           SCALAR IN MPAC AS X COMPONENT, PUSHES UP
1944                        00,3234  0 0006 1          EXTEND                    FOR Y AND THEN AGAIN FOR Z.
1945   REF 335  LAST 1071   00,3235  5 0000 1          INDEX   A
1946                        00,3236  3 0003 1          DCA     2
1947   REF 627  LAST 1073   00,3237  52 160 1          DXCH    MPAC +3
1948                        00,3240  0 0006 1          EXTEND
1949   REF  21  LAST 1075   00,3241  5 0166 0          INDEX   PUSHLOC
1950                        00,3242  3 0001 0          DCA     0
1951   REF 628  LAST 1075   00,3243  52 162 0          DXCH    MPAC +5
1952   REF   2  LAST 1039   00,3244  1 6542 0          TCF     VMODE             MODE IS NON VECTOR.

1953   REF   3  LAST 1073   00,3245  0 3317 1  VSQ     TC      VSQSUB            DOT MPAC WITH ITSELF.
1954   REF   1              00,3246  1 7353 1          TCF     DMODE             MODE IS NOW DP.

1955                        00,3247  0 0006 1  PUSH    EXTEND                    PUSH DOWN MPAC LEAVING IT LOADED.
1956   REF 629  LAST 1075   00,3250  3 0155 0          DCA     MPAC
1957   REF  22  LAST 1075   00,3251  50 166 0          INDEX   PUSHLOC           PUSH DOWN FIRST TWO REGISTERS IN EACH
1958                        00,3252  52 001 1          DXCH    0

1959   REF  30  LAST 1073   00,3253  50 163 0          INDEX   MODE              INCREMENT PUSHDOWN POINTER.
1960   REF   5  LAST 1019   00,3254  3 6265 0          CAF     NO.WDS
1961   REF  23  LAST 1075   00,3255  26 166 1          ADS     PUSHLOC

1962   REF  31  LAST 1075   00,3256  10 163 1          CCS     MODE
1963   REF   1              00,3257  1 3272 1          TCF     TPUSH             PUSH DOWN MPAC +2.
1964   REF  39  LAST 1074   00,3260  1 6102 0          TCF     DANZIG            DONE FOR DP.

1965                        00,3261  0 0006 1          EXTEND                    ON VECTOR, PUSH DOWN Y AND Z COMPONENTS.
1966   REF 630  LAST 1075   00,3262  3 0160 0          DCA     MPAC +3
1967   REF  24  LAST 1075   00,3263  50 166 0          INDEX   PUSHLOC
1968                        00,3264  51'775 0          DXCH    0 -4
1969                        00,3265  0 0006 1          EXTEND
1970   REF 631  LAST 1075   00,3266  3 0162 1          DCA     MPAC +5
1971   REF  25  LAST 1075   00,3267  50 166 0          INDEX   PUSHLOC
1972                        00,3270  51'777 1          DXCH    0 -2
1973   REF  40  LAST 1075   00,3271  1 6102 0          TCF     DANZIG

1974   REF 632  LAST 1075   00,3272  3 0156 0  TPUSH   CA      MPAC +2
1975   REF   2  LAST 1018   00,3273  1 6575 1          TCF     ENDTPUSH +2

1976   REF  55  LAST 1073   00,3274  50 120 1  RVQ     INDEX   FIXLOC            RVQ - RETURN IVA QPRET.
1977   REF   7  LAST 1021   00,3275  3 0052 0          CA      QPRET
1978   REF  22  LAST 1033   00,3276  54 117 1          TS      POLISH
1979   REF   5  LAST 1022   00,3277  1 6673 1          TCF     GOTO +4           (ASSUME QPRET POINTS TO FIXED ONLY.)
```

```
P1980           THE FOLLOWING SUBROUTINES ARE USED IN SQUARING MPAC, IN BOTH THE SCALAR AND VECTOR SENSE. THEY ARE
R1982   SPECIAL CASES OF DMPSUB AND DOTSUB, PUT IN TO SAVE SOME TIME.

 1983   REF 633  LAST 1075   00,3300  3 0155 0  DSQSUB    CA      MPAC +1         SQUARES THE SCALAR CONTENTS OF MPAC.
 1984                        00,3301  0 0006 1            EXTEND
 1985                        00,3302  7 0000 0            SQUARE
 1986   REF 634  LAST 1076   00,3303  54 156 1            TS      MPAC +2
 1987   REF 217  LAST 1074   00,3304  3 4746 0            CAF     ZERO            FORM 2(CROSS TERM).
 1988   REF 635  LAST 1076   00,3305  56 155 0            XCH     MPAC +1
 1989                        00,3306  0 0006 1            EXTEND
 1990   REF 636  LAST 1076   00,3307  7 0154 0            MP      MPAC
 1991                        00,3310  20 001 1            DDOUBL                  AND MAYBE OVERFLOW.
 1992   REF 637  LAST 1076   00,3311  20 156 1            DAS     MPAC +1         AND SET A TO NET OVERFLOW.
 1993   REF 638  LAST 1076   00,3312  56 154 1            XCH     MPAC
 1994                        00,3313  0 0006 1            EXTEND
 1995                        00,3314  7 0000 0            SQUARE
 1996   REF 639  LAST 1076   00,3315  20 155 1            DAS     MPAC
 1997   REF 283  LAST 1072   00,3316  0 0002 0            TC      Q

 1998                        00,3317  0 0006 1  VSQSUB    EXTEND                  DOTS THE VECTOR IN MPAC WITH ITSELF.
 1999   REF   8  LAST 1031   00,3320  22 137 1            QXCH    DOTRET
 2000   REF   2  LAST 1073   00,3321  0 3300 1            TC      DSQSUB          SQUARE THE X COMPONENT.
 2001   REF 640  LAST 1076   00,3322  52 160 1            DXCH    MPAC +3
 2002   REF 641  LAST 1076   00,3323  52 155 1            DXCH    MPAC
 2003   REF 137  LAST 1070   00,3324  52 131 0            DXCH    BUF             SO WE CAN END IN DOTSUB.
 2004   REF 642  LAST 1076   00,3325  3 0156 0            CA      MPAC +2
 2005   REF 138  LAST 1076   00,3326  54 132 0            TS      BUF +2

 2006   REF   3  LAST 1076   00,3327  0 3300 1            TC      DSQSUB          SQUARE Y COMPONENT.
 2007   REF 643  LAST 1076   00,3330  52 156 1            DXCH    MPAC +1
 2008   REF 139  LAST 1076   00,3331  20 132 0            DAS     BUF +1
 2009   REF 644  LAST 1076   00,3332  6 0154 1            AD      MPAC
 2010   REF 140  LAST 1076   00,3333  6 0130 0            AD      BUF
 2011   REF 141  LAST 1076   00,3334  54 130 1            TS      BUF
 2012                        00,3335  1 3337 1            TCF     +2
 2013   REF  10  LAST 1068   00,3336  54 121 1            TS      OVFIND          IF OVERFLOW.

 2014   REF 645  LAST 1076   00,3337  52 162 0            DXCH    MPAC +5
 2015   REF 646  LAST 1076   00,3340  52 155 1            DXCH    MPAC
 2016   REF   4  LAST 1076   00,3341  0 3300 1            TC      DSQSUB          SQUARE Z COMPONENT.
 2017   REF   1              00,3342  1 7226 1            TCF     ENDDOT          END AS IN DOTSUB.
```

```
P2018           DOUBLE PRECISION SQUARE ROOT ROUTINE. TAKE THE SQUARE ROOT OF THE TRIPLE PRECISION (MPAC +2 USED ONLY
R2020     IN NORMALIZATION) CONTENTS OF MPAC AND LEAVE THE NORMALIZED RESULT IN MPAC (C(MPAC) GREATER THAN OR EQUAL TO
R2022     .5). THE RIGHT SHIFT COUNT (TO UNNORMALIZE) IS LEFT IN MPTEMP.

 2023     REF 218  LAST 1076     00,3343  3 4746 0  SQRTSUB   CAF      ZERO             START BY ZEROING RIGHT SHIFT COUNT.
 2024     REF  59  LAST 1074     00,3344  54 135 1            TS       MPTEMP

 2025     REF 647  LAST 1076     00,3345  10 154 0            CCS      MPAC             CHECK FOR POSITIVE ARGUMENT, SHIFTING
 2026     REF   1                00,3346  1 3405 1            TCF      SMPAC+           FIRST SIGNIFICANT MPAC REGISTER INTO
 2027                            00,3347  1 3351 1            TCF      +2               MPAC ITSELF.
 2028     REF   1                00,3350  1 3373 1            TCF      SQRTNEG          SEE IF MAG OF ARGUMENT LESS THAN 10(-4).

 2029     REF 648  LAST 1077     00,3351  56 156 0            XCH      MPAC +2          MPAC IS ZERO - SHIFT LEFT 14.
 2030     REF 649  LAST 1077     00,3352  56 155 0            XCH      MPAC +1
 2031     REF 650  LAST 1077     00,3353  54 154 0            TS       MPAC
 2032     REF  17  LAST  957     00,3354  3 4750 1            CAF      SEVEN            AUGMENT RIGHT SHIFT COUNTER.
 2033     REF  60  LAST 1077     00,3355  54 135 1            TS       MPTEMP

 2034     REF 651  LAST 1077     00,3356  10 154 0            CCS      MPAC             SEE IF MPAC NOW PNZ.
 2035     REF   2  LAST 1077     00,3357  1 3405 1            TCF      SMPAC+
 2036                            00,3360  1 3362 1            TCF      +2
 2037     REF   1                00,3361  1 3376 1            TCF      ZEROANS          NEGATIVE BUT LESS THAN 10(-4) IN MAG.

 2038     REF 652  LAST 1077     00,3362  56 155 0            XCH      MPAC +1          ZERO - SHIFT LEFT 14 AGAIN.
 2039     REF 653  LAST 1077     00,3363  54 154 0            TS       MPAC
 2040     REF  18  LAST 1077     00,3364  3 4750 1            CAF      SEVEN            AUGMENT RIGHT SHIFT COUNTER.
 2041     REF  61  LAST 1077     00,3365  26 135 1            ADS      MPTEMP

 2042     REF 654  LAST 1077     00,3366  10 154 0            CCS      MPAC
 2043     REF   3  LAST 1077     00,3367  1 3405 1            TCF      SMPAC+
 2044     REF 284  LAST 1076     00,3370  0 0002 0            TC       Q                SQRT(0) = 0.
 2045     REF   2  LAST 1077     00,3371  1 3376 1            TCF      ZEROANS
 2046     REF   1                00,3372  1 3453 1            TCF      FIXROOT          DO NOT LEAVE SQRTSUB WITH -0 IN MPAC.


 2047     REF 336  LAST 1075     00,3373  10 000 0  SQRTNEG   CCS      A                ARGUMENT IS NEGATIVE, BUT SEE IF SIGN-
 2048     REF   1                00,3374  1 3402 0            TCF      SQRTABRT         CORRECTED ARGUMENT IS LESS THAN 10(-4)

 2049     REF 655  LAST 1077     00,3375  10 155 1            CCS      MPAC +1          IN MAGNITUDE. IF SO, CALL ANSWER ZERO.
 2050     REF 219  LAST 1077     00,3376  3 4746 0  ZEROANS   CAF      ZERO             FORCE ANSWER TO ZERO HERE.
 2051     REF   2  LAST 1077     00,3377  1 3453 1            TCF      FIXROOT
 2052     REF   2  LAST 1077     00,3400  1 3402 0            TCF      SQRTABRT
 2053     REF   3  LAST 1077     00,3401  1 3453 1            TCF      FIXROOT

 2054     REF  27  LAST 1023     00,3402  52 165 1  SQRTABRT  DXCH     LOC
 20541    REF   1                00,3403  0 5722 0            TC       P00DOO1
 2055                            00,3404   21302 0            OCT      21302

 2056     REF   1                00,3405  6 2444 1  SMPAC+    AD       -1/2+2           SEE IF ARGUMENT GREATER THAN OR EQUAL TO
 2057                            00,3406  0 0006 1             EXTEND                  .5.
 2058    REF   1                 00,3407  6 3456 0             BZMF     SRTEST         IF SO, SEE IF LESS THAN .25.

 2059    REF 656   LAST 1077     00,3410  52 155 1             DXCH     MPAC           WE WILL TAKE THE SQUARE ROOT OF MPAC/2.
 2060    REF  16   LAST 1059     00,3411  22 021 1             LXCH     SR             SHIFT RIGHT 1 AND GO TO THE SQRT ROUTINE
 2061                            00,3412  0 0006 1             EXTEND
 2062    REF  21   LAST 1059     00,3413  7 4727 0             MP       HALF
 2063    REF 657   LAST 1078     00,3414  52 155 1             DXCH     MPAC
 2064    REF  17   LAST 1078     00,3415  56 021 1             XCH      SR
 2065    REF 658   LAST 1078     00,3416  26 155 1             ADS      MPAC +1        GUARANTEED NO OVERFLOW.

 2066    REF   1                 00,3417  3 2314 0  ARGHI      CAF      SLOPEHI        ARGUMENT BETWEEN .25 AND .5. GET A
 2067                            00,3420  0 0006 1             EXTEND                  LINEAR APPROXIMATION FOR THIS RANGE.
 2068    REF 659   LAST 1078     00,3421  7 0154 0             MP       MPAC
 2069    REF   1                 00,3422  6 2566 0             AD       BIASHI         X0/2 = (MPAC/2)(SLOPEHI) + BIASHI/2.

 2070    REF 142   LAST 1076     00,3423  54 130 1   +4        TS       BUF            X0/2 (ARGLO ENTERS HERE).
 2071    REF 660   LAST 1078     00,3424  3 0154 1             CA       MPAC           SINGLE-PRECISION THROUGHOUT.
 2072                            00,3425  22 007 0             ZL
 2073                            00,3426  0 0006 1             EXTEND
 2074    REF 143   LAST 1078     00,3427  10 130 1             DV       BUF            (MPAC/2)/(X0/2)
 2075                            00,3430  0 0006 1             EXTEND
 2076    REF  22   LAST 1078     00,3431  7 4727 0             MP       HALF
 2077    REF 144   LAST 1078     00,3432  26 130 1             ADS      BUF            X1 = X0/2 + .5(MPAC/2)/(X0/2).

 2078                            00,3433  0 0006 1             EXTEND
 2079    REF  23   LAST 1078     00,3434  7 4727 0             MP       HALF           FORM UP X1/2.
 2080    REF 661   LAST 1078     00,3435  52 155 1             DXCH     MPAC           SAVE AND BRING OUT ARGUMENT.
 2081                            00,3436  0 0006 1             EXTEND                  TAKE DP QUOTIENT WITH X1.
 2082    REF 145   LAST 1078     00,3437  10 130 1             DV       BUF
 2083    REF 146   LAST 1078     00,3440  54 131 0             TS       BUF +1         SAVE MAJOR PART OF QUOTIENT.
 2084    REF 220   LAST 1077     00,3441  3 4746 0             CAF      ZERO           FORM MINOR PART OF QUOTIENT USING
 2085    REF 221   LAST 1070     00,3442  56 001 0             XCH      L              (REMAINDER,0).
 2086                            00,3443  0 0006 1             EXTEND
 2087    REF 147   LAST 1078     00,3444  10 130 1             DV       BUF
 2088    REF 222   LAST 1078     00,3445  54 001 1             TS       L              IN PREPARATION FOR DAS.
 2089    REF 148   LAST 1078     00,3446  3 0131 1             CA       BUF +1
 2090    REF 662   LAST 1078     00,3447  20 155 1             DAS      MPAC           X2 = X1/2 + (MPAC/2)X1

 2091                            00,3450  0 0006 1             EXTEND                  OVERFLOWS IF ARG. NEAR POSMAX.
 2092    REF   1                 00,3451  1 3455 1             BZF      TCQBNKOO
 2093    REF  32   LAST 1063     00,3452  3 4724 1             CAF      POSMAX
 2094    REF 663   LAST 1078     00,3453  54 154 0  FIXROOT    TS       MPAC
 2095    REF 664   LAST 1078     00,3454  54 155 1             TS       MPAC +1
 2096    REF 265   LAST 1077     00,3455  0 0002 0  TCQBNKOO   TC       Q              RETURN TO CALLER TO UNNORMALIZE, ETC.
```

```
2097  REF   1              00,3456  6 4730 1  SRTEST   AD      QUARTER       ARGUMENT WAS LESS THAN .5, SEE IF LESS
2098                       00,3457  0 0006 1           EXTEND                THAN .25.
2099  REF   1              00,3460  6 3502 0           BZMF    SQRTNORM      IF SO, BEGIN NORMALIZATION.

2100  REF 665  LAST 1078   00,3461  52 155 1           DXCH    MPAC          IF BETWEEN .5 AND .25, SHIFT RIGHT 1 AND
2101  REF  18  LAST 1078   00,3462  22 021 1           LXCH    SR            START AT ARGLO.
2102                       00,3463  0 0006 1           EXTEND
2103  REF  24  LAST 1078   00,3464  7 4727 0           MP      HALF
2104  REF 666  LAST 1079   00,3465  52 155 1           DXCH    MPAC
2105  REF  19  LAST 1079   00,3466  56 021 1           XCH     SR
2106  REF 667  LAST 1079   00,3467  26 155 1           ADS     MPAC +1       NO OVERFLOW.

2107  REF   1              00,3470  3 3007 0  ARGLO    CAF     SLOPELO       (NORMALIZED) ARGUMENT BETWEEN .125 AND
2108                       00,3471  0 0006 1           EXTEND                .25
2109  REF 668  LAST 1079   00,3472  7 0154 0           MP      MPAC
2110  REF   1              00,3473  6 2270 0           AD      BIASLO
2111  REF   1              00,3474  1 3423 0           TCF     ARGHI +4      BEGIN SQUARE ROOT.

2112                       00,3475  0 0006 1  SQRTNM2  EXTEND                SHIFT LEFT 2 AND INCREMENT RIGHT SHIFT
2113  REF 669  LAST 1079   00,3476  3 0156 0           DCA     MPAC +1       COUNT (FOR TERMINAL UNNORMALIZATION).
2114  REF 670  LAST 1079   00,3477  20 156 1           DAS     MPAC +1
2115  REF 671  LAST 1079   00,3500  6 0154 1           AD      MPAC
2116  REF 672  LAST 1079   00,3501  26 154 0           ADS     MPAC          (NO OVERFLOW).

2117  REF  62  LAST 1077   00,3502  24 135 0  SQRTNORM INCR    MPTEMP        FIRST TIME THROUGH, JUST SHIFT LEFT 1
2118                       00,3503  0 0006 1           EXTEND                (PUTS IN EFFECTIVE RIGHT SHIFT SINCE
2119  REF 673  LAST 1079   00,3504  3 0156 0           DCA     MPAC +1       WE WANT MPAC/2).
2120  REF 674  LAST 1079   00,3505  20 156 1           DAS     MPAC +1
2121  REF 675  LAST 1079   00,3506  6 0154 1           AD      MPAC
2122  REF 676  LAST 1079   00,3507  26 154 0           ADS     MPAC          (AGAIN NO OVERFLOW).
2123                       00,3510  6 0000 1           DOUBLE
2124  REF  18  LAST  476   00,3511  54 022 0           TS      CYL

2125  REF  19  LAST 1079   00,3512  10 022 0  NORMTEST CCS     CYL           SEE IF ARGUMENT NOW NORMALIZED AT
2126  REF  20  LAST 1079   00,3513  10 022 0           CCS     CYL           GREATER THAN .125.
2127  REF   1              00,3514  1 3475 0           TCF     SQRTNM2       NO - SHIFT LEFT 2 MORE AND TRY AGAIN.
2128  REF   2  LAST 1079   00,3515  1 3417 1           TCF     ARGHI         YES - NOW BETWEEN .5 AND .25.
2129  REF   1              00,3516  1 3470 0           TCF     ARGLO         ARGUMENT NOW BETWEEN .25 AND .125.
```

```
P2130    TRIGONOMETRIC FUNCTION PACKAGE.

R2131              THE FOLLOWING TRIGONOMETRIC FUNCTIONS ARE AVAILABLE AS INTERPRETIVE OPERATIONS:

R2133              1.  SIN                COMPUTES (1/2)SINE(2 PI MPAC).
R2134              2.  COS                COMPUTES (1/2)COSINE(2 PI MPAC).

R2135              3.  ASIN               COMPUTES (1/2PI)ARCSINE(2 MPAC).
R2136              4.  ACOS               COMPUTES (1/2PI)ARCCOSINE(2 MPAC).

R2137    SIN-ASIN AND COS-ACOS ARE MUTUALLY INVERSE, IE SIN(ASIN(X)) = X.


 2138    REF   6  LAST 1074   00,3517  0 6744 0  COSINE    TC      BRANCH              FINDS COSINE USING THE IDENTITY
 2139                         00,3520  1 3523 1            TCF     +3                  COS(X) = SIN(PI/2 - ABS(X)).
 2140    REF   1              00,3521  1 3526 1            TCF     PRESINE
 2141    REF   2  LAST 1080   00,3522  1 3526 1            TCF     PRESINE

 2142                         00,3523  0 0006 1   +3       EXTEND
 2143    REF 677  LAST 1079   00,3524  4 0155 1            DCS     MPAC
 2144    REF 678  LAST 1080   00,3525  52 155 1            DXCH    MPAC

 2145    REF   2  LAST 1079   00,3526  3 4730 1  PRESINE   CAF     QUARTER             PI/2 SCALED.
 2146    REF 679  LAST 1080   00,3527  26 154 0            ADS     MPAC


 2147    REF 680  LAST 1080   00,3530  52 155 1  SINE      DXCH    MPAC                DOUBLE ARGUMENT.
 2148                         00,3531  20 001 1            DDOUBL
 2149                         00,3532  54 000 0            OVSK                        SEE IF OVERFLOW PRESENT.
 2150                         00,3533  1 3536 0            TCF     +3                  IF NOT, ARGUMENT OK AS IS.

 2151                         00,3534  0 0006 1            EXTEND                      IF SO, WE LOST (OR GAINED) PI, SO
 2152                         00,3535  4 0001 1            DCOM                        COMPLEMENT MPAC USING THE IDENTITY
A2153                                                                                  SIN(X-(+)PI) = SIN(-X).
 2154    REF 681  LAST 1080   00,3536  52 155 1   +3       DXCH    MPAC
 2155    REF 682  LAST 1080   00,3537  3 0154 1            CA      MPAC                SEE IF ARGUMENT GREATER THAN .5 IN
 2156                         00,3540  6 0000 1            DOUBLE                      MAGNITUDE. IF SO, REDUCE IT TO LESS THAN
 2157    REF 223  LAST 1078   00,3541  54 001 1            TS      L                   .5 (+-PI/2 SCALED) AS FOLLOWS:
 2158    REF   1              00,3542  1 3553 0            TCF     SN1

 2159    REF 337  LAST 1077   00,3543  50 000 1            INDEX   A                   IF POSITIVE, FORM PI - X, IF NEGATIVE
 2160    REF   4  LAST  862   00,3544  3 4726 0            CAF     NEG1/2 +1           USE -PI - X.
 2161                         00,3545  6 0000 1            DOUBLE
 2162                         00,3546  0 0006 1            EXTEND
 2163    REF 683  LAST 1080   00,3547  60 154 1            SU      MPAC                GUARANTEED NO OVERFLOW.
 2164    REF 684  LAST 1080   00,3550  54 154 0            TS      MPAC
 2165    REF 685  LAST 1080   00,3551  4 0155 1            CS      MPAC +1
 2166    REF 686  LAST 1080   00,3552  54 155 1            TS      MPAC +1
 2167                         00,3553  0 0006 1  SN1     EXTEND                      SET UP TO EVALUATE HASTINGS POLYNOMIAL
 2168  REF 687  LAST 1080     00,3554  3 0155 0          DCA      MPAC
 2169  REF  19  LAST 1066     00,3555  52 134 0          DXCH     BUF2
 2170  REF   5  LAST 1076     00,3556  0 3300 1          TC       DSQSUB             SQUARE MPAC.

 2171  REF   2  LAST  859     00,3557  0 7243 0          TC       POLY               EVALUATE FOURTH ORDER POLYNOMIAL.
 2172                         00,3560   00003 1          DEC      3
 2173                         00,3561   14441 0          2DEC     +.3926990796
 2173                         00,3562   37325 1
 2174                         00,3563   53250 0          2DEC     -.6459637111
 2174                         00,3564   60764 1
 2175                         00,3565   12146 1          2DEC     +.318758717
 2175                         00,3566   21276 1
 2176                         00,3567   75466 1          2DEC     -.074780249
 2176                         00,3570   71471 0
 2177                         00,3571   00236 0          2DEC     +.009694988
 2177                         00,3572   32757 0

 2178  REF   1                00,3573  3 2470 0          CAF      LBUF2              MULTIPLY BY ARGUMENT AND SHIFT LEFT 2.
 2179  REF  19  LAST 1042     00,3574  0 7127 1          TC       DMPSUB -1

 2180                         00,3575  0 0006 1          EXTEND
 2181  REF 688  LAST 1081     00,3576  3 0156 0          DCA      MPAC +1
 2182  REF 689  LAST 1081     00,3577  20 156 1          DAS      MPAC +1
 2183  REF 690  LAST 1081     00,3600  6 0154 1          AD       MPAC
 2184  REF 691  LAST 1081     00,3601  26 154 0          ADS      MPAC               NEITHER SHIFT OVERFLOWS.
 2185                         00,3602  0 0006 1          EXTEND
 2186  REF 692  LAST 1081     00,3603  3 0156 0          DCA      MPAC +1
 2187  REF 693  LAST 1081     00,3604  20 156 1          DAS      MPAC +1
 2188  REF 694  LAST 1081     00,3605  6 0154 1          AD       MPAC
 2189  REF 695  LAST 1081     00,3606  26 154 0          ADS      MPAC
 2190  REF  41  LAST 1075     00,3607  1 6102 0          TCF      DANZIG
```

```
P2191              ARCSIN/ARCCOS ROUTINE.

 2192    REF    1                 00,3610  3 3631 0  ARCSIN    CAF      LASINEX           COMPUTE ARCSIN BY USING THE IDENTITY
 2193                             00,3611  1 3613 1            TCF      +2                ARCSIN(X) = PI/2 - ARCCOS(X).

 2194    REF    1                 00,3612  3 3713 1  ARCCOS    CAF      LOANZIG           (EXITS IMMEDIATELY).
 2195    REF    1                 00,3613  54 136 1            TS       ESCAPE
 2196    REF    7   LAST 1080     00,3614  0 6744 0            TC       BRANCH            TEST SIGN OF INPUT.
 2197    REF    1                 00,3615  1 3625 1            TCF      ACOSST            START IMMEDIATELY IF POSITIVE.
 2198    REF    1                 00,3616  1 3731 0            TCF      ACOSZERO          ARCCOS(0) = PI/2 = .25.
 2199                             00,3617  0 0006 1            EXTEND                     IF NEGATIVE, USE THE IDENTITY
 2200    REF  696   LAST 1081     00,3620  4 0155 1            DCS      MPAC              ARCCOS(X) = PI - ARCCOS(-X), FORCING
 2201    REF  697   LAST 1082     00,3621  52 155 1            DXCH     MPAC              ARGUMENT POSITIVE.
 2202    REF    1                 00,3622  3 3734 1            CAF      TCSUBTR           SET EXIT  TO DO ABOVE BEFORE
 2203    REF    2   LAST 1082     00,3623  56 136 0            XCH      ESCAPE            ARCSIN/ARCCOS CONSIDERATIONS.
 2204    REF    1                 00,3624  54 137 0            TS       ESCAPE2

 2205    REF   25   LAST 1079     00,3625  4 4727 0  ACOSST    CS       HALF              TEST MAGNITUDE OF INPUT.
 2206    REF  698   LAST 1082     00,3626  6 0154 1            AD       MPAC
 2207    REF  338   LAST 1080     00,3627  10 000 0            CCS      A
 2208    REF    1                 00,3630  1 3721 1            TCF      ACOSOVF           THIS IS PROBABLY AN OVERFLOW CASE.

 2209    REF    1                 00,3631  1 3707 0  LASINEX   TCF      ASINEX

 2210    REF    1                 00,3632  1 3642 0            TCF      ACOSST2           NO OVERFLOW - PROCEED.

 2211    REF  699   LAST 1082     00,3633  10 155 1            CCS      MPAC +1           IF MAJOR PART IS .5, CALL ANSWER 0
 2212    REF  221   LAST 1078     00,3634  3 4746 0            CAF      ZERO              UNLESS MINOR PART NEGATIVE.
 2213    REF    1                 00,3635  1 3637 1            TCF      ACOS=0

 2214    REF    2   LAST 1082     00,3636  1 3642 0            TCF      ACOSST2

 2215    REF  700   LAST 1082     00,3637  54 155 1  ACOS=0    TS       MPAC +1
 2216    REF  701   LAST 1082     00,3640  54 154 0            TS       MPAC
 2217    REF    3   LAST 1082     00,3641  0 0136 0            TC       ESCAPE

 2218                             00,3642  0 0006 1  ACOSST2   EXTEND                     NOW THAT ARGUMENT IS IN PROPER RANGE,
 2219    REF  702   LAST 1082     00,3643  4 0155 1            DCS      MPAC              BEGIN COMPUTATION. USE HASTINGS
 2220    REF   26   LAST 1082     00,3644  6 4727 1            AD       HALF              APPROXIMATION ARCCOS(X) = SQRT(1-X)P(X)
 2221    REF  703   LAST 1082     00,3645  52 155 1            DXCH     MPAC              IN A SCALED VERSION WHERE P(X) IS A
 2222    REF   20   LAST 1081     00,3646  52 134 0            DXCH     BUF2              SEVENTH ORDER POLYNOMIAL.

 2223    REF    3   LAST 1074     00,3647  0 3343 0            TC       SQRTSUB           RETURNS WITH NORMALIZED SQUARE ROOT.

 2224    REF   63   LAST 1079     00,3650  10 135 1            CCS      MPTEMP            SEE IF UN-NORMALIZATION REQUIRED.
 2225    REF    1                 00,3651  1 3714 1            TCF      ACOSSHR           IF SO.
```

```
2226   REF 704  LAST 1082   00,3652  52 155 1  ACOS3     DXCH    MPAC             SET UP FOR POLYNOMIAL EVALUATION.
2227   REF  21  LAST 1082   00,3653  52 134 0            DXCH    BUF2
2228   REF 705  LAST 1083   00,3654  52 155 1            DXCH    MPAC

2229   REF   3  LAST 1081   00,3655  0 7243 0            TC      POLY
2230                        00,3656   00006 1            DEC     6
2231                        00,3657   13240 0            2DEC    +.353553385      COEFFICIENTS ARE C 2(+I)/PISQRT(2) WHERE
2231                        00,3660   23630 0
2232                        00,3661   74721 0            2DEC*   -.0483017006 B+1*                  I
2232                        00,3662   47775 1
2233                        00,3663   02440 0            2DEC*   +.0200273085 B+2*     WHERE C STANDS FOR ORIGINAL COEFFS.
2233                        00,3664   20237 0
2234                        00,3665   75067 1            2DEC*   -.0112931863 B+3*
2234                        00,3666   70742 1
2235                        00,3667   03436 0            2DEC*   +.00695311612 B+4*
2235                        00,3670   26756 1
2236                        00,3671   74037 0            2DEC*   -.00384617957 B+5*
2236                        00,3672   57640 1
2237                        00,3673   03046 0            2DEC*   +.001501297736 B+6*
2237                        00,3674   07143 0
2238                        00,3675   76654 1            2DEC*   -.000284160334 B+7*
2238                        00,3676   42244 0

2239   REF   2  LAST 1081   00,3677  3 2470 0            CAF     LBUF2            DO FINAL MULTIPLY AND GO TO ANY
2240   REF  20  LAST 1081   00,3700  0 7127 1            TC      DMPSUB -1        EPILOGUE SEQUENCES.
2241   REF   4  LAST 1082   00,3701  0 0136 0            TC      ESCAPE

2242                        00,3702  0 0006 1  SUBTR     EXTEND                   EPILOGUE FOR NEGATIVE INPUTS TO ARCCOS.
2243   REF 706  LAST 1083   00,3703  4 0155 1            DCS     MPAC
2244   REF  27  LAST 1082   00,3704  6 4727 1            AD      HALF             FORMS PI - ARCCOS(-X) = ARCCOS(X).
2245   REF 707  LAST 1083   00,3705  52 155 1            DXCH    MPAC
2246   REF   2  LAST 1082   00,3706  0 0137 1            TC      ESCAPE2          GO TO POSSIBLE ARCSIN EPILOGUE.

2247                        00,3707  0 0006 1  ASINEX    EXTEND
2248   REF 708  LAST 1083   00,3710  4 0155 1            DCS     MPAC             ARCSIN EPILOGUE - GET ARCSIN(X)
2249   REF   3  LAST 1080   00,3711  6 4730 1            AD      QUARTER          = PI/2 - ARCCOS(X).
2250   REF 709  LAST 1083   00,3712  52 155 1            DXCH    MPAC
2251   REF  42  LAST 1081   00,3713  1 6102 0  LDANZIG   TCF     DANZIG
```

```
 2252    REF 339  LAST 1082   00,3714  50 000 1  ACOSSHR   INDEX    A                  THE SHIFT RIGHT IS LESS THAN 14 SINCE
 2253    REF  63  LAST 1071   00,3715  3 4727 1            CAF      BIT14              THE INPUT WAS NON-ZERO DP.
 2254    REF  64  LAST 1082   00,3716  54 135 1            TS       MPTEMP
 2255    REF   4  LAST 1048   00,3717  0 2073 1            TC       VSHRRND            DP SHIFT RIGHT AND ROUND.
 2256    REF   1              00,3720  1 3652 1            TCF      ACOS3              PROCEED.

 2257                         00,3721  0 0006 1  ACOSOVF   EXTEND                      IF MAJOR PART WAS ONLY 1 MORE THAN .5,
 2258    REF   2  LAST 1082   00,3722  1 3637 1            BZF      ACOS=0             CALL ANSWER ZERO.

 2259                         00,3723  0 0006 1  ACOSABRT  EXTEND                      IF OVERFLOW, CALL ANSWER ZERO BUT
 22591   REF  28  LAST 1077   00,3724  3 0165 0            DCA      LOC                SOUND AN ALARM.
 22592   REF   1              00,3725  0 5726 1            TC       ALARM1
 22593                        00,3726   01301 1            OCT      1301

 2260    REF 222  LAST 1082   00,3727  3 4746 0            CAF      ZERO
 22601   REF   3  LAST 1084   00,3730  1 3637 1            TCF      ACOS=0

 2261    REF   4  LAST 1083   00,3731  3 4730 1  ACOSZERO  CAF      QUARTER            ACOS(0) = PI/2.
 2262    REF   4  LAST 1084   00,3732  1 3640 1            TCF      ACOS=0 +1          SET MPAC AND EXIT VIA ESCAPE.

 2263                         00,3733   77763 0  NEG12     DEC      -12
 2264    REF   1              00,3734  1 3702 0  TCSUBTR   TCF      SUBTR
```

```
P2265              THE FOLLOWING INSTRUCTIONS ARE AVAILABLE FOR SETTING, MODIFYING, AND BRANCHING ON INDEX REGISTERS:

R2267               1.  AXT                  ADDRESS TO INDEX TRUE.
R2268               1.  AXC                  ADDRESS TO INDEX COMPLEMENTED.
R2269               3.  LXA                  LOAD INDEX FROM ERASABLE.
R2270               4.  LXC                  LOAD INDEX COMPLEMENTED FROM ERASABLE.
R2271               5.  SXA                  STORE INDEX IN ERASABLE.
R2272               6.  XCHX                 EXCHANGE INDEX REIGSTER WITH ERASABLE.

R2273               7.  INCR                 INCREMENT INDEX REGISTER.
R2274               8.  XAD                  ERASABLE ADD TO INDEX REGISTER.
R2275               9.  XSU                  ERASABLE SUBTRACT FROM INDEX REGISTER.

R2276              10.  TIX                  BRANCH ON INDEX REGISTER AND DECREMENT.


 2277                          01,2350                      BANK    01

 2278   REF   1                                             COUNT*  $$/INTER
 2279   REF   1                01,2350  0 2445 0  AXT       TC      TAGSUB          SELECT APPROPRIATE INDEX REGISTER.
 2280   REF  23  LAST 1075     01,2351  3 0117 0            CA      POLISH
 2281   REF   4  LAST 1004     01,2352  50 130 0  XSTORE    INDEX   INDEXLOC        CONTAINS C(FIXLOC) OR C(FIXLOC)+1.
 2282   REF  29  LAST 1014     01,2353  54 046 1            TS      X1
 2283   REF  43  LAST 1083     01,2354  1 6102 0            TCF     DANZIG

 2284   REF   2  LAST 1085     01,2355  0 2445 0  AXC       TC      TAGSUB
 2285   REF  24  LAST 1085     01,2356  4 0117 1            CS      POLISH
 2286   REF   1                01,2357  0 2352 1            TC      XSTORE

 2287   REF   1                01,2360  0 2433 1  LXA       TC      15ADRERS        LOAD INDEX REGISTER FROM ERASABLE.
 2288   REF  25  LAST 1085     01,2361  50 117 0            INDEX   POLISH
 2289                          01,2362  3 0000 1            CA      0
 2290   REF   2  LAST 1085     01,2363  1 2352 0            TCF     XSTORE

 2291   REF   2  LAST 1085     01,2364  0 2433 1  LXC       TC      15ADRERS        LOAD NDX REG FROM ERASABLE COMPLEMENTED.
 2292   REF  26  LAST 1085     01,2365  50 117 0            INDEX   POLISH
 2293                          01,2366  4 0000 0            CS      0
 2294   REF   3  LAST 1085     01,2367  1 2352 0            TCF     XSTORE

 2295   REF   3  LAST 1085     01,2370  0 2433 1  SXA       TC      15ADRERS        STORE INDEX REGISTER IN ERASABLE.
 2296   REF   5  LAST 1085     01,2371  50 130 0            INDEX   INDEXLOC
 2297   REF  30  LAST 1085     01,2372  3 0046 0            CA      X1
 2298   REF  27  LAST 1085     01,2373  50 117 0  MSTORE1   INDEX   POLISH
 2299                          01,2374  54 000 0            TS      0
 2300   REF  44  LAST 1085     01,2375  1 6102 0            TCF     DANZIG
 2301    REF   4  LAST 1085    01,2376   0 2433 1  XCHX      TC      15ADRERS        EXCHANGE INDEX REGISTER WITH ERASABLE.
 2302    REF  28  LAST 1085    01,2377  50 117 0             INDEX   POLISH
 2303                          01,2400   3 0000 1            CA      0
 2304    REF   6  LAST 1085    01,2401  50 130 0             INDEX   INDEXLOC
 2305    REF  31  LAST 1085    01,2402  56 046 0             XCH     X1
 2306    REF   1               01,2403   1 2373 0            TCF     MSTORE1

 2307    REF   5  LAST 1086    01,2404   0 2433 1  XAD       TC      15ADRERS        ADD ERASABLE TO INDEX REGISTER.
 2308    REF  29  LAST 1086    01,2405  50 117 0             INDEX   POLISH
 2309                          01,2406   3 0000 1            CA      0
 2310    REF   7  LAST 1086    01,2407  50 130 0   XAD2      INDEX   INDEXLOC
 2311    REF  32  LAST 1086    01,2410  26 046 1             ADS     X1              IGNORING OVERFLOWS.
 2312    REF  45  LAST 1085    01,2411   1 6102 0            TCF     DANZIG

 2313    REF   3  LAST 1085    01,2412   0 2445 0  INCR      TC      TAGSUB          INCREMENT INDEX REGISTER.
 2314    REF  30  LAST 1086    01,2413   3 0117 0            CA      POLISH
 2315    REF   1               01,2414   1 2407 1            TCF     XAD2

 2316    REF   6  LAST 1086    01,2415   0 2433 1  XSU       TC      15ADRERS        SUBTRACT ERASABLE FROM INDEX REGISTER.
 2317    REF  31  LAST 1086    01,2416  50 117 0             INDEX   POLISH
 2318                          01,2417   4 0000 0            CS      0
 2319    REF   2  LAST 1086    01,2420   1 2407 1            TCF     XAD2


 2320    REF   4  LAST 1086    01,2421   0 2445 0  TIX       TC      TAGSUB          BRANCH AND DECREMENT ON INDEX.
 2321    REF   8  LAST 1086    01,2422  50 130 0             INDEX   INDEXLOC
 2322    REF  12  LAST  962    01,2423   4 0050 0            CS      S1
 2323    REF   9  LAST 1086    01,2424  50 130 0             INDEX   INDEXLOC
 2324    REF  33  LAST 1086    01,2425   6 0046 0            AD      X1
 2325                          01,2426   0 0006 1            EXTEND                  NO OPERATION IF DECREMENTED INDEX IS
 2326    REF  46  LAST 1086    01,2427   6 6102 1            BZMF    DANZIG          NEGATIVE OR ZERO.

 2327    REF  10  LAST 1086    01,2430  50 130 0   DOTIXBR   INDEX   INDEXLOC
 2328    REF  34  LAST 1086    01,2431  56 046 0             XCH     X1              IGNORING OVERFLOWS.

 2329    REF   6  LAST 1075    01,2432   1 6667 1            TCF     GOTO            DO THE BRANCH USING THE CADR IN POLISH.
```

```
P2330           SUBROUTINE TO CONVERT AN ERASABLE ADDRESS (11 BITS) TO AN EBANK SETTING AND SUBADDRESS.

 2332   REF  32  LAST 1086   01,2433  4 0117 1  15ADRERS CS      POLISH
 2333   REF   2  LAST 1014   01,2434  6 4763 1           AD      DEC45
 2334   REF 340  LAST 1084   01,2435  10 000 0           CCS     A                DOES THE ADDRESS POINT TO THE WORK AREA?
 2335   REF  56  LAST 1075   01,2436  3 0120 1           CA      FIXLOC           YES.  ADD FIXLOC.  EBANK OK AS IS.
 2336                        01,2437  1 2444 0           TCF     +5

 2337   REF   6  LAST 1014   01,2440  3 5000 1           CA      OCT1400          NO.  SET EBANK & MAKE UP SUBADDRESS.
 2338   REF  33  LAST 1087   01,2441  56 117 0           XCH     POLISH
 2339   REF  69  LAST 1022   01,2442  54 003 0           TS      EBANK
 2340   REF  14  LAST 1022   01,2443  7 4350 1           MASK    LOW8
 2341   REF  34  LAST 1087   01,2444  26 117 1  +5       ADS     POLISH           FALL INTO TAGSUB, AND RETURN VIA Q.

R2342           SUBROUTINE WHICH SETS THE ADDRESS OF THE SPECIFIED INDEX IN INDEXLOC. (ACTUALLY, THE ADDRESS -38D.)

 2344   REF  57  LAST 1087   01,2445  3 0120 1  TAGSUB   CA      FIXLOC
 2345   REF  11  LAST 1086   01,2446  54 130 1           TS      INDEXLOC

 2346   REF  32  LAST 1054   01,2447  10 020 1           CCS     CYR              BIT 15 SPECIFIES INDEX.
 2347   REF  12  LAST 1087   01,2450  24 130 0           INCR    INDEXLOC         0 MEANS USE X2.
 2348   REF 286  LAST 1078   01,2451  0 0002 0           TC      Q
 2349   REF 287  LAST 1087   01,2452  0 0002 0           TC      Q                1 FOR X1.
```

```
P2350             MISCELLANEOUS OPERATION CODES WITH DIRECT ADDRESSES. INCLUDED HERE ARE:

R2352             1.  ITA                    STORE QPRET (RETURN ADDRESS) IN ERASABLE.
R2354             2.  CALL                   CALL A SUBROUTINE, LEAVING RETURN IN QPRET.
R2356             3.  RTB                    RETURN TO BASIC LANGUAGE AT THE GIVEN ADDRESS.
R2358             4.  BHIZ                   BRANCH IF THE HIGH ORDER OF MPAC IS ZERO (SINGLE PRECISION).
R2360             5.  BOV                    BRANCH ON OVERFLOW.
R2361             6.  GOTO                   SIMPLE SEQUENCE CHANGE.

 2362   REF  33  LAST 1087  01,2453  10 020 1  RTB/BHIZ CCS     CYR
 2363   REF  35  LAST 1087  01,2454  3 0117 0  RTB      CA      POLISH
 2364   REF   4  LAST  937  01,2455  0 4612 0           TC      SWCALL   -1     SO A "TC Q" FROM ROUTINE LEADS TO DANZIG

 2365   REF 710  LAST 1083  01,2456  10 154 0  BHIZ     CCS     MPAC
 2366   REF  47  LAST 1086  01,2457  1 6102 0           TCF     DANZIG
 2367   REF   7  LAST 1086  01,2460  1 6667 1           TCF     GOTO
 2368   REF  48  LAST 1088  01,2461  1 6102 0           TCF     DANZIG
 2369   REF   8  LAST 1088  01,2462  1 6667 1           TCF     GOTO

 2370   REF  11  LAST 1076  01,2463  10 121 1  BOV(B)   CCS     OVFIND          BRANCH ON OVERFLOW TO BASIC OR INTERP.
 2371                       01,2464  1 2466 0           TCF     +2
 2372   REF  49  LAST 1088  01,2465  1 6102 0           TCF     DANZIG
 2373   REF  12  LAST 1088  01,2466  54 121 1           TS      OVFIND
 2374   REF  34  LAST 1088  01,2467  10 020 1           CCS     CYR
 2375   REF   1             01,2470  1 2454 1           TCF     RTB             IF BASIC.
 2376                       01,2471   00360 1  85TOB8   OCT     360
 2377   REF   9  LAST 1088  01,2472  1 6667 1           TCF     GOTO
 2378   REF  35  LAST 1088   01,2473  10 020 1  BZE/GOTO CCS     CYR            SEE WHICH OP-CODE IS DESIRED.
 2379   REF   8  LAST 1082   01,2474  0 6744 0           TC      BRANCH         DO BZE.
 2380   REF  50  LAST 1088   01,2475  1 6102 0           TCF     DANZIG
 2381   REF  10  LAST 1088   01,2476  1 6667 1           TCF     GOTO           DO GOTO.
 2382   REF  51  LAST 1089   01,2477  1 6102 0           TCF     DANZIG

 2383   REF  36  LAST 1089   01,2500  10 020 1  BPL/BMN  CCS     CYR
 2384   REF   1              01,2501  1 2507 0           TCF     BPL
 2385                        01,2502    12000 1  5B10     DEC     5 B+10         SHIFTS OP CODE IN SWITCH INSTRUCTION ADR

 2386   REF   9  LAST 1089   01,2503  0 6744 0           TC      BRANCH         DO BMN.
 2387   REF  52  LAST 1089   01,2504  1 6102 0           TCF     DANZIG
 2388   REF  53  LAST 1089   01,2505  1 6102 0           TCF     DANZIG
 2389   REF  11  LAST 1089   01,2506  1 6667 1           TCF     GOTO           ONLY IF NNZ.

 2390   REF  10  LAST 1089   01,2507  0 6744 0  BPL      TC      BRANCH
 2391   REF  12  LAST 1089   01,2510  1 6667 1           TCF     GOTO           IF POSITIVE OR ZERO.
 2392   REF  13  LAST 1089   01,2511  1 6667 1           TCF     GOTO
 2393   REF  54  LAST 1089   01,2512  1 6102 0           TCF     DANZIG

 2394   REF  37  LAST 1089   01,2513  10 020 1  CALL/ITA CCS     CYR
 2395   REF   1              01,2514  1 6661 1           TCF     CALL

 2396   REF   7  LAST  459   01,2515  0 5701 1           TC      CCSHOLE
 2397   REF   7  LAST 1086   01,2516  0 2433 1           TC      15ADRERS       STORE QPRET. (TAGSUB AFTER 15ADRERS IS
 2398   REF  58  LAST 1087   01,2517  50 120 1           INDEX   FIXLOC         SLOW IN THIS CASE, BUT SAVES STORAGE.)
 2399   REF   8  LAST 1075   01,2520  3 0052 0           CA      QPRET
 2400   REF   2  LAST 1086   01,2521  1 2373 0           TCF     MSTORE1
```

```
P2401             THE FOLLOWING OPERATIONS ARE AVAILABLE FOR ALTERING AND TESTING INTERPRETIVE SWITCHES:

R2403   00        BONSET                   SET A SWITCH AND DO A GOTO IF IT WAS ON.
R2404   01        SETGO                    SET A SWITCH AND DO A GOTO.
R2405   02        BOFSET                   SET A SWITCH AND DO A GOTO IF IT WAS OFF
R2406   03        SET                      SET A SWITCH.

R2407   04        BONINV                   INVERT A SWITCH AND BRANCH IF IT WAS ON.
R2408   05        INVGO                    INVERT A SWITCH AND DO A GOTO.
R2409   06        BOFINV                   INVERT A SWITCH AND BRANCH IF IT WAS OFF
R2410   07        INVERT                   INVERT A SWITCH.

R2411   10        BONCLR                   CLEAR A SWITCH AND BRANCH IF IT WAS ON.
R2412   11        CLRGO                    CLEAR A SWITCH AND DO A GOTO.
R2413   12        BOFCLR                   CLEAR A SWITCH AND BRANCH IF IT WAS OFF.
R2414   13        CLEAR                    CLEAR A SWITCH.

R2415   14        BON                      BRANCH IF A SWITCH WAS ON.
R2416   16        BOFF                     BRANCH IF A SWITCH WAS OFF.


R2417             THE ADDRESS SUPPLIED WITH THE SWITCH INSTRUCTION IS INTERPRETED AS FOLLOWS:

R2419             BITS 1-4    SWITCH BIT NUMBER (1-15).
R2420             BITS 5-8    SWITCH OPERATION NUMBER.
R2421             BITS 9-     SWITCH WORD NUMBER (UP TO 64 SWITCH WORDS).

R2422             THE ADDRESS ITSELF IS MADE UP BY THE YUL SYSTEM ASSEMBLER. THE BRANCH INSTRUCTIONS REQUIRE TWO
R2424       ADDRESSES, THE SECOND TAKEN AS THE DIRECT (OR INDIRECT IF IN ERASABLE) ADDRESS OF THE BRANCH.


 2426   REF   2  LAST  740   01,2522  3 4753 1  SWITCHES CAF    LOW4             LEAVE THE SWITCH BIT IN  SWBIT  .
 2427   REF  36  LAST 1088   01,2523  7 0117 1           MASK   POLISH
 2428   REF 341  LAST 1087   01,2524  50 000 1           INDEX  A
 2429   REF  40  LAST 1074   01,2525  3 4726 0           CAF    BIT15            (NUMBER FROM LEFT TO RIGHT.)
 2430   REF   1              01,2526  54 131 0           TS     SWBIT

 2431   REF  32  LAST  991   01,2527  3 4736 1           CAF    BIT7             LEAVE THE SWITCH NUMBER IN SWWORD.
 2432                        01,2530  0 0006 1           EXTEND
 2433   REF  37  LAST 1090   01,2531  7 0117 1           MP     POLISH
 2434   REF   1              01,2532  54 130 1           TS     SWWORD

 2435                        01,2533  0 0004 0           INHINT                  DURING SWITCH CHANGE SO RUPT CAN USE TOO
 2436   REF 342  LAST 1090   01,2534  50 000 1           INDEX  A                LEAVE THE SWITCH WORD ITSELF IN L.
 2437   REF  40  LAST  567   01,2535  3 0074 1           CA     STATE
 2438   REF 288  LAST 1087   01,2536  54 002 1           TS     Q                Q WILL BE USED AS A CHANNEL.
 2439   REF  23  LAST  915   01,2537  3 4732 0             CAF     BIT11
 2440                        01,2540  0 0006 1             EXTEND                  DISPATCH SWITCH BIT OPERATION AS IN BITS
 2441   REF  38  LAST 1090   01,2541  7 0117 1             MP      POLISH          7-8 OF POLISH.
 2442   REF   1              01,2542  7 2602 0             MASK    B3TOB4          GETS 4X2-BIT CODE.
 2443   REF 343  LAST 1090   01,2543  50 000 1             INDEX   A
 2444                        01,2544  1 2545 0             TCF     +1

 2445   REF   2  LAST 1090   01,2545  3 0131 1   +1        CA      SWBIT           00 - SET SWITCH IN QUESTION.
 2446                        01,2546  0 0006 1             EXTEND
 2447   REF   1              01,2547  04 002 1             ROR     QCHAN
 2448   REF   1              01,2550  1 2557 0             TCF     SWSTORE

 2449   REF   3  LAST 1091   01,2551  3 0131 1   +5        CA      SWBIT           01 - INVERT SWITCH.
 2450                        01,2552  0 0006 1             EXTEND
 2451   REF   2  LAST 1091   01,2553  06 002 0             RXOR    QCHAN
 2452   REF   2  LAST 1091   01,2554  1 2557 0             TCF     SWSTORE

 2453   REF   4  LAST 1091   01,2555  4 0131 0   +9D       CS      SWBIT           10 - CLEAR.
 2454   REF 289  LAST 1090   01,2556  7 0002 1             MASK    Q
 2455   REF   2  LAST 1090   01,2557  50 130 0  SWSTORE    INDEX   SWWORD
 2456   REF  41  LAST 1090   01,2560  54 074 0             TS      STATE           NEW SWITCH WORD.
 2457                          01,2561  0 0003 1   +13D     RELINT              11 - NOOP.
 2458   REF  36  LAST  995     01,2562  3 4730 1            CAF     BIT13
 2459                          01,2563  0 0006 1            EXTEND              DISPATCH SEQUCE CHANGING OR BRANCHING
 2460   REF  39  LAST 1091     01,2564  7 0117 1            MP      POLISH      CODE.
 2461   REF   2  LAST 1091     01,2565  7 2602 0            MASK    B3TOB4
 2462   REF 344  LAST 1091     01,2566  50 000 1            INDEX   A
 2463                          01,2567  1 2570 0            TCF     +1          ORIGINALLY STORED IN BITS 5-6.

 2464   REF 290  LAST 1091     01,2570  4 0002 1   +1       CS      Q           00 - BRANCH IF ON.
 2465   REF   5  LAST 1091     01,2571  7 0131 0  TEST      MASK    SWBIT
 2466   REF 345  LAST 1092     01,2572  10 000 0            CCS     A
 2467   REF   1                01,2573  1 2603 1            TCF     SWSKIP

 2468   REF   1                01,2574  1 6736 1   +5       TCF     SWBRANCH    01 - GO TO.

 2469   REF   2  LAST 1092     01,2575  1 2603 1            TCF     SWSKIP      HERE ONLY ON BIT 15.

 2470   REF   8  LAST 1089     01,2576  0 5701 1            TC      CCSHOLE
 2471   REF   9  LAST 1092     01,2577  0 5701 1            TC      CCSHOLE

 2472   REF 291  LAST 1092     01,2600  3 0002 0   +9D      CA      Q           10 - BRANCH IF OFF.
 2473   REF   1                01,2601  1 2571 1            TCF     TEST

 2474                          01,2602   00014 1  B3TOB4    OCT     0014
 2475   REF  29  LAST 1084     01,2603  24 164 1  SWSKIP    INCR    LOC

 2476   REF   1                01,2522            SW/       EQUALS SWITCHES

 2477   REF  55  LAST 1089     01,2604  1 6102 0   +13D     TCF     DANZIG      11 - NOOP.
 0001                          4723                     BLOCK   02

 00015  REF    1                                        COUNT*  $$/FCONS
R00016   THE FCLLOWING TABLE OF 1B VALUES IS INDEXED. DO NOT INSERT OR REMOVE ANY QUANTITIES.

 0002                          4723   37777 1  DPOSMAX  OCT     37777            MUST PRECEDE POSMAX
 0003                          4724   37777 1  POSMAX   OCT     37777

 0004   REF    5  LAST 1080    4725            LIMITS   =       NEG1/2

 0007                          4725   57777 1  NEG1/2   OCT     -20000           USED BY SIN ROUTINE (MUST BE TWO
A0008                                                                            LOCATIONS IN FRONT OF BIT14)
R0009             BIT TABLE

 0010                          4726   40000 0  BIT15    OCT     40000
 0011                          4727   20000 0  BIT14    OCT     20000
 0012                          4730   10000 0  BIT13    OCT     10000
 0013                          4731   04000 0  BIT12    OCT     04000
 0014                          4732   02000 0  BIT11    OCT     02000
 0015                          4733   01000 0  BIT10    OCT     01000
 0016                          4734   00400 0  BIT9     OCT     00400
 0017                          4735   00200 0  BIT8     OCT     00200
 0018                          4736   00100 0  BIT7     OCT     00100
 0019                          4737   00040 0  BIT6     OCT     00040
 0020                          4740   00020 0  BIT5     OCT     00020
 0021                          4741   0CC10 0  BIT4     OCT     00010
 0022                          4742   00004 0  BIT3     OCT     00004
 0023                          4743   00002 0  BIT2     OCT     00002
 0024                          4744   00001 0  BIT1     OCT     00001


R0025   DO NCT DESTROY THIS COMBINATICN, SINCE IT IS USED IN DOUBLE PRECISION INSTRUCTIONS.
 0027                          4745   77777 0  NEG0     OCT     -0               MUST PRECEDE ZERO
 0028                          4746   0CC00 1  ZERO     OCT     0                MUST FOLLOW NEG0
A0029                                          BIT1     OCT     00001
A0030                                          NO.WDS   OCT     2                INTERPRETER
A0031                                          OCTAL3   OCT     3                INTERPRETER
A0032                                          R3D1     OCT     4                PINBALL
 0033                          4747   0C005 1  FIVE     OCT     5
A0034                                          REVCNT   OCT     6                INTERPRETER
 0035                          4750   0CC07 0  SEVEN    OCT     7
A0036                                          BIT4     OCT     00010
A0037                                          R2D1     OCT     11               PINBALL
 00375  REF    6  LAST  472    4311            OCT11    =       R2D1             P20S
A0038                                          BINCON   DEC     10               PINBALL             (OCTAL 12)
 0039                          4751   00013 0  ELEVEN   DEC     11
A0040                                          OCT14    OCT     14               ALARM AND ABORT (FILLER)
 00401                         4752   00015 0  OCT15    OCT     15
A0041                                          R1D1     OCT     16               PINBALL
 0043                          4753   00017 1  LOW4     OCT     17
```

```
A0044                                          BIT5      OCT    00020
A0045                                          ND1       OCT    21            PINBALL
A0046                                          VD1       OCT    23            PINBALL
A0047                                          OCT24     OCT    24            SERVICE ROUTINES
A0048                                          MD1       OCT    25            PINBALL
 00485                         4754   00030 1  BITS4&5   OCT    30
A0049                                          OCT31     OCT    31            SERVICE ROUTINES
 00491                         4755   00033 1  OCT33     OCT    33
 00492   REF   3  LAST   869   4755            DEC27     =      OCT33
 00493                         4756   00035 1  OCT35     OCT    35
 00494   REF   2  LAST   740   4756            DEC29     =      OCT35
 0050                          4757   00032 0  CALLCODE  OCT    00032
A0051                                          LOW5      OCT    37            PINBALL
A0052                                          33DEC     DEC    33            PINBALL           (OCTAL 41)
A0053                                          34DEC     DEC    34            PINBALL           (OCTAL 42)
 0054                          4760   00045 0  TBUILDFX  DEC    37            BUILDUP FOR CONVIENCE IN DAPTESTING
 0055                          4761   00046 0  TDECAYFX  DEC    38            CONVENIENCE FOR DAPTESTING
A0056                                          BIT6      OCT    00040
 0057                          4762   00050 1  OCT50     OCT    50
 0058                          4763   00055 1  DEC45     DEC    45
 0059                          4764   00060 1  SUPER011  OCT    60            BITS FOR SUPERBNK SETTING 011.
 0060                          4765   00062 0  .5SEC     DEC    50
A0061                                          BIT7      OCT    00100

 0062    REF  33  LAST  1090   4736            SUPER100  =      BIT7          BITS FOR SUPERBNK SETTING 100
A0063                                                                         (LAST 4K OF ROPE)
 0064                          4766   00120 1  SUPER101  OCT    120           BITS FOR SUPERBNK SETTING 101
A0065                                          OCT121    OCT    121           SERVICE ROUTINES
A0066                                                                         (FIRST 8K OF ACM)
 0067                          4767   00140 1  SUPER110  OCT    140           BITS FOR SUPERBNK SETTING 110.
A0068                                                                         (LAST 8K OF ACM)
 0069                          4770   00144 0  1SEC      DEC    100
A0070                                          LOW7      OCT    177           INTERPRETER
A0071                                          BIT8      OCT    00200
A0072                                          UT215     OCT    215           ALARM AND ABORT
A0073                                          8,5       OCT    00220         P20-P25 SUNDANCE
 0074                          4771   00310 0  2SECS     DEC    200
A0075                                          LOW8      OCT    377           PINBALL
A0076                                          BIT9      OCT    00400
 0077                          4772   00401 1  GN/CCODE  OCT    00401         SET S/C CONTROL SWITCH TO G/N
 0079                          4773   00454 1  3SECS     DEC    300
 0080                          4774   00620 0  4SECS     DEC    400
 00801                         4775   00777 0  LOW9      OCT    777
A0081                                          BIT10     OCT    01000
A0082                                          5.5DEGS   DEC    .03056        P20-P25 SUNDANCE  (OCTAL 00765)
A0083                                          OCT1103   OCT    1103          ALARM AND ABORT
 0084                          4776   01124 1  C5/2      DEC    .0363551                        (OCTAL 01124)
 0085                          4777   01211 1  V05N09    VN     0509          (SAME AS OCTAL 1211)
 0086                          5000   01400 1  OCT1400   OCT    01400
 00865                         5001   01426 0  V06N22    VN     0622
```

```
A0087                             MID5       OCT      1740           PINBALL
 00875               5002  01776 0 BITS2-10 OCT      1776
 0088                5003  01777 1 LOW10     OCT      1777
A0089                             BIT11      OCT      02000
A0090                             2K+3       OCT      2003           PINBALL
 0091                5004  02177 1 LOW7+2K   OCT      2177           OP CODE MASK + BANK 1 FBANK SETTING.
 0092                5005  02400 1 EBANK5    OCT      02400
 0093                5006  03000 1 PRIO3     OCT      03000
 0094                5007  03400 0 EBANK7    OCT      03400
A0095                             LOW11      OCT      3777           PINBALL
A0096                             BIT12      OCT      04000
A0097                             RELTAB     OCT      04025          T4RUPT
 0098                5010  05000 1 PRIO5     OCT      05000
 0099                5011  06000 1 PRIO6     OCT      06000
 0100                5012  07000 0 PRIO7     OCT      07000

A0102                             BIT13      OCT      10000
A0103                                        OCT      10003          T4RUPT     RELTAB +1D
A0104                             13,7,2     OCT      10102          P20-P25 SUNDANCE
 0105                5013  11000 1 PRIO11    OCT      11000
A0106                             PRIO12     OCT      12000          BANKCALL
 0107                5014  13000 0 PRIO13    OCT      13000
 0108                5015  14000 1 PRIO14    OCT      14000
A0109                                        OCT      14031          T4RUPT     RELTAB +2D
 0110                5016  15000 0 PRIO15    OCT      15000
 0111                5017  16000 0 PRIO16    OCT      16000
A0112                             85DEGS     DEC      .45556         P20-P25 SUNDANCE   (OCTAL 16450)
 0113                5020  17000 1 PRIO17    OCT      17000
 0114                5021  17770 1 OCT17770  OCT      17770
A0115                             BIT14      OCT      20000
A0116                                        OCT      20033          T4RUPT     RELTAB +3D
 0117                5022  21000 1 PRIO21    OCT      21000
 01175               7731                    BLOCK    03
 01176  REF    1                             COUNT*   $$/FCONS
 0118                7731  22000 1 PRIO22    OCT      22000          SERVICE ROUTINES
 0119                7732  23000 0 PRIO23    OCT      23000
 0120                7733  24000 1 PRIO24    OCT      24000
A0121                             5/8+1      OCT      24001          SINGLE PRECISION SUBROUTINES
A0122                                        OCT      24017          T4RUPT     RELTAB +4D
 0123                7734  25000 0 PRIO25    OCT      25000
 0124                7735  26000 0 PRIO26    OCT      26000
 0125                7736  27000 1 PRIO27    OCT      27000
A0126                             CHRPRIO    OCT      30000          PINBALL
A0127                                        OCT      30036          T4RUPT     RELTAB +5D
 0128                7737  31000 0 PRIO31    OCT      31000
 0129                7740  31103 1 C1/2      DEC      .7853134                          (OCTAL 31103)
 0130                7741  32000 0 PRIO32    OCT      32000
 0131                7742  33000 1 PRIO33    OCT      33000
 0132                7743  34000 0 PRIO34    OCT      34000
A0133                                        OCT      34034          T4RUPT     RELTAB +6D
```

```
 0134                           7744   35000 1  PRIO35   OCT    35000
 0135                           7745   36000 1  PRIO36   OCT    36000
 0136                           7746   37000 0  PRIO37   OCT    37000
 0137                           7747   37401 0  63/64+1  OCT    37401
A0138                                           MID7     OCT    37600           PINBALL
 0139                           7750   37766 1  OCT37766 OCT    37766
 0140                           7751   37774 1  OCT37774 OCT    37774
 0141                           7752   37776 0  OCT37776 OCT    37776
A01411                                          DPOSMAX  OCT    37777
A0142                                           BIT15    OCT    40000
A0143                                           OCT40001 OCT    40001           INTERPRETER  ( CS   1   INSTRUCTION)
 0144                           7753   40014 0  DLOADCOD OCT    40014
 0145                           7754   40015 1  DLOAD*   OCT    40015
A0146                                                    OCT    40023           T4RUPT     RELTAB +7D
 01465                          7755   40040 1  BIT15+6  OCT    40040
 01466                          7756   40200 1  OCT40200 OCT    40200
A0147                                                    OCT    44035           T4RUPT    RELTAB +8D
A0148                                                    OCT    50037           T4RUPT     RELTAB +9D
A0149                                                    OCT    54000           T4RUPT     RELTAB +10D
 01495                          7757   57777 1  -BIT14   OCT    57777
A0150                                           RELTAB11 OCT    60000           T4RUPT
 0151                           7760   65552 0  C3/2     DEC    -.3216147                         (OCTAL 65552)
 0152                           7761   70000 0  13,14,15 OCT    70000
 0153                           7762   73777 1  -1/8     OCT    73777
 0154                           7763   74000 1  HIGH4    OCT    74000
 0155                           7764   74056 1  -ENDERAS DEC    -2001                             (OCTAL 74056)
A0156                                           HI5      OCT    76000           PINBALL
 0157                           7765   77700 0  HIGH9    OCT    77700
A0158                                           -ENDVAC  DEC    -45             INTERPRETER        (OCTAL 77722)
A0159                                           -OCT10   OCT    -10                                 (OCT 77767)
A0161                                           NEG4     DEC    -4                                 (OCTAL 77773)
 0162                           7766   77774 0  NEG3     DEC    -3
 0163                           7767   77775 1  NEG2     OCT    77775
 0164                           7770   77776 1  NEGONE   DEC    -1
```

```
L         FIXEO-FIXFD CONSTANT POOL                                                         USER'S PAGE NO.   5        EO S3

P0165     DEFINED BY EQUALS

R0166     IT WOULO BE TO THE USERS ADVANTAGE TO OCCASIONALLY CHECK ANY OF THESE SYMBOLS IN ORDER TO PREVENT ANY
R0168     ACCIDENTAL OEFINITION CHANGES.

 0169     REF    5  LAST  872       7770             MINUS1    =       NEG1
 0170     REF   12  LAST 1057       7770             NEG1      =       NEGONE
 0171     REF   52  LAST 1002       4744             ONE       =       BIT1
 0172     REF   46  LAST  975       4743             TWO       =       BIT2
 0173     REF    1                  6266             THREE     =       OCTAL3
 0174     REF   31  LAST 1026       6266             LOW2      =       THREE
 0175     REF   35  LAST  899       4742             FOUR      =       BIT3
 0176     REF    3  LAST 1006       6263             SIX       =       REVCNT
 0177     REF   19  LAST 1077       4750             LOW3      =       SEVEN
 0178     REF   46  LAST  974       4741             EIGHT     =       BIT4
 0179     REF    7  LAST 1093       4311             NINE      =       R2D1
 0180     REF    4  LAST  515       4354             TEN       =       BINCON
 0181     REF    3  LAST  740       4751             NOUTCON   =       ELEVEN
 0182     REF   15  LAST  471       4351             OCT23     =       V01
 01825    REF    3  LAST  785       4353             OCT25     =       MD1
 0183     REF   34  LAST 1053       4733             PRIO1     =       BIT10
 0184     REF    7  LAST 1087       5000             EBANK3    =       OCT1400
 0185     REF   24  LAST 1091       4732             PRIO2     =       BIT11
 0186     REF    1                  4766             OCT120    =       SUPER101
 0187     REF    2  LAST  885       4767             OCT140    =       SUPER110
 0188     REF   25  LAST 1097       4732             2K        =       BIT11
 0189     REF   26  LAST 1097       4732             EBANK4    =       BIT11
 0190     REF   29  LAST  829       4731             PRIO4     =       BIT12
 0191     REF    5  LAST  894       5006             EBANK6    =       PRIO3
 0192     REF   37  LAST 1092       4730             QUARTER   =       BIT13
 0193     REF   38  LAST 1097       4730             PRIO10    =       BIT13
 01935    REF    1                  7704             OCT10001  =       CCSL
 0194     REF   28  LAST 1083       4727             POS1/2    =       HALF
 0195     REF   64  LAST 1084       4727             PRIO20    =       BIT14
 0196     REF   65  LAST 1097       4727             HALF      =       BIT14
 0197     REF    5  LAST  483       4346             PRIO30    =       CHRPRIO
 0198     REF   10  LAST 1024       4346             BIT13-14  =       PRIO30              INTERPRETER USES IN PROCESSING STORECODE
 01985    REF    3  LAST 1009       6512             OCT30002  =       TLOAD +1
 0199     REF    1                  7743             B12T14    =       PRIO34
 0200     REF   41  LAST 1090       4726             NEGMAX    =       BIT15
 0201     REF   42  LAST 1097       4726             VLOADCOD  =       BIT15
 0202     REF    2  LAST  231       6130             VLOAD*    =       OCT40001
 0203     REF    2  LAST  166       4101             OCT60000  =       RELTAB11
 0204     REF    6  LAST  911       4341             BANKMASK  =       HI5
 0001    REF   1                  23,2000                          SETLOC INTPRET1
 0002                             23,2474                          BANK

 0003    REF   1                                                   COUNT* $$/ICONS
 0004                             23,2474   10000 0  DP1/4TH   2DEC    .25
 0004                             23,2475   00000 1
 0005                             23,2476   00000 1  UNITZ     2DEC    0
 0005                             23,2477   00000 1
 0006                             23,2500   00000 1  UNITY     2DEC    0
 0006                             23,2501   00000 1
 0007                             23,2502   20000 0  UNITX     2DEC    .5
 0007                             23,2503   00000 1
 0008                             23,2504   00000 1  ZEROVECS 2DEC    0
 0008                             23,2505   00000 1
 0009                             23,2506   00000 1            2DEC    0
 0009                             23,2507   00000 1
 0010                             23,2510   00000 1            2DEC    0
 0010                             23,2511   00000 1
 0011    REF  11  LAST   907      23,2502            DPHALF    =       UNITX
 0012                             23,2512   37777 1  DPPOSMAX  OCT     37777
 0013                             23,2513   37777 1            OCT     37777
```

```
L         INTERPRETIVE CONSTANTS                                                                  USER'S PAGE NO.   2      EO S3

P0014     INTERPRETIVE CONSTANTS IN THE OTHER HALF-MEMORY

 0015     REF    1                 12,2000                              SETLOC INTPRET2
 0016                              12,2000                              BANK

 0017     REF    1                                                      COUNT* $$/ICONS
 0018                              12,2000     00000 1    ZUNIT         2DEC   0
 0018                              12,2001     00000 1
 0019                              12,2002     00000 1    YUNIT         2DEC   0
 0019                              12,2003     00000 1
 0020                              12,2004     20000 0    XUNIT         2DEC   .5
 0020                              12,2005     00000 1
 0021                              12,2006     00000 1    ZEROVEC       2DEC   0
 0021                              12,2007     00000 1
 0022                              12,2010     00000 1                  2DEC   0
 0022                              12,2011     00000 1
 0023                              12,2012     00000 1                  2DEC   0
 0023                              12,2013     00000 1
 0024                              12,2014     77777 0                  OCT    77777               -0,-6,-12 MUST REMAIN IN THIS ORDER
 0025                              12,2015     77771 0    DEC-6         DEC    -6
 0026                              12,2016     77763 0    DEC-12        DEC    -12
 0027                              12,2017     37777 1    LODPMAX       2OCT   3777737777          THESE TWO CONSTANTS MUST REMAIN
 0027                              12,2020     37777 1
 0028                              12,2021     37777 1    LODPMAX1      2OCT   3777737777          ADJACENT AND THE SAME FOR INTEGRATION
 0028                              12,2022     37777 1
 0029     REF    5   LAST   963    12,2006                ZERODP        =      ZEROVEC
 0030     REF    7   LAST   956    12,2004                HALFDP        =      XUNIT
 0001                               5023                       BLOCK  02
R0002    SINGLE PRECISION SINF AND COSINE

 00025   REF   1                                               COUNT* $$/INTER
 0003    REF  29   LAST 1097        5023   6 4727 1  SPCOS     AD     HALF              ARGUMENTS SCALED AT PI
 0004    REF   1                    5024  55'075 0  SPSIN      TS     TEMK
 0005    REF   1                    5025   1 5027 0            TCF    SPT
 0006    REE   2   LAST 1100        5026   4 1075 0            CS     TEMK
 0007                               5027   6 0000 1  SPT       DOUBLE
 0008    REF   3   LAST 1100        5030  55'075 0             TS     TEMK
 0009    REF   1                    5031   1 5042 0            TCF    POLLEY
 0010    REF   4   LAST 1100        5032  57'075 1             XCH    TEMK
 0011    REF   5   LAST 1100        5033  51'075 1             INDEX  TEMK
 0012    REF   3   LAST 1026        5034   6 4725 0            AD     LIMITS
 0013                               5035   4 0000 0            COM
 0014    REE   6   LAST 1100        5036   6 1075 1            AD     TEMK
 0015    REF   7   LAST 1100        5037  55'075 0             TS     TEMK
 0016    REE   2   LAST 1100        5040   1 5042 0            TCF    POLLEY
 0017    REF   1                    5041   1 5060 0            TCF    ARG90
 0018                               5042   0 0006 1  POLLEY    EXTEND
 0019    REF   8   LAST 1100        5043   7 1075 0            MP     TEMK
 0020    REF   1                    5044  55'076 0             TS     SQ
 0021                               5045   0 0006 1            EXTEND
 0022    REF   1                    5046   7 4776 1            MP     C5/2
 0023    REF   1                    5047   6 7760 1            AD     C3/2
 0024                               5050   0 0006 1            EXTEND
 0025    REE   2   LAST 1100        5051   7 1076 0            MP     SQ
 0026    REF   1                    5052   6 7740 0            AD     C1/2
 0027                               5053   0 0006 1            EXTEND
 0028    REE   9   LAST 1100        5054   7 1075 0            MP     TEMK
 0029                               5055  20 001 1             DDOUBL
 0030    REE  10   LAST 1100        5056  55'075 0             TS     TEMK
 0031    REF 292   LAST 1092        5057   0 0002 0            TC     Q
 0032    REE 346   LAST 1092        5060  50 000 1   ARG90     INDEX  A
 0033    REF   4   LAST 1100        5061   4 4725 1            CS     LIMITS
 0034    REF 293   LAST 1100        5062   0 0002 0            TC     Q                 RESULT SCALED AT 1
 0001                         5063                       BLOCK  02
R0002              TO ENTER A JOB REQUEST REQUIRING NO VAC AREA:

 00025  REF    1                                         COUNT* $$/EXEC
 00029                        5063   0 0004 0  NOVAC     INHINT
 0003   REF    1              5064   6 5155 0            AD     FAKEPRET         LOC(MPAC +6) - LOC(QPRET)
 00031  REF    3  LAST  381   5065  54 063 0             TS     NEWPRIO          PRIORITY OF NEW JOB + NOVAC C(FIXLOC)

 0004                         5066   0 0006 1            EXTEND
 0005   REF  294  LAST 1100   5067   5 0002 0            INDEX  Q                Q WILL BE UNDISTURBED THROUGHOUT.
 0006                         5070   3 0001 0            DCA    0                2CADR OF JOB ENTERED.
 0007   REF    1              5071  52 066 0             DXCH   NEWLOC
 0008   REF    1              5072   3 5154 1            CAF    EXECBANK
 0009   REF   25  LAST 1043   5073  56 004 0             XCH    FBANK
 0010   REF    1              5074  54 061 1             TS     EXECTEM1
 0011   REF    1              5075   1 2631 0            TCF    NOVAC2           ENTER EXECUTIVE BANK.

R0012              TO ENTER A JOB REQUEST REQUIRING A VAC AREA - E.G., ALL (PARTIALLY) INTERPRETIVE JOBS.

 0014                         5076   0 0004 0  FINDVAC   INHINT
 00145  REF    4  LAST 1101   5077  54 063 0             TS     NEWPRIO
 0015                         5100   0 0006 1            EXTEND
 0016   REF  295  LAST 1101   5101   5 0002 0            INDEX  Q
 0017                         5102   3 0001 0            DCA    0
 0018   REF    2  LAST 1101   5103  52 066 0   SPVACIN   DXCH   NEWLOC
 0019   REF    2  LAST 1101   5104   3 5154 1            CAF    EXECBANK
 0020   REF   26  LAST 1101   5105  56 004 0             XCH    FBANK
 0021   REF    1              5106   1 2605 1            TCF    FINDVAC2         OFF TO EXECUTIVE SWITCHED-BANK.

R00211             TO ENTER A FINDVAC WITH THE PRIORITY IN NEWPRIO TO THE 2CADR ARRIVING IN A AND L:

R002125            USERS OF SPVAC MUST INHINT BEFORE STORING IN NEWPRIO.

 00213  REF  296  LAST 1101   5107  56 002 0   SPVAC     XCH    Q
 00214  REF    6  LAST  890   5110   6 7767 0            AD     NEG2
 00215  REF  297  LAST 1101   5111  56 002 0             XCH    Q
 00216  REF    1              5112   1 5103 1            TCF    SPVACIN

R0022              TO SUSPEND A BASIC JOB SO A HIGHER PRIORITY JOB MAY BE SERVICED:

 0024   REF  298  LAST 1101   5113  22 002 0   CHANG1    LXCH   Q
 0025   REF    3  LAST 1101   5114   3 5154 1            CAF    EXECBANK
 0026   REF   30  LAST 1023   5115  56 006 1             XCH    BBANK
 0027   REF    1              5116   1 2712 0            TCF    CHANJOB

R0030              TO SUSPEND AN INTERPRETIVE JOB:

 0031   REF   30  LAST 1092   5117   4 0164 0  CHANG2    CS     LOC              NEGATIVE LOC SHOWS JOB = INTERPRETIVE.
R00315             ITRACE (4) REFERS TO "CHANG2".
 0032   REF  224  LAST 1080   5120  54 001 1             TS     L
 0033   REF   4  LAST 1101        5121  3 5154 1   +2      CAF     EXECBANK
 00335  REF  31  LAST 1101        5122  54 006 0           TS      BBANK
 0034   REF   2  LAST 1101        5123  1 2711 0           TCF     CHANJOB -1
```

```
P0035                TO VOLUNTARILY SUSPEND A JOB UNTIL THE COMPLETION OF SOME ANTICIPATED EVENT (I/O EVENT ETC.):

 0037    REF  31  LAST 1101      5124  54 164 0  JOBSLEEP TS      LOC
 0038    REF   5  LAST 1102      5125  3 5154 1           CAF     EXECBANK
 0039    REF  27  LAST 1101      5126  54 004 1           TS      FBANK
 0040    REF   1                 5127  1 3002 1           TCF     JOBSLP1

R0041                TO AWAKEN A JOB PUT TO SLEEP IN THE ABOVE FASHION:

 0042                            5130  0 0004 0  JOBWAKE  INHINT
 00421   REF   3  LAST 1101      5131  54 065 0           TS      NEWLOC
 0043    REF  69  LAST 1040      5132  4 4743 1           CS      TWO                 EXIT IS VIA FINDVAC/NOVAC PROCEDURES.
 0044    REF 299  LAST 1101      5133  26 002 1           ADS     Q
 0045    REF   6  LAST 1103      5134  3 5154 1           CAF     EXECBANK
 0046    REF  28  LAST 1103      5135  56 004 0           XCH     FBANK
 0047    REF   1                 5136  1 3027 0           TCF     JOBWAKE2

R0048                TO CHANGE THE PRIORITY OF A JOB CURRENTLY UNDER EXECUTION:

 0049                            5137  0 0004 0  PRIOCHNG INHINT                      NEW PRIORITY ARRIVES IN A. RETURNS TO
 0050    REF   5  LAST 1101      5140  54 063 0           TS      NEWPRIO             CALLER AS SOON AS NEW JOB PRIORITY IS
 0051    REF   7  LAST 1103      5141  3 5154 1           CAF     EXECBANK            HIGHEST. PREPARE FOR POSSIBLE BASIC-
 0052    REF  32  LAST 1102      5142  56 006 1           XCH     BBANK               STYLE CHANGE-JOB.
 0053    REF   9  LAST 1023      5143  54 165 1           TS      BANKSET
 0054    REF 300  LAST 1103      5144  3 0002 0           CA      Q
 0055    REF   1                 5145  1 3076 1           TCF     PRIOCH2

R0058                TO REMOVE A JOB FROM EXECUTIVE CONSIDERATIONS:

 0059    REF   8  LAST 1103      5146  3 5154 1  ENDOFJOB CAF     EXECBANK
 0060    REF  29  LAST 1103      5147  54 004 1           TS      FBANK
 0061    REF   1                 5150  1 3107 0           TCF     ENDJOB1

 0062    REF   2  LAST 1101      5151  3 0061 0  ENDFIND  CA      EXECTEM1            RETURN TO CALLER AFTER JOB ENTRY
 0063    REF  30  LAST 1103      5152  54 004 1           TS      FBANK               COMPLETE.
 0064    REF   2  LAST  537      5153  1 6762 0           TCF     Q+2
 0066    REF   2  LAST 1101      5154    02605 0 EXECBANK CADR    FINDVAC2

 00662   REF 711  LAST 1088      5155    00110 1 FAKEPRET ADRES   MPAC -36D           LOC(MPAC +6) - LOC(QPRET)

R00665               TO CHANGE A "FINDVAC" JOB TO A "NOVAC" -- RELEASE ITS VAC AREA:
 00666   REF  12  LAST  867      5156  3 0167 1  VACRLEAS CA      PRIORITY            CHANGE TO NOVAC VALUE
 006662  REF   2  LAST  243      5157  7 7746 1           MASK    PRIO37
 006664  REF   2  LAST 1101      5160  6 5155 0           AD      FAKEPRET
 006666  REF  13  LAST 1103      5161  56 167 1           XCH     PRIORITY
 006668  REF  10  LAST  867      5162  7 4775 1           MASK    LOW9
 00667   REF 347  LAST 1100      5163  10 000 0           CCS     A
 006672  REF 348  LAST 1103      5164  50 000 1           INDEX   A
 006674                          5165  54 000 0           TS      0                   RELEASE VAC AREA
 006676  REF 301  LAST 1103      5166  0 0002 0           TC      Q
```

```
P0067              LOCATE AN AVAILABLE VAC AREA.

 0068                          01,2605                              BANK     01
 00685   REF   1                                                    COUNT*   $$/EXEC
 0069    REF   3  LAST 1103    01,2605   54 061 1   FINDVAC2  TS       EXECTEM1         (SAVE CALLER'S BANK FIRST.)
 0070    REF   4  LAST  255    01,2606   10 400 1             CCS      VAC1USE
 0071    REF   1               01,2607   1 2624 1             TCF      VACFOUND
 0072    REF   3  LAST  255    01,2610   10 454 0             CCS      VAC2USE
 0073    REF   2  LAST 1104    01,2611   1 2624 1             TCF      VACFOUND
 0074    REF   3  LAST  255    01,2612   10 530 0             CCS      VAC3USE
 0075    REF   3  LAST 1104    01,2613   1 2624 1             TCF      VACFOUND
 0076    REF   3  LAST  255    01,2614   10 604 1             CCS      VAC4USE
 0077    REF   4  LAST 1104    01,2615   1 2624 1             TCF      VACFOUND
 0078    REF   3  LAST  255    01,2616   10 660 0             CCS      VAC5USE
 0079    REF   5  LAST 1104    01,2617   1 2624 1             TCF      VACFOUND
 00792   REF   4  LAST 1104    01,2620   22 061 0             LXCH     EXECTEM1
 00794   REF 302  LAST 1103    01,2621   3 0002 0             CA       0
 0080    REF   3  LAST  255    01,2622   0 5712 0             TC       BAILOUT1
 0081                          01,2623    31201 0             OCT      31201            NO VAC AREAS

 0082    REF  7(  LAST 1103    01,2624   6 4743 0   VACFOUND  AD       TWO              RESERVE THIS VAC AREA BY STORING A ZERO
 0083                          01,2625   22 007 0             ZL                        IN ITS VAC USE REGISTER AND STORE THE
 0084    REF 349  LAST 1103    01,2626   50 000 1             INDEX    A                ADDRESS OF THE FIRST WORD OF IT IN THE
 0085                          01,2627   21'777 0             LXCH     0 -1             LOW NINE BITS OF THE PRIORITY WORD.
 0086    REF   6  LAST 1103    01,2630   26 063 0             ADS      NEWPRIO

 0087    REF 223  LAST 1084    01,2631   3 4746 0   NOVAC2    CAF      ZERO             NOVAC ENTERS HERE. FIND A CORE SET.
 0088    REF   5  LAST  473    01,2632   54 064 1             TS       LOCCTR
 0089    REF   1               01,2633   3 2640 1             CAF      NO.CORES         SEVEN SETS OF ELEVEN REGISTERS EACH.
 0090    REF   1               01,2634   54 062 1   NOVAC3    TS       EXECTEM2
 0091    REF   6  LAST 1104    01,2635   50 064 0             INDEX    LOCCTR
 0092    REF  14  LAST 1103    01,2636   10 167 0             CCS      PRIORITY         EACH PRIORITY REGISTER CONTAINS -0 IF
 0093    REF   1               01,2637   1 2700 0             TCF      NEXTCORE         THE CORRESPONDING CORE SET IS AVAILABLE.
 0094                          01,2640    00007 0   NO.CORES  DEC      7
 0095    REF   2  LAST 1104    01,2641   1 2700 0             TCF      NEXTCORE         AN ACTIVE JOB HAS A POSITIVE PRIORITY
A0096                                                                                   BUT A DORMANT JOB'S PRIORITY IS NEGATIVE
```

```
0097    REF    7  LAST 1104    01,2642   3 0063 1  CORFOUND CA      NEWPRIO        SET THE PRIORITY OF THIS JOB IN THE CORE
0098    REF    7  LAST 1104    01,2643  50 064  0           INDEX   LOCCTR         SET'S PRIORITY REGISTER AND SET THE
0099    REF   15  LAST 1104    01,2644  54 167  0           TS      PRIORITY       JOB'S PUSH-DOWN POINTER AT THE BEGINNING
0100    REF   11  LAST 1103    01,2645   7 4775 1           MASK    LOW9           OF THE WORK AREA AND OVERFLOW INDICATOR
0101    REF    8  LAST 1105    01,2646  50 064  0           INDEX   LOCCTR
0102    REF   26  LAST 1075    01,2647  54 166  1           TS      PUSHLOC        OFF TO PREPARE FOR INTERPRETIVE PROGRAMS

0103    REF    9  LAST 1105    01,2650  10 064  1           CCS     LOCCTR         IF CORE SET ZERO IS BEING LOADED, SET UP
0104    REF    1               01,2651   1 2665 1           TCF     SETLOC         OVFIND AND FIXLOC IMMEDIATELY .
0105    REF   13  LAST 1088    01,2652  54 121  1           TS      OVFIND
0106    REF   27  LAST 1105    01,2653   3 0166 0           CA      PUSHLOC
0107    REF   59  LAST 1089    01,2654  54 120  0           TS      FIXLOC

0108    REF    8  LAST 1001    01,2655  10 067  1  SPECTEST CCS     NEWJOB         SEE IF ANY ACTIVE JOBS WAITING (RARE).
0109    REF    2  LAST 1105    01,2656   1 2665 1           TCF     SETLOC         MUST BE AWAKENED BUT UNCHANGED JOB.
0110    REF   10  LAST 1092    01,2657   0 5701 1           TC      CCSHOLE
0111    REF   11  LAST 1105    01,2660   0 5701 1           TC      CCSHOLE
0112    REF    9  LAST 1105    01,2661  54 067  1           TS      NEWJOB         +0 SHOWS ACTIVE JOB ALREADY SET.
0113    REF    4  LAST 1103    01,2662  52 066  0           DXCH    NEWLOC
0114    REF   32  LAST 1103    01,2663  52 165  1           DXCH    LOC
0115    REF    1               01,2664   1 5151 0           TCF     ENDFIND

0116    REF    5  LAST 1105    01,2665  52 066  0  SETLOC   DXCH    NEWLOC         SET UP THE LOCATION REGISTERS FOR THIS
0117    REF   10  LAST 1105    01,2666  50 064  0           INDEX   LOCCTR
0118    REF   33  LAST 1105    01,2667  52 165  1           DXCH    LOC
0119    REF   10  LAST 1105    01,2670  50 067  0           INDEX   NEWJOB         THIS INDEX INSTRUCTION INSURES THAT THE
0120    REF   16  LAST 1105    01,2671   4 0167 0           CS      PRIORITY       HIGHEST ACTIVE PRIORITY WILL BE COMPARED
0121    REF    8  LAST 1105    01,2672   6 0063 1           AD      NEWPRIO        WITH THE NEW PRIORITY TO SEE IF NEWJOB
0122                           01,2673   0 0006 1           EXTEND                 SHOULD BE SET TO SIGNAL A SWITCH.
0123    REF    2  LAST 1105    01,2674   6 5151 1           BZMF    ENDFIND
0124    REF   11  LAST 1105    01,2675   3 0064 0           CA      LOCCTR         LOCCTR IS LEFT SET AT THIS CORE SET IF
0125    REF   11  LAST 1105    01,2676  54 067  1           TS      NEWJOB         THE CALLER WANTS TO LOAD ANY MPAC
0126    REF    3  LAST 1105    01,2677   1 5151 0           TCF     ENDFIND        REGISTERS, ETC.

0127    REF    1               01,2700   3 3037 0  NEXTCORE CAF     COREINC
0128    REF   12  LAST 1105    01,2701  26 064  1           ADS     LOCCTR
0129    REF    2  LAST 1104    01,2702  10 062  1           CCS     EXECTEM2
0130    REF    1               01,2703   1 2634 0           TCF     NOVAC3
01302   REF    5  LAST 1104    01,2704  22 061  0           LXCH    EXECTEM1
01304   REF  303  LAST 1104    01,2705   3 0002 0           CA      Q
0131    REF    4  LAST 1104    01,2706   0 5712 0           TC      BAILOUT1       NO CORE SETS AVAILABLE.
0132                           01,2707    31202 0           OCT     31202
```

```
P0133               THE FOLLOWING ROUTINE SWAPS CORE SET 0 WITH THAT WHOSE RELATIVE ADDRESS IS IN NEWJOB.

 01345  REF  34  LAST 1105    01,2710  22 164 1   -2       LXCH   LOC
 0135   REF  10  LAST 1103    01,2711  30 165 0   -1       CAE    BANKSET          BANKSET, NOT BBANK, HAS RIGHT CONTENTS.
 0136                         01,2712  0 0004 0  CHANJOB   INHINT
 01362                        01,2713  0 0006 1            EXTEND
 01364  REF  15  LAST  999    01,2714  04 007 1            ROR    SUPERBNK         PICK UP CURRENT SBANK FOR BBCON
 01366  REF 225  LAST 1101    01,2715  56 001 0            XCH    L                LOC IN A AND BBCON IN L.
 01368  REF  12  LAST 1105    01,2716  50 067 0  +4        INDEX  NEWJOB           SWAP LOC AND BANKSET.
 0137   REF  35  LAST 1106    01,2717  52 165 1            DXCH   LOC
 0138   REF  36  LAST 1106    01,2720  52 165 1            DXCH   LOC

 01382  REF  11  LAST 1106    01,2721  30 165 0            CAE    BANKSET
 01384                        01,2722  0 0006 1            EXTEND
 01388  REF  16  LAST 1106    01,2723  01 007 1            WRITE  SUPERBNK         SET SBANK FOR NEW JOB.
 0139   REF 712  LAST 1103    01,2724  52 155 1            DXCH   MPAC             SWAP MULTI-PURPOSE ACCUMULATOR AREAS.
 0140   REF  13  LAST 1106    01,2725  50 067 0            INDEX  NEWJOB
 0141   REF 713  LAST 1106    01,2726  52 155 1            DXCH   MPAC
 0142   REF 714  LAST 1106    01,2727  52 155 1            DXCH   MPAC
 0143   REF 715  LAST 1106    01,2730  52 157 0            DXCH   MPAC +2
 0144   REF  14  LAST 1106    01,2731  50 067 0            INDEX  NEWJOB
 0145   REF 716  LAST 1106    01,2732  52 157 0            DXCH   MPAC +2
 0146   REF 717  LAST 1106    01,2733  52 157 0            DXCH   MPAC +2
 0147   REF 718  LAST 1106    01,2734  52 161 0            DXCH   MPAC +4
 0148   REF  15  LAST 1106    01,2735  50 067 0            INDEX  NEWJOB
 0149   REF 719  LAST 1106    01,2736  52 161 0            DXCH   MPAC +4
 0150   REF 720  LAST 1106    01,2737  52 161 0            DXCH   MPAC +4
 0151   REF 721  LAST 1106    01,2740  52 163 1            DXCH   MPAC +6
 0152   REF  16  LAST 1106    01,2741  50 067 0            INDEX  NEWJOB
 0153   REF 722  LAST 1106    01,2742  52 163 1            DXCH   MPAC +6
 0154   REF 723  LAST 1106    01,2743  52 163 1            DXCH   MPAC +6

 0155   REF 224  LAST 1104    01,2744  3 4746 0            CAF    ZERO
 0156   REF  14  LAST 1105    01,2745  56 121 0            XCH    OVFIND           MAKE PUSHLOC NEGATIVE IF OVFIND NZ.
 0157                         01,2746  0 0006 1            EXTEND
 0158                         01,2747  1 2752 1            BZF    +3
 0159   REF  28  LAST 1105    01,2750  4 0166 1            CS     PUSHLOC
 0160   REF  29  LAST 1106    01,2751  54 166 1            TS     PUSHLOC

 0161   REF  30  LAST 1106    01,2752  52 167 0            DXCH   PUSHLOC
 0162   REF  17  LAST 1106    01,2753  50 067 0            INDEX  NEWJOB
 0163   REF  31  LAST 1106    01,2754  52 167 0            DXCH   PUSHLOC
 0164   REF  32  LAST 1106    01,2755  52 167 0            DXCH   PUSHLOC          SWAPS PUSHLOC AND PRIORITY.
 0165   REF  12  LAST 1105    01,2756  3 4775 0            CAF    LOW9             SET FIXLOC TO BASE OF VAC AREA.
 0166   REF  17  LAST 1105    01,2757  7 0167 0            MASK   PRIORITY
 0167   REF  60  LAST 1105    01,2760  54 120 0            TS     FIXLOC

 0168   REF  33  LAST 1106    01,2761  10 166 1            CCS    PUSHLOC          SET OVERFLOW INDICATOR ACCORDING TO
 0169   REF 225  LAST 1106    01,2762  3 4746 0            CAF    ZERO
 0170   REF   1               01,2763  1 2770 1            TCF    ENDPRCHG -1
```

```
0171   REF  34  LAST 1106   01,2764  4 C166 1            CS     PUSHLOC
0172   REF  35  LAST 1107   01,2765  54 166 1            TS     PUSHLOC
0173   REF 100  LAST 1070   01,2766  3 4744 1            CAF    ONE
0174   REF  15  LAST 1106   01,2767  56 121 0            XCH    OVFIND
0175   REF  18  LAST 1106   01,2770  54 067 1            TS     NEWJOB

0176                        01,2771  0 C003 1   ENDPRCHG RELINT
0177   REF  37  LAST 1106   01,2772  52 165 1            DXCH   LOC              BASIC JOBS HAVE POSITIVE ADDRESSES, SO
0178                        01,2773  0 0006 1            EXTEND                  DISPATCH WITH A DTCB.
0179                        01,2774  6 2776 0            BZMF   +2               IF INTERPRETIVE, SET UP FBANK, ETC.
0180                        01,2775  52 006 0            DTCB
```

```
 0181                          01,2776  4 0000 0            COM                  EPILOGUE TO JOB CHANGE FOR INTERPRETIVE
 0182    REF 101  LAST 1107    01,2777  6 4744 1            AD       ONE
 0183    REF  38  LAST 1107    01,3000  54 164 0            TS       LOC         RESUME.
 0186    REF   1               01,3001  1 6071 0            TCF      INTRSM

R0187           COMPLETE JOBSLEEP PREPARATIONS.

 0188                          01,3002  0 0004 0  JOBSLP1   INHINT
 0189    REF  18  LAST 1106    01,3003  4 0167 0            CS       PRIORITY    NNZ PRIORITY SHOWS JOB ASLEEP.
 0190    REF  19  LAST 1108    01,3004  54 167 0            TS       PRIORITY
 0191    REF   8  LAST 1042    01,3005  3 6115 1            CAF      LOW7
 0192    REF  33  LAST 1103    01,3006  7 0006 0            MASK     BBANK
 01921                         01,3007  0 0006 1            EXTEND
 01922   REF  17  LAST 1106    01,3010  04 007 1            ROR      SUPERBNK    SAVE OLD SUPERBANK VALUE.
 0193    REF  12  LAST 1106    01,3011  54 165 1            TS       BANKSET
 0194    REF 226  LAST 1106    01,3012  4 4746 1            CS       ZERO
 0195    REF 149  LAST 1078    01,3013  54 131 0  JOBSLP2   TS       BUF +1      HOLDS - HIGHEST PRIORITY.
 0196    REF   1               01,3014  1 3124 1            TCF      EJSCAN      SCAN FOR HIGHEST PRIORITY ALA ENDOFJOB.

 01961                         01,3015  0 0004 0  NUCHANG2  INHINT               QUICK... DONT LET NEWJOB CHANGE TO +0 .
 019611  REF  19  LAST 1107    01,3016  10 067 1            CCS      NEWJOB
 019612                        01,3017  1 3022 0            TCF      +3          NEWJOB STILL PNZ
 019613                        01,3020  0 0003 1            RELINT               NEWJOB HAS CHANGED TO +0. WAKE UP JOB
 019614  REF   1               01,3021  1 3220 0            TCF      ADVAN +2    VIA NUDIPECT. (VERY RARE CASE.)

 01962   REF  71  LAST 1104    01,3022  3 4743 0            CAF      TWO
 01963                         01,3023  0 0006 1            EXTEND
 01964   REF  30  LAST  868    01,3024  05 011 1            WOR      DSALMOUT    TURN ON ACTIVITY LIGHT
 01965   REF  39  LAST 1108    01,3025  52 165 1            DXCH     LOC         AND SAVE ADDRESS INFO FOR BENEFIT OF
 01966   REF   3  LAST 1102    01,3026  1 2716 1            TCF      CHANJOB + 4  POSSIBLE SLEEPING JOB.
```

```
P0197            TO WAKE UP A JOB, EACH CORE SET IS FOUND TO LOCATE ALL JOBS WHICH ARE ASLEEP. IF THE FCADR IN THE
R0199   LOC REGISTER OF ANY SUCH JOB MATCHES THAT SUPPLIED BY THE CALLER, THAT JOB IS AWAKENED. IF NO JOB IS FOUND,
R0201   LOCCTR IS SET TO -1 AND NO FURTHER ACTION TAKES PLACE.

 0202   REF   6  LAST 1105   01,3027  54 061 1  JOBWAKE2 TS      EXECTEM1
 0203   REF 227  LAST 1108   01,3030  3 4746 0           CAF     ZERO                BEGIN CORE SET SCAN.
 0204   REF  13  LAST 1105   01,3031  54 064 1           TS      LOCCTR
 0205   REF   2  LAST 1104   01,3032  3 2640 1           CAF     NO.CORES
 0206   REF   3  LAST 1105   01,3033  54 062 1  JOBWAKE4 TS      EXECTEM2
 0207   REF  14  LAST 1109   01,3034  50 064 0           INDEX   LOCCTR
 0208   REF  20  LAST 1108   01,3035  10 167 0           CCS     PRIORITY
 0209   REF   1              01,3036  1 3041 0           TCF     JOBWAKE3            ACTIVE JOB - CHECK NEXT CORE SET.
 0210                        01,3037   00014 1  COREINC  DEC     12                  12 REGISTERS PER CORE SET.
 0211   REF   1              01,3040  1 3050 0           TCF     WAKETEST            SLEEPING JOB - SEE IF CADR MATCHES.

 0212   REF   2  LAST 1105   01,3041  3 3037 0  JOBWAKE3 CAF     COREINC
 0213   REF  15  LAST 1109   01,3042  26 064 1           ADS     LOCCTR
 0214   REF   4  LAST 1109   01,3043  10 062 1           CCS     EXECTEM2
 0215   REF   1              01,3044  1 3033 0           TCF     JOBWAKE4
 0216   REF 102  LAST 1108   01,3045  4 4744 0           CS      ONE                 EXIT IF SLEEPING JOB NOT FOUND.
 0217   REF  16  LAST 1109   01,3046  54 064 1           TS      LOCCTR
 0218   REF   4  LAST 1105   01,3047  1 5151 0           TCF     ENDFIND

 0219   REF   6  LAST 1105   01,3050  4 0065 0  WAKETEST CS      NEWLOC
 0220   REF  17  LAST 1109   01,3051  50 064 0           INDEX   LOCCTR
 0221   REF  40  LAST 1108   01,3052  6 0164 1           AD      LOC
 0222                        01,3053  0 0006 1           EXTEND
 0223                        01,3054  1 3056 0           BZF     +2                  IF MATCH.
 0224   REF   2  LAST 1109   01,3055  1 3041 0           TCF     JOBWAKE3            EXAMINE NEXT CORE SET IF NO MATCH.

 0225   REF  13  LAST 1109   01,3056  50 064 0           INDEX   LOCCTR              RE-COMPLEMENT PRIORITY TO SHOW JOB AWAKE
 0226   REF  21  LAST 1109   01,3057  4 0167 0           CS      PRIORITY
 0227   REF   9  LAST 1105   01,3060  54 063 0           TS      NEWPRIO
 0228   REF  19  LAST 1109   01,3061  50 064 0           INDEX   LOCCTR
 0229   REF  22  LAST 1109   01,3062  54 167 0           TS      PRIORITY

 0230   REF   1              01,3063  4 4341 1           CS      FBANKMSK            MAKE UP THE 2CADR OF THE WAKE ADDRESS
 0231   REF   7  LAST 1109   01,3064  7 0065 0           MASK    NEWLOC              USING THE CADR IN NEWLOC AND THE EBANK
 0232   REF   3  LAST 1021   01,3065  6 4732 0           AD      2K                  HALF OF BBANK SAVED IN BANKSET.
 0233   REF   8  LAST 1109   01,3066  56 065 1           XCH     NEWLOC
 0234   REF   2  LAST 1109   01,3067  7 4341 1           MASK    FBANKMSK
 0235   REF  20  LAST 1109   01,3070  50 064 0           INDEX   LOCCTR
 0236   REF  13  LAST 1108   01,3071  6 0165 0           AD      BANKSET
 0237   REF   9  LAST 1109   01,3072  54 066 0           TS      NEWLOC +1

 0238   REF  21  LAST 1109   01,3073  10 064 1           CCS     LOCCTR              SPECIAL TREATMENT IF THIS JOB WAS
 0239   REF   3  LAST 1105   01,3074  1 2665 1           TCF     SETLOC              ALREADY IN THE RUN (0) POSITION.
 0240   REF   1              01,3075  1 2655 1           TCF     SPECTEST
```

```
P0241              PRIORITY CHANGE. CHANGE THE CONTENTS OF PRIORITY AND SCAN FOR THE JOB OF HIGHEST PRIORITY.

 0243    REF  41  LAST 1109   01,3076  54 164 0  PRIOCH2  TS      LOC
 0244    REF 228  LAST 1109   01,3077  3 4746 0           CAF     ZERO            SET FLAG TO TELL ENDJOB SCANNER IF THIS
 0245    REF 150  LAST 1108   01,3100  54 130 1           TS      BUF             JOB IS STILL HIGHEST PRIORITY.
 0246    REF  13  LAST 1106   01,3101  3 4775 0           CAF     LOW9
 0247    REF  23  LAST 1109   01,3102  7 0167 0           MASK    PRIORITY
 0248    REF  10  LAST 1109   01,3103  6 0063 1           AD      NEWPRIO
 0249    REF  24  LAST 1110   01,3104  54 167 0           TS      PRIORITY
 0250                         01,3105  4 0000 0           COM
 0251    REF   1              01,3106  1 3013 1           TCF     JOBSLP2         AND TO EJSCAN.
```

```
P0252           RELEASE THIS CORE SET AND VAC AREA AND SCAN FOR THE JOB OF HIGHEST ACTIVE PRIORITY.

 0254                             01,3107  0 0004 0  ENDJOB1  INHINT
 0255    REF 229  LAST 1110      01,3110  4 4746 1           CS      ZERO
 0256    REF 151  LAST 1110      01,3111  54 131 0           TS      BUF +1
 0257    REF  25  LAST 1110      01,3112  56 167 1           XCH     PRIORITY
 0258    REF  14  LAST 1110      01,3113  7 4775 1           MASK    LOW9
 02581   REF 226  LAST 1106      01,3114  54 001 1           TS      L

 02582   REF   3  LAST 1103      01,3115  4 5155 1           CS      FAKEPRET
 025821  REF 227  LAST 1111      01,3116  6 0001 0           AD      L

 02583                           01,3117  0 0006 1           EXTEND
 02584   REF   2  LAST 1108      01,3120  6 3124 0           BZMF    EJSCAN          NOVAC ENDOFJOB

 0259    REF 228  LAST 1111      01,3121  10 001 1           CCS     L
 0260    REF 350  LAST 1104      01,3122  50 000 1           INDEX   A
 0261                            01,3123  54 000 0           TS      0

 0262    REF  26  LAST 1111      01,3124  10 203 1  EJSCAN   CCS     PRIORITY +12D
 0263    REF   1                 01,3125  0 3175 1           TC      EJ1
 0264    REF  12  LAST 1105      01,3126  0 5701 1           TC      CCSHOLE
 0265                            01,3127  1 3130 1           TCF     +1

 0266    REF  27  LAST 1111      01,3130  10 217 1           CCS     PRIORITY +24D   EXAMINE EACH PRIORITY REGISTER TO FIND
 0267    REF   2  LAST 1111      01,3131  0 3175 1           TC      EJ1             THE JOB OF HIGHEST ACTIVE PRIORITY.
 0268    REF  13  LAST 1111      01,3132  0 5701 1           TC      CCSHOLE
 0269                            01,3133  1 3134 0           TCF     +1

 0270    REF  28  LAST 1111      01,3134  10 233 1           CCS     PRIORITY +36D
 0271    REF   3  LAST 1111      01,3135  0 3175 1           TC      EJ1
 0272    REF  29  LAST 1111      01,3136   67610 1  -CCSPR  -CCS     PRIORITY
 0273                            01,3137  1 3140 0           TCF     +1

 0274    REF  30  LAST 1111      01,3140  10 247 1           CCS     PRIORITY +48D
 0275    REF   4  LAST 1111      01,3141  0 3175 1           TC      EJ1
 0276    REF  14  LAST 1111      01,3142  0 5701 1           TC      CCSHOLE
 0277                            01,3143  1 3144 1           TCF     +1

 0278    REF  31  LAST 1111      01,3144  10 263 1           CCS     PRIORITY +60D
 0279    REF   5  LAST 1111      01,3145  0 3175 1           TC      EJ1
 0280    REF  15  LAST 1111      01,3146  0 5701 1           TC      CCSHOLE
 0281                            01,3147  1 3150 1           TCF     +1

 0282    REF  32  LAST 1111      01,3150  10 277 1           CCS     PRIORITY +72D
 0283    REF   6  LAST 1111      01,3151  0 3175 1           TC      EJ1
 0284    REF  16  LAST 1111      01,3152  0 5701 1           TC      CCSHOLE
 0285                            01,3153  1 3154 0           TCF     +1

 02851   REF  33  LAST 1111      01,3154  10 313 1           CCS     PRIORITY +84D
```

```
02852  REF   7  LAST 1111   01,3155  0 3175 1          TC      EJ1
02853  REF  17  LAST 1111   01,3156  0 5701 1          TC      CCSHOLE
02854                       01,3157  1 3160 1          TCF     +1
```

```
P0286                 EVALUATE THE RESULTS OF THE SCAN.

 0287   REF 152  LAST 1111   01,3160  10 131 0              CCS      BUF +1          SEE IF THERE ARE ANY ACTIVE JOBS WAITING
 0288   REF  18  LAST 1112   01,3161   0 5701 1             TC       CCSHOLE
 0289   REF  19  LAST 1113   01,3162   0 5701 1             TC       CCSHOLE

 0290                        01,3163   1 3165 1             TCF      +2
 0291   REF   3  LAST  235   01,3164   1 3210 0             TCF      DUMMYJOB
 0292   REF 153  LAST 1113   01,3165  10 130 1              CCS      BUF             BUF IS ZERO IF THIS IS A PRIOCHNG AND
 0293                        01,3166   1 3170 0             TCF      +2              CHANGED PRIORITY IS STILL HIGHEST.
 0294   REF   2  LAST 1106   01,3167   1 2770 1             TCF      ENDPRCHG -1

 0295   REF 351  LAST 1111   01,3170  50 000 1              INDEX    A               OTHERWISE, SET NEWJOB TO THE RELATIVE
 0296                        01,3171   3 7777 0             CAF      0 -1            ADDRESS OF THE NEW JOB'S CORE SET.
 0297   REF   1              01,3172   6 3136 0             AD       -CCSPR
 0298   REF  20  LAST 1108   01,3173  54 067 1              TS       NEWJOB
 0299   REF   4  LAST 1108   01,3174   1 2710 1             TCF      CHANJOB -2

 0300   REF 154  LAST 1113   01,3175  54 132 0  EJ1         TS       BUF +2
 0301   REF 155  LAST 1113   01,3176   6 0131 1             AD       BUF +1          - OLD HIGH PRIORITY.
 0302   REF 352  LAST 1113   01,3177  10 000 0              CCS      A
 0303   REF 156  LAST 1113   01,3200   4 0132 0             CS       BUF +2
 0304   REF   1              01,3201   1 3204 0             TCF      EJ2             NEW HIGH PRIORITY.
 0305                        01,3202  13 203 1              NOOP
 0306   REF   3  LAST 1103   01,3203   1 6762 0             TCF      Q+2

 0308   REF 157  LAST 1113   01,3204  54 131 0  EJ2         TS       BUF +1
 0309   REF 304  LAST 1105   01,3205   3 0002 0             CA       Q
 0310   REF 158  LAST 1113   01,3206  54 130 1              TS       BUF
 0311   REF   4  LAST 1113   01,3207   1 6762 0             TCF      Q+2
```

```
P0314              IDLING AND COMPUTER ACTIVITY (GREEN) LIGHT MAINTENANCE. THE IDLING ROUTINE IS NOT A JOB IN ITSELF,
R0316    BUT RATHER A SUBROUTINE OF THE EXECUTIVE.

 0318    REF   4  LAST  302       1361                      EBANK= SELFRET          SELF-CHECK STORAGE IN EBANK.

 0319    REF 230  LAST 1111    01,3210  4 4746 1  DUMMYJOB CS     ZERO            SET NEWJOB TO -0 FOR IDLING.
 0320    REF  21  LAST 1113    01,3211  54 067 1           TS     NEWJOB
 0321                          01,3212  0 0003 1           RELINT
 0322    REF  72  LAST 1108    01,3213  4 4743 1           CS     TWO             TURN OFF THE ACTIVITY LIGHT.
 0323                          01,3214  0 0006 1           EXTEND
 0324    REF  31  LAST 1108    01,3215  03 011 1           WAND   DSALMOUT
 0328    REF  22  LAST 1114    01,3216  10 067 1  ADVAN    CCS    NEWJOB          IS A NEWJOB ACTIVE ?
 0329    REF   1               01,3217  1 3015 1           TCF    NUCHANG2        YES... ONE REQUIRING A CHANGE JOB.
 0330    REF  73  LAST 1114    01,3220  3 4743 0           CAF    TWO             NEW JOB ALREADY IN POSITION FOR
 0331    REF   1               01,3221  1 3230 1           TCF    NUDIRECT        EXECUTION.

 0335    REF   6  LAST  217    01,3222  25'356 0           INCR   DUMLOOPS        COUNT DUMMYJOB LOOPS FOR DOWNLINK

 0336    REF   5  LAST 1114    01,3223  3 1361 1           CA     SELFRET
 0337    REF 229  LAST 1111    01,3224  54 001 1           TS     L               PUT RETURN ADDRESS IN L.
 0338    REF   1               01,3225  3 3227 0           CAF    SELFBANK
 0339    REF   5  LAST  613    01,3226  1 5170 0           TCF    SUPDXCHZ + 1     AND DISPATCH JOB.

 0340    REF   6  LAST 1114       1361                     EBANK= SELFRET
 0341    REF   3  LAST  303    01,3227   66102 1  SELFBANK BBCON  SELFCHK

 0342                          01,3230  0 0006 1  NUDIRECT EXTEND                 TURN THE GREEN LIGHT BACK ON.
 0343    REF  32  LAST 1114    01,3231  05 011 1           WOR    DSALMOUT
 0344    REF  42  LAST 1110    01,3232  52 165 1           DXCH   LOC             JOBS STARTED IN THIS FASHION MUST BE
 0345    REF   6  LAST 1114    01,3233  1 5167 0           TCF    SUPDXCHZ

 0346                             5167                     BLOCK  2               IN FIXED-FIXED SO OTHERS MAY USE.

 0347    REF   2 LAST 1101 TO 1104:     68     68*         COUNT* $$/EXEC
R0348    SUPDXCHZ - ROUTINE TO TRANSFER TO SUPERBANK.
R0349    CALLING SEQUENCE
A0350                                                      TCF    SUPDXCHZ        WITH 2CADR OF DESIRED LOCATION IN A + L.

 0351    REF 230  LAST 1114       5167  56 001 0  SUPDXCHZ XCH    L               BASIC.
 0352                             5170  0 0006 1  +1       EXTEND
 0353    REF  18  LAST 1108       5171  01 007 1           WRITE  SUPERBNK
 0354    REF  34  LAST 1108       5172  54 006 0           TS     BBANK
 0355    REF 231  LAST 1114       5173  0 0001 0           TC     L

 0356                             5174   77677 1  NEG100   OCT    77677
```

```
R0001    PROGRAM DESCRIPTION                                                                           DATE - 10 OCTOBER 1966
R0003    MOD NO - 2                                                                                    LOG SECTION - WAITLIST
R0005    MOD BY - MILLER    (DTMAX INCREASED TO 162.5 SEC)                                             ASSEMBLY SUNBURST REV 5
R00072   MOD 3 BY KERNAN  (INHINT INSERTED AT WAITLIST)  2/28/68 SKIPPER REV 4

R00073   MOD 4BY KERNAN (TWIDDLE IN 54)  3/28/68 SKIPPER REV 13.
R000799

R0008    FUNCTIONAL DESCRIPTION-
R0009            PART OF A SECTION OF PROGRAMS,-WAITLIST, TASKOVER, T3RUPT, USED  TO CALL A PROGRAM, (CALLED A TASK),
R0011       WHICH IS TO BEGIN IN C(A) CENTISECONDS.  WAITLIST UPDATES TIME3, LST1 AND LST2. THE MEANING OF THESE LISTS
R0013       FOLLOW.

R0014                         C(TIME3)  = 16384 -(T1-T) CENTISECONDS, (T=PRESENT TIME, T1-TIME FOR TASK1)
R0016

R0017                                      C(LST1)     = -(T2-T1)+1
R0018                                      C(LST1 +1) = -(T3-T2)+1
R0019                                      C(LST1 +2) = -(T4-T3)+1
R0020                                                   .
R0021                                                   .
R0022                                      C(LST1 +6) = -(T8-T7)+1
R0023                                      C(LST1 +7) = -(T9-T8)+1

R0024                                      C(LST2)     = 2CADR OF TASK1
R0025                                      C(LST2 +2) = 2CADR OF TASK2
R0026                                                   .
R0027                                                   .
R0028                                      C(LST2 +14)= 2CADR OF TASK8
R0029                                      C(LST2 +16)= 2CADR OF TASK9

R0030    WARNINGS-
R0031    --------
R0032                     1) 1 <= C(A) <= 16250D (1 CENTISECOND TO 162.5 SEC)
R0033                     2) 9 TASKS MAXIMUM
R0034                     3) TASKS CALLED UNDER INTERRUPT INHIBITED
R0035                     4) TASKS END BY TC TASKOVER

R0036    CALLING SEQUENCE-

R0037                     L-1     CA      DELTAT    (TIME IN CENTISECONDS TO TASK START)
R0039                     L       TC      WAITLIST
R0040                     L+1     2CADR   DESIRED TASK
R0041                     L+2     (MINOR OF 2CADR)
R0042                     L+3     RELINT            (RETURNS HERE)

R00421   TWIDDLE-
R00422   -------
R00423                    TWIDDLE IS FOR USE WHEN THE TASK BEING SET UP IS IN THE SAME EBANK AND FBANK AS THE USER.   IN
R00425                    SUCH CASES, IT IMPROVES UPON WAITLIST BY ELIMINATING THE NEED FOR THE BBCON HALF OF THE 2CADR,
R00427                SAVING A WORD.   TWIDDLE IS LIKE WAITLIST IN EVERY RESPECT EXCEPT CALLING SEQUENCE, TO WIT-

R0043                 L-1     CA      DELTAT
R00431                L       TC      TWIDDLE
R00432                L+1     ADRES   DESIRED TASK
R00433                L+2     RELINT                    (RETURNS HERE)

R00439  NORMAL EXIT MODES-

R0044                 AT L+3 OF CALLING SEQUENCE

R0045   ALARM OR ABORT EXIT MODES-

R0046                 TC      ABORT
R0047                 OCT     1203    (WAITLIST OVERFLOW - TOO MANY TASKS)

R0048   ERASABLE INITIALIZATION REQUIRED-

R0049                 ACCOMPLISHED BY FRESH START,--LST2,...,  LST2 +16 =ENDTASK
R0050                                               LST1,...,  LST1 +7  =NEG1/2

R0051   OUTPUT--

R0052                 LST1 AND LST2 UPDATED WITH NEW TASK AND ASSOCIATED TIME.
R0053   DEBRIS-

R0054                 CENTRALS- A,Q,L
R0055                 OTHER   - WAITEXIT, WAITADR, WAITTEMP, WAITBANK
R0056   DETAILED ANALYSIS OF TIMING-

R0057             CONTROL WILL NOT BE RETURNED TO THE SPECIFIED ADDRESS (2CADR)   IN EXACTLY DELTA T CENTISECONDS.
R0059       THE APPROXIMATE TIME MAY BE CALCULATED AS FOLLOWS

R0060                 LET T0 = THE TIME OF THE TC WAITLIST
R0061                 LET TS = T0 +147U + COUNTER INCREMENTS (SET UP TIME)
R0062                 LET X  = TS -(1)0TS)/100  (VARIANCE FROM COUNTERS)
R0063                 LET Y  = LENGTH OF TIME OF INHIBIT INTERRUPT AFTER T3RUPT
R0064                 LET Z  = LENGTH OF TIME TO PROCESS TASKS WHICH ARE DUE THIS T3RUPT BUT DISPATCHED EARLIER.
R0066       (Z=0, USUALLY)
R0067                 LET DELTD = THE ACTUAL TIME TAKEN TO GIVE CONTROL TO 2CADR
R0068              THEN   DELTD = TS+DELTA T -X +Y +Z +1.05MS* +COUNTERS*
R0069       *-THE TIME TAKEN BY WAITLIST ITSELF AND THE COUNTER TICKING DURING THIS WAITLIST TIME.
R0071

R0072             IN SHORT, THE ACTUAL TIME TO RETURN CONTROL TO A 2CADR IS AUGMENTED BY THE TIME TO SET UP THE TASK:S
R0074       INTERRUPT, ALL COUNTERS TICKING, THE T3RUPT PROCESSING TIME, THE WAITLIST PROCESSING TIME AND THE POSSIBILITY
R0076       OF OTHER TASKS INHIBITING THE INTERRUPT.

 0077                           5175                      BLOCK  02
 0078    REF  14  LAST  232   E3,1400                        EBANK= LST1            TASK  LISTS IN SWITCHED E BANK.

 0079    REF   1                                             COUNT* $$/WAIT
 00795                          5175  0 0004 0  TWIDDLE  INHINT
 0080    REF 232  LAST 1114     5176  54 001 1           TS       L                 SAVE DELAY TIME IN L
 0081    REF  33  LAST 1078     5177  3 4724 1           CA       POSMAX
 0082    REF 305  LAST 1113     5200  26 002 1           ADS      Q                 CREATING OVERFLOW AND Q-1 IN Q
 0083    REF  35  LAST 1114     5201  3 0006 1           CA       BBANK
 00832                          5202  0 0006 1           EXTEND
 00834   REF  19  LAST 1114     5203  04 007 1           ROR      SUPERBNK
 0084    REF 233  LAST 1117     5204  56 001 0           XCH      L

 00849                          5205  0 0004 0  WAITLIST INHINT
 0085    REF 306  LAST 1117     5206  56 002 0           XCH      Q                 SAVE DELTA T IN Q AND RETURN IN
 0086    REF   1                5207  54 061 1           TS       WAITEXIT          WAITEXIT.
 0087                           5210  0 0006 1           EXTEND
 0088    REF   2  LAST 1117     5211  5 0061 0           INDEX    WAITEXIT          IF TWIDDLING, THE TS SKIPS TO HERE
 0089                           5212  3 0001 0           DCA      0                 PICK UP 2CADR OF TASK.
 0090    REF   1                5213  54 063 0  -1       TS       WAITADR           BBCON WILL REMAIN IN L
 0091    REF   1                5214  3 5222 0  DLY2     CAF      WAITBB            ENTRY FROM FIXDELAY AND VARDELAY.
 0092    REF  36  LAST 1117     5215  56 006 1           XCH      BBANK
 0093    REF   1                5216  1 3234 0           TCF      WAIT2

R0094              RETURN TO CALLER AFTER TASK INSERTION:

 0095    REF   3  LAST 1117     5217  52 062 1  LVWTLIST DXCH     WAITEXIT
 0096    REF  74  LAST 1114     5220  6 4743 0           AD       TWO
 0097                           5221  52 006 0           DTCB

 0099    REF  15  LAST 1117   E3,1400                    EBANK= LST1
 0100    REF   2  LAST 1117     5222   02063 0  WAITBB   BBCON    WAIT2

R0101              RETURN TO CALLER +2 AFTER WAITING DT SPECIFIED AT CALLER +1.

 0102    REF 307  LAST 1117     5223  50 002 0  FIXDELAY INDEX    Q                 BOTH ROUTINES MUST BE CALLED UNDER
 0103                           5224  3 0000 1           CAF      0                 WAITLIST CONTROL AND TERMINATE THE TASK
 0104    REF 308  LAST 1117     5225  24 002 0           INCR     Q                 IN WHICH THEY WERE CALLED.

R0105              RETURN TO CALLER +1 AFTER WAITING THE DT AS ARRIVING IN A.

 0106    REF 309  LAST 1117     5226  56 002 0  VARDELAY XCH      Q                 DT TO Q. TASK ADRES TO WAITADR.
 0107    REF   2  LAST 1117     5227  54 063 0           TS       WAITADR
 0108    REF  37  LAST 1117     5230  3 0006 1           CA       BBANK             BBANK IS SAVED DURING DELAY.
 0109                           5231  0 0006 1           EXTEND
 0110    REF  20  LAST 1117     5232  04 007 1           ROR      SUPERBNK          ADD SBANK TO BBCON.
 0111    REF 234  LAST 1117     5233  54 001 1           TS       L
 0112    REF   1                5234  3 5237 1           CAF      DELAYEX
 0113    REF   4  LAST 1117     5235  54 061 1           TS       WAITEXIT          GO TO TASKOVER AFTER TASK ENTRY.
 0114    REF   1                5236  1 5214 1           TCF      DLY2
 0115    REF  62  LAST  964        5237  1 5261 0  DELAYEX  TCF     TASKOVER -2      RETURNS TO TASKOVER
```

```
R0116   ENDTASK MUST BE ENTERED IN FIXED-FIXED SO IT IS DISTINGUISHABLE BY ITS ADRES ALONE.

 0118   REF  16  LAST 1117   E3,1400                        EBANK= LST1
 0119   REF   1                 5240    72535 1  ENDTASK -2CADR  SVCT3
 0119   REF   1                 5241    73714 1

 0120   REF  22  LAST  924      5242  10 076 1  SVCT3     CCS    FLAGWRD2        DRIFT FLAG
 0121   REF  63  LAST 1118      5243   1 5263 1           TCF    TASKOVER
 0122   REF  64  LAST 1119      5244   1 5263 1           TCF    TASKOVER
 0123                           5245   1 5246 0           TCF    +1

 01231  REF   3  LAST  233      5246  11'301 0  CKIMUSE   CCS    IMUCADR         DON'T DO NBDONLY IF SOMEONE ELSE IS IN
 01232  REF   1                 5247   1 5260 1           TCF    SVCT3X          IMUSTALL.
 01233                          5250   1 5253 1           TCF    +3
 01234  REF   2  LAST 1119      5251   1 5260 1           TCF    SVCT3X
 01235  REF   3  LAST 1119      5252   1 5260 1           TCF    SVCT3X

 0124   REF   1                 5253   3 7744 1     +3    CAF    PRIO35          COMPENSATE FOR NBD COEFFICIENTS ONLY.
 0125   REF  24  LAST  866      5254   0 5063 1           TC     NOVAC               ENABLE EVERY 81.93 SECONDS
 0126   REF   6  LAST  860   E3,1460                      EBANK= NBDX
 0127   REF   1                 5255    03625 0           2CADR  NBDONLY
 0127   REF   1                 5256    14063 1
 0128   REF  65  LAST 1119      5257   1 5263 1           TCF    TASKOVER


 01281  REF  15  LAST  777      5260   0 5223 1  SVCT3X   TC     FIXDELAY        DELAY MAX OF 2 TIMES FOR IMUZERO.
 01282                          5261    00764 1           DEC    500
 01283  REF   2  LAST 1119      5262   0 5242 0           TC     SVCT3           CHECK DRIFT FLAG AGAIN.
```

```
P0129             BEGIN TASK INSERTION.

 0130                         01,3234                        BANK    01
 0131   REF    1                                             COUNT*  $$/WAIT
 0132   REF    1              01,3234  54 062 1  WAIT2       TS      WAITBANK        BBANK OF CALLING PROGRAM.
 01322  REF 310  LAST 1117    01,3235  3 0002 0              CA      Q
 01324                        01,3236  0 0006 1              EXTEND
 01326  REF    1              01,3237  6 3525 0              BZMF    WAITPOOH

 0133   REF    2  LAST  230   01,3240  4 0026 1              CS      TIME3
 0134   REF   38  LAST 1051   01,3241  6 4735 1              AD      BIT8            BIT 8 = OCT 200
 0135   REF  353  LAST 1113   01,3242  10 000 0              CCS     A               TEST 200 - C(TIME3).  IF POSITIVE,
A0136                                            IT MEANS THAT TIME3 OVERFLOW HAS OCCURRED PRIOR TO CS  TIME3 AND THAT
A0137                                            C(TIME3) = T - T1, INSTEAD OF 1.0 - (T1 - T).  THE FOLLOWING FOUR
A0138                                            ORDERS SET C(A) = TD - T1 + 1 IN EITHER CASE.

 0139   REF    3  LAST 1097   01,3243  6 6130 0              AD      OCT40001        OVERFLOW HAS OCCURRED.  SET C(A) =
 0140   REF  354  LAST 1120   01,3244  4 0000 0              CS      A               T - T1 + 1.0 - 201

R0141   NORMAL CASE (C(A) NNZ) YIELDS SAME C(A):  -( -(1.0-(T1-T)) + 200) - 1

 0142   REF    1              01,3245  6 3373 0              AD      OCT40201
 0143   REF  311  LAST 1120   01,3246  6 0002 0              AD      Q               RESULT = TD - T1 + 1.

 0144   REF  355  LAST 1120   01,3247  10 000 0              CCS     A               TEST TD - T1 + 1

 0145   REF   17  LAST 1119   01,3250  6 1400 1              AD      LST1            IF TD - T1 POS, GO TO WTLST5 WITH
 0146   REF    1              01,3251  1 3313 1              TCF     WTLST5          C(A) = (TD - T1) + C(LST1) = TD-T2+1

 0147                         01,3252  13 253 1              NOOP
 0148   REF  312  LAST 1120   01,3253  4 0002 1              CS      Q

R0149   NOTE THAT THIS PROGRAM SECTION IS NEVER ENTERED WHEN T-T1 G/E -1,
R0150   SINCE TD-T1+1 = (TD-T) + (T-T1+1), AND DELTA T = TD-T G/E +1 .  (G/E
R0151   SYMBOL MEANS GREATER THAN OR EQUAL TO).  THUS THERE NEED BE NO CON-
R0152   CERN OVER A PREVIOUS OR IMMINENT OVERFLOW OF TIME3 HERE.

 0153   REF    1              01,3254  6 4727 1              AD      POS1/2          WHEN TD IS NEXT, FORM QUANTITY
 0154   REF    2  LAST 1120   01,3255  6 4727 1              AD      POS1/2            1.0 - DELTA T = 1.0 - (TD - T)
 0155   REF    3  LAST 1120   01,3256  56 026 0              XCH     TIME3
 0156   REF    7  LAST 1041   01,3257  6 4726 0              AD      NEGMAX
 0157   REF  313  LAST 1120   01,3260  6 0002 0              AD      Q               1.0 - DELTAT T NOW COMPLETE.
 0158                         01,3261  0 0006 1              EXTEND                  ZERO INDEX Q.
 0159                         01,3262  22 007 0              QXCH    7               (ZQ)
 0160   REF  18  LAST 1120   01,3263  57'400 1  WTLST4   XCH     LST1
 0161   REF  19  LAST 1121   01,3264  57'401 0           XCH     LST1 +1
 0162   REF  20  LAST 1121   01,3265  57'402 0           XCH     LST1 +2
 0163   REF  21  LAST 1121   01,3266  57'403 1           XCH     LST1 +3
 0164   REF  22  LAST 1121   01,3267  57'404 0           XCH     LST1 +4
 0165   REF  23  LAST 1121   01,3270  57'405 1           XCH     LST1 +5
 0166   REF  24  LAST 1121   01,3271  57'406 1           XCH     LST1 +6
 0167   REF  25  LAST 1121   01,3272  57'407 0           XCH     LST1 +7

 0168   REF   3  LAST 1117   01,3273  3 0063 1           CA      WAITADR          (MINOR PART OF TASK CADR HAS BEEN IN L.)
 0169   REF 314  LAST 1120   01,3274  50 C02 0           INDEX   Q
 0170                        01,3275  1 3276 0           TCF     +1

 0171   REF  24  LAST  746   01,3276  53'411 0           DXCH    LST2
 0172   REF  25  LAST 1121   01,3277  53'413 1           DXCH    LST2 +2
 0173   REF  26  LAST 1121   01,3300  53'415 1           DXCH    LST2 +4
 0174   REF  27  LAST 1121   01,3301  53'417 0           DXCH    LST2 +6
 0175   REF  28  LAST 1121   01,3302  53'421 0           DXCH    LST2 +8D
 0176   REF  29  LAST 1121   01,3303  53'423 1           DXCH    LST2 +10D        AT END, CHECK THAT C(LST2+10) IS STD
 0177   REF  30  LAST 1121   01,3304  53'425 1           DXCH    LST2 +12D
 0178   REF  31  LAST 1121   01,3305  53'427 0           DXCH    LST2 +14D
 0179   REF  32  LAST 1121   01,3306  53'431 1           DXCH    LST2 +16D
 0180   REF   3  LAST  232   01,3307  6 5240 1           AD      ENDTASK            END ITEM, AS CHECK FOR EXCEEDING
A0181                                                                               THE LENGTH OF THE LIST.
 0182                        01,3310  0 0006 1           EXTEND                   DUMMY TASK ADRES SHOULD BE IN FIXED-
 0183   REF   1              01,3311  1 5217 1           BZF     LVWTLIST         FIXED SO ITS ADRES ALONE DISTINGUISHES
 0184   REF   1              01,3312  1 3366 0           TCF     WTABORT          IT.
 0185   REF 356  LAST 1120   01,3313  10 000 0  WTLST5    CCS       A                   TEST  TD - T2 + 1
 0186   REF  26  LAST 1121   01,3314  6 1401 0            AD        LST1 +1
 0187                        01,3315  1 3321 0            TCF       +4
 0188   REF 103  LAST 1109   01,3316  6 4744 1            AD        ONE
 0189   REF   1              01,3317  0 3377 1            TC        WTLST2
 0190                        01,3320   00001 0            OCT       1

 0191   REF 357  LAST 1122   01,3321  10 000 0  +4        CCS       A                   TEST  TD - T3 + 1
 0192   REF  27  LAST 1122   01,3322  6 1402 0            AD        LST1 +2
 0193                        01,3323  1 3327 0            TCF       +4
 0194   REF 104  LAST 1122   01,3324  6 4744 1            AD        ONE
 0195   REF   2  LAST 1122   01,3325  0 3377 1            TC        WTLST2
 0196                        01,3326   00002 0            OCT       2

 0197   REF 358  LAST 1122   01,3327  10 000 0  +4        CCS       A                   TEST  TD - T4 + 1
 0198   REF  28  LAST 1122   01,3330  6 1403 1            AD        LST1 +3
 0199                        01,3331  1 3335 0            TCF       +4
 0200   REF 105  LAST 1122   01,3332  6 4744 1            AD        ONE
 0201   REF   3  LAST 1122   01,3333  0 3377 1            TC        WTLST2
 0202                        01,3334   00003 1            OCT       3

 0203   REF 359  LAST 1122   01,3335  10 000 0  +4        CCS       A                   TEST  TD - T5 + 1
 0204   REF  29  LAST 1122   01,3336  6 1404 0            AD        LST1 +4
 0205                        01,3337  1 3343 1            TCF       +4
 0206   REF 106  LAST 1122   01,3340  6 4744 1            AD        ONE
 0207   REF   4  LAST 1122   01,3341  0 3377 1            TC        WTLST2
 0208                        01,3342   00004 0            OCT       4

 0209   REF 360  LAST 1122   01,3343  10 000 0  +4        CCS       A                   TEST  TD - T6 + 1
 0210   REF  30  LAST 1122   01,3344  6 1405 1            AD        LST1 +5
 0211                        01,3345  1 3351 1            TCF       +4
 0212   REF 107  LAST 1122   01,3346  6 4744 1            AD        ONE
 0213   REF   5  LAST 1122   01,3347  0 3377 1            TC        WTLST2
 0214                        01,3350   00005 1            OCT       5

 0215   REF 361  LAST 1122   01,3351  10 000 0   +4       CCS       A                   TEST TD - T7 + 1
 0216   REF  31  LAST 1122   01,3352  6 1406 1            AD        LST1 +6
 0217                        01,3353  1 3357 1            TCF       +4
 0218   REF 108  LAST 1122   01,3354  6 4744 1            AD        ONE
 0219   REF   6  LAST 1122   01,3355  0 3377 1            TC        WTLST2
 0220                        01,3356   00006 1            OCT       6
```

```
0221   REF 362  LAST 1122   01,3357  10 000 0    +4         CCS      A
0222   REF  32  LAST 1122   01,3360  6 1407 0               AD       LST1 +7
0223                        01,3361  1 3365 0               TCF      +4
0224   REF 109  LAST 1122   01,3362  6 4744 1               AD       ONE
0225   REF   7  LAST 1122   01,3363  0 3377 1               TC       WTLST2
0226                        01,3364   00007 0               OCT      7

0227   REF 363  LAST 1123   01,3365  10 000 0    +4         CCS      A
0228   REF   1              01,3366  0 3374 1  WTABORT      TC       FILLED
0229                        01,3367  13 370 1               NOOP                         CAN'T GET HERE
0230   REF 110  LAST 1123   01,3370  6 4744 1               AD       ONE
0231   REF   8  LAST 1123   01,3371  0 3377 1               TC       WTLST2
0232                        01,3372   00010 0               OCT      10

0233                        01,3373   40201 0  OCT40201     OCT      40201
```

```
 02332  REF   5  LAST 1117   01,3374  52 062 1  FILLED   DXCH   WAITEXIT
 02334  REF   5  LAST 1105   01,3375  0 5712 0           TC     BAILOUT1        NO ROOM IN THE INN
 02336                       01,3376   31203 1           OCT    31203
```

```
R0234   THE ENTRY TO WTLST2 JUST PRECEDING OCT  N  IS FOR T  LE TD LE T   -1.
R0235                                                     N            N+1

R0236   (LE MEANS LESS THAN OR EQUAL TO).  AT ENTRY, C(A) = -(TD - T   + 1)
R0237                                                            N+1

R0238   THE LST1 ENTRY -(T    - T +1) IS TO BE REPLACED BY -(TD - T + 1), AND
R0239                     N+1   N                                 N

R0240   THE ENTRY -(T    - TD + 1) IS TO BE INSERTED IMMEDIATELY FOLLOWING.
R0241                N+1

 0242   REF   1               01,3377  54 064 1  WTLST2   TS      WAITTEMP           C(A) = -(TD - T    + 1)
 0243   REF 315  LAST 1121    01,3400  50 002 0           INDEX   Q
 0244                         01,3401  3 0000 1           CAF     Q
 0245   REF 316  LAST 1125    01,3402  54 002 1           TS      Q               INDEX VALUE INTO Q.

 0246   REF 111  LAST 1123    01,3403  3 4744 1           CAF     ONE
 0247   REF   2  LAST 1125    01,3404  6 0064 0           AD      WAITTEMP
 0248   REF 317  LAST 1125    01,3405  50 C02 0           INDEX   Q               C(A) = -(TD - T ) + 1.
 0249   REF  33  LAST 1123    01,3406  27'377 1           ADS     LST1 -1                         N

 0250   REF   3  LAST 1125    01,3407  4 0064 1           CS      WAITTEMP
 0251   REF 318  LAST 1125    01,3410  50 002 0           INDEX   Q
 0252   REF   1               01,3411  1 3263 1           TCF     WTLST4

R0253   C(TIME3) = 1.0 - (T1 - T)

R0254   C(LST1   ) = - (T2 - T1) + 1
R0255   C(LST1+1) = - (T3 - T2) + 1
R0256   C(LST1+2) = - (T4 - T3) + 1
R0257   C(LST1+3) = - (T5 - T4) + 1
R0258   C(LST1+4) = - (T6 - T5) + 1

R0259   C(LST2    ) = 2CADR  TASK1
R0260   C(LST2+2 ) = 2CADR  TASK2
R0261   C(LST2+4 ) = 2CADR  TASK3
R0262   C(LST2+6 ) = 2CADR  TASK4
R0263   C(LST2+8 ) = 2CADR  TASK5
R0264   C(LST2+10) = 2CADR  TASK6
```

```
P0265            ENTERS HERE ON T3 RUPT TO DISPATCH WAITLISTED TASK.

 0266                          01,3412  0 0006 1  T3RUPT   EXTEND
 0267  REF  21  LAST 1117      01,3413  04 007 1           RDR      SUPERBNK        READ CURRENT SUPERBANK VALUE AND
 0268  REF   6  LAST  989      01,3414  54 016 1           TS       BANKRUPT        SAVE WITH E AND E BANK VALUES.
 0269                          01,3415  0 0006 1           EXTEND
 0270  REF   6  LAST  989      01,3416  22 012 1           QXCH     QRUPT

 0271  REF   6  LAST 1093      01,3417  3 4725 0  T3RUPT2  CAE      NEG1/2          DISPATCH WAITLIST TASK.
 0272  REF  34  LAST 1125      01,3420  57'407 0           XCH      LST1 +7
 0273  REF  35  LAST 1126      01,3421  57'406 1           XCH      LST1 +6
 0274  REF  36  LAST 1126      01,3422  57'405 1           XCH      LST1 +5
 0275  REF  37  LAST 1126      01,3423  57'404 0           XCH      LST1 +4         1.  MOVE UP LST1 CONTENTS, ENTERING
 0276  REF  38  LAST 1126      01,3424  57'403 1           XCH      LST1 +3             A VALUE OF 1/2 +1 AT THE BOTTOM
 0277  REF  39  LAST 1126      01,3425  57'402 0           XCH      LST1 +2             FOR T6-T5, CORRESPONDING TO THE
 0278  REF  40  LAST 1126      01,3426  57'401 0           XCH      LST1 +1             INTERVAL 81.91 SEC FOR ENDTASK.
 0279  REF  41  LAST 1126      01,3427  57'400 1           XCH      LST1
 0280  REF  34  LAST 1117      01,3430  6 4724 1           AD       POSMAX          2. SET T3 = 1.0 - T2 -T USING LIST 1.
 0281  REF   4  LAST 1120      01,3431  26 026 1           ADS      TIME3           SO T3 WONT TICK DURING UPDATE.
 0282  REF   4  LAST  531      01,3432  54 332 1           TS       RUPTAGN
 0283  REF 231  LAST 1114      01,3433  4 4746 1           CS       ZERO
 0284  REF   5  LAST 1126      01,3434  54 332 1           TS       RUPTAGN         SETS RUPTAGN TO +1 ON OVERFLOW.

 0285                          01,3435  0 0006 1           EXTEND                   DISPATCH TASK.
 0286  REF   4  LAST 1121      01,3436  4 5241 1           DCS      ENDTASK
 0287  REF  33  LAST 1121      01,3437  53'431 1           DXCH     LST2 +16D
 0288  REF  34  LAST 1126      01,3440  53'427 0           DXCH     LST2 +14D
 0289  REF  35  LAST 1126      01,3441  53'425 1           DXCH     LST2 +12D
 0290  REF  36  LAST 1126      01,3442  53'423 1           DXCH     LST2 +10D
 0291  REF  37  LAST 1126      01,3443  53'421 0           DXCH     LST2 +8D
 0292  REF  38  LAST 1126      01,3444  53'417 0           DXCH     LST2 +6
 0293  REF  39  LAST 1126      01,3445  53'415 1           DXCH     LST2 +4
 0294  REF  40  LAST 1126      01,3446  53'413 1           DXCH     LST2 +2
 0295  REF  41  LAST 1126      01,3447  53'411 0           DXCH     LST2

 0296  REF 235  LAST 1117      01,3450  56 001 0           XCH      L
 0297                          01,3451  0 0006 1           EXTEND
 0298  REF  22  LAST 1126      01,3452  01 007 1           WRITE    SUPERBNK        SET SUPERBANK FROM BBCON OF 2CADR
 0299  REF 236  LAST 1126      01,3453  56 001 0           XCH      L               RESTORE TO L FOR DXCH Z.
 0300                          01,3454  52 006 0           DTCB
```

```
P0301.           RETURN, AFTER EXECUTION OF T3 OVERFLOW TASK:

 0302                               5263                         BLOCK   02
 0303    REF    2 LAST 1117 TO 1120:    54     54*               COUNT*  $$/WAIT
 0304    REF    6  LAST 1126        5263  10 332 1  TASKOVER CCS     RUPTAGN          IF +1 RETURN TO T3RUPT, IF -0 RESUME.
 0305    REF    2  LAST 1117        5264  3 5222 0           CAF     WAITBB
 0306    REF   38  LAST 1117        5265  54 006 0           TS      BBANK
 0307    REF    1                   5266  1 3417 1           TCF     T3RUPT2          DISPATCH NEXT TASK IF IT WAS DUE.

 0308    REF    7  LAST 1126        5267  3 0016 0           CA      BANKRUPT
 0309                               5270  0 0006 1           EXTEND
 0310    REF   23  LAST 1126        5271  01 007 1           WRITE   SUPERBNK         RESTORE SUPERBANK BEFORE RESUME IS DONE

 0311                               5272  0 0006 1  RESUME   EXTEND
 0312    REF    7  LAST 1126        5273  22 012 1           QXCH    QRUPT
 0313    REF    8  LAST 1127        5274  3 0016 0  NOQRSM   CA      BANKRUPT
 0314    REF   39  LAST 1127        5275  56 006 1           XCH     BBANK
 0315    REF   11  LAST  164        5276  52 011 0  NOQBRSM  DXCH    ARUPT
 03155                              5277  0 0003 1           RELINT
 0316                               5300  5 0017 1           RESUME
```

```
P0317   LONGCALL

R0318   PROGRAM DESCRIPTION                                   DATE- 17 MARCH 1967
R0319   PROGRAM WRITTEN BY W.H. VANDEVER                     LOG SECTION WAITLIST
R0320   MOD BY- R. MELANSON TO ADD DOCUMENTATION          ASSEMBLY SUNDISK REV. 100

R0321   FUNCTIONAL DESCRIPTION-
R0322   LONGCALL IS CALLED WITH THE DELTA TIME ARRIVING IN A,L SCALED AS TIME2,TIME1 WITH THE 2CADR OF THE TASK
R0324   IMMEDIATELY FOLLOWING THE TC LONGCALL.  FOR EXAMPLE, IT MIGHT BE DONE AS FOLLOWS WHERE TIMELOC IS THE NAME OF
R0326   A DP REGISTER CONTAINING A DELTA TIME AND WHERE TASKTODO IS THE NAME OF THE LOCATION AT WHICH LONGCALL IS TO
R0328   START

R0329   CALLING SEQUENCE-
A0330                                                       EXTEND
A0331                                                       DCA     TIMELOC
A0332                                                       TC      LONGCALL
A0333                                                       2CADR   TASKTODO

R0334   NORMAL EXIT MODE-
R0335      1). TC     WAITLIST
R0336      2). DTCB   (TO L+3 OF CALLING ROUTINE 1ST PASS THRU LONGCYCL)
R0337      3). DTCB   (TO TASKOVER ON SUBSEQUENT PASSES THRU LONGCYCL)

R0338   ALARM OR ABORT EXIT MODE-
R0339      NONE

R0340   OUTPUT-
R0341      LONGTIME AND LONGTIME+1 = DELTA TIME
R0342      LONGEXIT AND LONGEXIT+1 = RETURN 2CADR
R0343      LONGCADR AND LONGCADR+1 = TASK 2CADR
R0344      A = SINGLE PRECISION TIME FOR WAITLIST

R0345   ERASABLE INITIALIZATION-
R0346      A = MOST SIGNIFICANT PART OF DELTA TIME
R0347      L = LEAST SIGNIFICANT PART OF DELTA TIME
R0348      Q = ADDRESS OF 2CADR TASK VALUE

R0349   DEBRIS-
R0350      A,Q,L
R0351      LONGCADR AND LONGCADR+1
R0352      LONGEXIT AND LONGEXIT+1
R0353      LONGTIME AND LONGTIME+1

R0354   *** THE FOLLOWING IS TO BE IN FIXED-FIXED AND UNSWITCHED ERRASIBLE ***

 0355                           5301                       BLOCK   02
 0356   REF  42  LAST 1126   E3,1400                       EBANK= LST1
 0357   REF   1                 5301  53'153 0  LONGCALL DXCH    LONGTIME        OBTAIN THE DELTA TIME

 0358                           5302  0 0006 1             EXTEND                  OBTAIN THE 2CADR
 0359   REF 319  LAST 1125       5303   5 0002 0              NDX      Q
 0360                            5304   3 0001 0              DCA      0
 0361   REF   1                  5305   53'147 0              DXCH     LONGCADR

 0362                            5306   0 0006 1              EXTEND                      NOW GO TO THF APPRORRIATE SWITCHED BANK
 0363   REF   1                  5307   3 5312 1              DCA      LGCL2CDR           FOR THE REST OF LONGCALL
 0364                            5310   52 C06 0              DTCB

 0365   REF  43  LAST 1128   E3,1400                          EBANK=   LSTI
 0366   REF   1                  5311    03455 0    LGCL2CDR  2CADR    LNGCALL2
 0366   REF   1                  5312    02063 0

R0367   *** THE FOLLOWING MAY BE IN A SWITCHED BANK, INCLUDING ITS ERASABLE ***

 0368                        01,3455                          BANK     01
 0369   REF   2 LAST 1120 TO 1127:    145    145*             COUNT*   $$/WAIT
 0370   REF   1              01,3455    23'435 1  LNGCALL2  LXCH     LONGEXIT +1        SAVE THE CORRECT BB FOR RETURN
 0371   REF  75  LAST 1117   01,3456    3 4743 0            CA       TWO                OBTAIN THE RETURN ADDRESS
 0372   RFF 320  LAST 1129   01,3457    26 002 1            ADS      Q
 0373   RFF   2  LAST 1129   01,3460    55'434 1            TS       LONGEXIT

 03731  RFF   2  LAST 1128   01,3461    3 1152 0            CA       LONGTIME           CHECK FOR LEGITIMATE DELTA-TIME
 03732  REF 364  LAST 1123   01,3462    10 C00 0            CCS      A
 03733  REF   I              01,3463    1 3471 1            TCF      LONGCYCL           HI-ORDER OK --> ALL IS OK.
 03734                       01,3464    1 3466 1            TCF      +2                 HI-ORDER ZERO --> CHECK LO-ORDER.
 03735  REF   1              01,3465    1 3523 1            TCF      LONGROOH           HI-ORDER NEG. --> NEG. DT
 03736  REF   3  LAST 1129   01,3466    3 1153 1      +2    CA       LONGTIME +I        CHECK LO-ORDER FOR ZERO OR NEGATIVE.
 03737                       01,3467    0 C006 1            EXTEND
 03738  REF   2  LAST 1129   01,3470    6 3523 0            BZMF     LONGPOOH           BAD DELTA-TIME.  ABORT

R0374            *** WAITLIST TASK LONGCYCL ***
 0375                        01,3471    0 0006 1  LONGCYCL  FXTEND                      CAN WE SUCCESFULLY TAKE ABOUT 1.25
 0376   REF   1              01,3472    4 3503 0            DCS      DPBIT14            MINUTES OFF OF LONGTIME
 0377   RFF   4  LAST 1129   01,3473    21'153 0            DAS      LONGTIME

 0378   RFF   5  LAST 1129   01,3474    11'153 0            CCS      LONGTIME +1        THE REASONIBG BEHIND THIS RART IS
 0379   REF   1              01,3475    1 3513 1            TCF      MUCHTIME           INVOLVED, TAKING INTO ACCOUNT THAT THE
A0380                                                                                   WORDS MAY NOT BE SIGNED CORRECTED (DP
A0381                                                                                   BASIC INSTRUCTIONS
A0382                                                                                   DO NOT SIGN CORRECT) AND THAT WE SUBTRAC
A0383                                                                                   TED BIT14 (1 OVER HALF THE ROS. VALUE
A0384                                                                                   REPRESENTIBLE IN SINGLE WORD)
 0385                        01,3476    13 477 1            NOOP                        CAN:T GET HERE     **********
 0386                        01,3477    1 3500 0            TCF      +1
 0387   REF   6  LAST 1129   01,3500    11'152 1            CCS      LONGTIME
 0388   REF   2  LAST 1129   01,3501    1 3513 1            TCF      MUCHTIME
 0389                        01,3502     CCC00 1  DRBIT14   OCT      00000
 0390                        01,3503     20000 0            OCT      20000

A0391                                                                                   LONGCALL
```

```
 0392   REF  66  LAST 1097    01,3504  3 4727 1  LASTTIME CA      BIT14              GET BACK THE CORRECT DELTA TFOR WAITLIST
 0393   REF   7  LAST 1129    01,3505  27'153 0           ADS     LONGTIME +1
 0395   REF  28  LAST  964    01,3506  0 5175 1           TC      TWIDDLE
 0396   REF  44  LAST 1129    E3,1400                     EBANK=  LST1
 0397   REF   1               01,3507   03520 0           ADRES   GETCADR
 0399   REF   1               01,3510  3 3522 1  LONGRTRN CA      TSKOVCDR           SET IT UP SO THAT ONLY THE FIRST EXIT IS
 0400   REF   3  LAST 1129    01,3511  53'435 0           DXCH    LONGEXIT           TO THE CALLER OF LONGCALL
 0401                         01,3512  52 006 0           DTCB                       THE REST ARE TO TASKOVER

 0402   REF  67  LAST 1130    01,3513  3 4727 1  MUCHTIME CA      BIT14              WE HAVE OVER OUR ABOUT 1.25 MINUTES
 0404   REF  32  LAST  862    01,3514  0 5205 0           TC      WAITLIST           SO SET UP FOR ANOTHER CYCLE THROUGH HERE
 0405   REF  45  LAST 1130    E3,1400                     EBANK=  LST1
 0406   REF   2  LAST 1129    01,3515   03471 0           2CADR   LONGCYCL
 0406                         01,3516   02063 0

 0408   REF   1               01,3517  1 3510 1           TCF     LONGRTRN           NOW EXIT PROPERLY

R0409                *** WAITLIST TASK  GETCADR ***
 0410   REF   2  LAST 1129    01,3520  53'147 0  GETCADR  DXCH    LONGCADR           GET THE LONGCALL THAT WE WISHED TO START
 0411   REF   7  LAST 1114    01,3521  1 5167 0           TCF     SUPDXCHZ           AND TRANSFER CONTROL
 0412   REF  66  LAST 1119    01,3522   05263 0  TSKOVCDR GENADR  TASKOVER
 0413   REF   4  LAST 1130    01,3523  53'435 0  LONGPOOH DXCH    LONGEXIT
 0414                         01,3524  1 3526 1           TCF     +2
 0415   REF   6  LAST 1124    01,3525  52 062 1  WAITPOOH DXCH    WAITEXIT
 0416   REF   2  LAST 1077    01,3526  0 5722 0   +2      TC      POODOO1
 0417                         01,3527   21204 1           OCT     21204
```

```
L        LATITUDE LONGITUDE SUBROUTINES                                                            USER'S PAGE NO.   1       EO S3

R0001    SUBROUTINE TO CONVERT RAD VECTOR AT GIVEN TIME TO LAT,LONG AND ALT

R0002    CALLING SEQUENCE

R0003      L-1     CALL
R0004      L               LAT-LONG
R0005    SUBROUTINES USED

R0006     R-TO-RP,ARCTAN,SETGAMMA,SETRE
R0007    ERASABLE INIT. REQ.

R0008      AXO,-AYO,AZO,TEPHEM (SET AT LAUNCH TIME)
R0009    ALPHAV = POSITION VECTOR METERS B-29
R0010      MPAC-- TIME  (CSECS B-28)
R0011     ERADFLAG =1, TO COMPUTE EARTH RADIUS, =0 FOR FIXED EARTH RADIUS
R0012     LUNAFLAG=0 FOR EARTH,1 FOR MOON
R0013    OUTPUT

R0014      LATITUDE IN LAT   (REVS. B-0)
R0015      LONGITUDE IN LONG   (REVS. B-0)
R0016    ALTITUDE IN ALT METERS B-29
 0017                           30,3761                      BANK    30
 0018    REF   1                13,2000                      SETLOC  LATLONG
 0019                           13,2406                      BANK

 0020    REF   1                                             COUNT*  $$/LT-LG
 0021    REF   7   LAST  970    E4,1431                      EBANK=  ALPHAV
 0022                           13,2406   40220 0  LAT-LONG  STQ     SETPD
 0023    REF   2   LAST  150    13,2407   03674 1                    INCORPEX
 0024                           13,2410   00001 0                    0D
 0025                           13,2411   24007 0            STOVL   6D                  SAVE TIME IN 6-7D FOR R-TO-RP
 0026    REF   8   LAST 1131    13,2412   02032 1                    ALPHAV
 0027                           13,2413   51406 1            PUSH    ABVAL               0-5D= R FOR R-TO-RP
 0028    REF   2   LAST  118    13,2414   16070 1            STODL   ALPHAM              ABS. VALUE OF R FOR ALT FORMULA BELOW
 0029    REF   6   LAST 1099    13,2415   24007 0                    ZEROVEC             SET MPAC=0 FOR EARTH,NON-ZERO FOR MOON
 0030                           13,2416   71414 0            BOFF    COS                 USE COS(0) TO GET NON-ZERO IN MPAC
 0031    REF   6   LAST  970    13,2417   01743 0                    LUNAFLAG            0=EARTH,1=MOON
 0032    REF   1                13,2420   26421 1                    CALLRTRP
 0033                           13,2421   77624 1  CALLRTRP  CALL
 0034    REF   5   LAST  977    13,2422   51644 0                    R-TO-RP             RP VECTOR CONVERTED FROM R B-29
 0035                           13,2423   77656 1            UNIT                        UNIT RP B-1
 0036    REF   9   LAST 1131    13,2424   36032 0            STCALL  ALPHAV              U2= 1/2 SINL FOR SETRE SUBR BELOW
 0037    REF   1                13,2425   26605 0                    SETGAMMA             SET GAMMA=B2/A2 FOR EARTH,=1 FOR MOON
 0038                           13,2426   77624 1            CALL                         SCALED B-1
 0039    REF   1                13,2427   26615 1                    SETRE               CALC RE METERS B-29
 0040                           13,2430   63545 0            DLOAD   DSQ
 0041    REF  10   LAST 1131    13,2431   02032 1                    ALPHAV
 0042                           13,2432   63525 0            PDDL    DSQ
 0043    REF  11   LAST 1131    13,2433   02034 1                    ALPHAV +2
 0044                           13,2434   75415 0            DAD     SQRT
```

```
0045                           13,2435   76405 1          DMP     SL1R
0046   REF   1                 13,2436   00011 1                  GAMRP
0047   REF   7  LAST  600      13,2437   14021 1          STODL   COSTH            COS(LAT) B-1
0048   REF  12  LAST 1131      13,2440   02036 0                  ALPHAV +4
0049   REF   7  LAST  600      13,2441   34023 1          STCALL  SINTH            SIN(LAT) B-1
0050   REF   4  LAST  600      13,2442   26545 1                  ARCTAN
0051   REF   5  LAST  930      13,2443   15120 0          STODL   LAT              LAT B0
0052   REF  13  LAST 1132      13,2444   02032 1                  ALPHAV
0053   REF   8  LAST 1132      13,2445   14021 1          STODL   COSTH            COS(LONG) B-1
0054   REF  14  LAST 1132      13,2446   02034 1                  ALPHAV +2
0055   REF   8  LAST 1132      13,2447   34023 1          STCALL  SINTH            SIN(LONG) B-1
0056   REF   5  LAST 1132      13,2450   26545 1                  ARCTAN
0057   REF   5  LAST  930      13,2451   15122 1          STODL   LONG             LONG. REVS B-0 IN RANGE -1/2 TO 1/2
0058   REF   3  LAST 1131      13,2452   02070 1                  ALPHAM
0059                           13,2453   77625 0          DSU                      ALT= R-RE METERS B-29
0060   REF   2  LAST  150      13,2454   03673 0                  ERADM
0061   REF   5  LAST  930      13,2455   35124 0          STCALL  ALT              EXIT WITH ALT METERS B-29
0062   REF   3  LAST 1131      13,2456   03674 1                  INCORPEX
```

```
P0063    SUBROUTINE TO CONVERT LAT,LONG,ALT AT GIVEN TIME TO RADIUS VECTOR
R0064    CALLING SEQUENCE

R0065      L-1     CALL
R0066      L               LALOTORV
R0067    SUBROUTINES USED

R0068     SETGAMMA,SETRE,RP-TO-R
R0069    ERASABLE INIT. REQ.

R0070      AXO,AYO,AZO,TEPHEM  SET AT LAUNCH TIME
R0071      LAT-- LATITUDE  (REVS B0)
R0072      LONG-- LONGITUDE  (REVS B0)
R0073    ALT--ALTITUDE (METERS) B-29
R0074      MPAC-- TIME  (CSECS B-28)
R0075      ERADFLAG =1 TO COMPUTE EARTH RADIUS, =0 FOR FIXED EARTH RADIUS
R0076     LUNAFLAG=0 FOR EARTH,1 FOR MOON
R0077    OUTPUT

R0078    R-VECTOR IN ALPHAV (METERS B-29)
 0079                          13,2457   40220 0  LALOTORV STQ     SETPD            LAT,LONG,ALT TO R VECTOR
 0080    REF   4  LAST 1132    13,2460   03674 1                   INCORPEX
 0081                          13,2461   00001 0                   0D
 0082                          13,2462   34007 1           STCALL  6D               6-7D= TIME FOR RP-TO-R
 0083    REF   2  LAST 1131    13,2463   26605 0                   SETGAMMA         GAMMA=B2/A2 FOR EARTH,1 FOR MOON B-1
 0084                          13,2464   73545 1           DLOAD   SIN                             COS(LONG)COS(LAT) IN MPAC
 0085    REF   6  LAST 1132    13,2465   01120 0                   LAT                    UNIT RP= SIN(LONG)COS(LAT)     2-3D
 0086                          13,2466   65275 1           DMPR    PDDL             PD 2            GAMMA*SIN(LAT)        0-1D
 0087    REF   2  LAST 1132    13,2467   00011 1                   GAMRP
 0088    REF   7  LAST 1133    13,2470   01120 0                   LAT                      0-1D= GAMMA*SIN(LAT) B-2
 0089                          13,2471   65346 0           COS     PDDL             PD 4      2-3D=COS(LAT) B-1 TEMPORARILY
 0090    REF   6  LAST 1132    13,2472   01122 1                   LONG
 0091                          13,2473   57356 0           SIN     DMPR             PD 2
 0092                          13,2474   71525 0           PDDL    COS              PD 4     2-3D=SIN(LONG)COS(LAT) B-2
 0093    REF   8  LAST 1133    13,2475   01120 0                   LAT
 0094                          13,2476   71525 0           PDDL    COS              PD 6      4-5D=COS(LAT) B-1 TEMPORARILY
 0095    REF   7  LAST 1133    13,2477   01122 1                   LONG
 0096                          13,2500   55475 1           DMPR    VDEF             PD 4     MPAC= COS(LONG)COS(LAT) B-2
 0097                          13,2501   41456 0           UNIT    PUSH             0-5D= UNIT RP FOR RP-TO-R SUBR.
 0098    REF  15  LAST 1132    13,2502   36032 0           STCALL  ALPHAV           ALPHAV +4= SINL FOR SETRE SUBR.
 0099    REF   2  LAST 1131    13,2503   26615 1                   SETRE            RE METERS B-29
 0100                          13,2504   43145 0           DLOAD   BOFF             SET MPAC=0 FOR EARTH,NON-ZERO FOR MOON
 0101    REF   7  LAST 1131    13,2505   24007 0                   ZEROVEC
 0102    REF   7  LAST 1131    13,2506   01743 0                   LUNAFLAG
 0103    REF   1               13,2507   26511 0                   CALLRPRT
 0104                          13,2510   77746 1           COS                      USE COS(0) TO GET NON-ZERO IN MPAC
 0105                          13,2511   77624 1  CALLRPRT CALL
 0106    REF   6  LAST  976    13,2512   55716 1                   RP-TO-R          EXIT WITH UNIT R VECTOR IN MPAC
 0107    REF  16  LAST 1133    13,2513   16032 1           STODL   ALPHAV
 0108    REF   3  LAST 1132    13,2514   03673 0                   ERADM
 0109                            13,2515   74215 1             DAD     VXSC            (RE + ALT)(UNIT R) METERS B-30
 0110   REF   6  LAST 1132       13,2516   01124 1                     ALT
 0111   REF  17  LAST 1133       13,2517   02032 1                     ALPHAV
 0112                            13,2520   77772 0             VSL1                    R METERS B-29
 0113   REF  18  LAST 1134       13,2521   36032 0             STCALL  ALPHAV          EXIT WITH R IN METERS B-29
 0114   REF   5  LAST 1133       13,2522   03674 1                     INCORPEX
R0115   SUBROUTINE TO COMPUTE EARTH RADIUS

R0116   INPUT

R0117     1/2 SIN LAT IN ALPHAV +4

R0118   OUTPUT

R0119     EARTH RADIUS IN ERADM AND MPAC  (METERS B-29)

 0120                            13,2523   63545 0  GETERAD    DLOAD   DSQ
 0121   REF  19  LAST 1134       13,2524   02036 0                     ALPHAV +4       SIN**2(L)
 0122                            13,2525   44352 0             SL1     BDSU
 0123   REF   1                  13,2526   24005 1                     DP1/2           COS**2(L)
 0124                            13,2527   44275 1             DMPR    BDSU
 0125   REF   1                  13,2530   26544 0                     EE
 0126   REF   2  LAST 1134       13,2531   24005 1                     DP1/2
 0127                            13,2532   75465 1             BDDV    SQRT
 0128   REF   1                  13,2533   26540 1                     B2XSC
 0129                            13,2534   77622 1             SR4R
 0130   REF   4  LAST 1133       13,2535   03673 0             STORE   ERADM
 0131                            13,2536   77616 0             RVQ

R01311  THE FCLLOWING CONSTANIS WERE COMPLTED WITH A=6378166,B=6356784 METERS
R01312  B2XSC= B**2 SCALED B-51
R01313  B2/A2= B**2/A**2 SCALED B-1
R01314  EE=(1-B**2/A**2) SCALED B-0
 0132                            13,2537   00446 1  B2XSC      2DEC    .0179450689       B**2 SCALED B-51
 0132                            13,2540   00305 1
 0133   REF   8  LAST 1099       12,2004            DP1/2      =       XUNIT
 0134                            13,2541   17711 0  B2/A2      2DEC    .9933064884 B-1   GAMMA= B**2/A**2 B-1
 0134                            13,2542   05254 1
 0135                            13,2543   00155 0  EE         2DEC    6.6935116 E-3     (1-B**2/A**2) B-0
 0135                            13,2544   25250 1
```

```
P0137    ARCTAN SUBROUTINE


R0138    CALLING SEQUENCE

R0139      SIN THETA IN SINTH B-1
R0140      COS THETA IN COSTH B-1
R0141      CALL ARCTAN

R0142    OUTPUT
R0143      ARCTAN THETA IN MPAC AND THETA B-0 IN RANGE -1/2 TO +1/2


 0144                        13,2545   77600 1  ARCTAN   BOV
 0145   REF   1              13,2546   26547 0                    CLROVFLW
 0146                        13,2547   63545 0  CLROVFLW DLOAD    DSQ
 0147   REF   9  LAST 1132   13,2550   00023 0                    SINTH
 0148                        13,2551   63525 0           PDDL     DSQ
 0149   REF   9  LAST 1132   13,2552   00021 1                    COSTH
 0150                        13,2553   77615 0           DAD
 0151                        13,2554   75454 0           BZE      SQRT
 0152   REF   1              13,2555   26573 1                    ARCTANXX       ATAN=0/0  SET THETA=0
 0153                        13,2556   40065 0           BDDV     BOV
 0154   REF  10  LAST 1135   13,2557   00023 0                    SINTH
 0155   REF   1              13,2560   26600 0                    ATAN=90
 0156                        13,2561   67542 0           SP1      ASIN
 0157   REF   3  LAST  943   13,2562   00025 0           STORE    THETA
 0158                        13,2563   50125 1           PDDL     BMN
 0159   REF  10  LAST 1135   13,2564   00021 1                    COSTH
 0160   REF   1              13,2565   26567 1                    NEGCOS
 0161                        13,2566   43545 1           DLOAD    RVQ
 0162                        13,2567   57545 1  NEGCOS   DLOAD    DCOMP
 0163                        13,2570   43244 1           BPL      DAD
 0164   REF   1              13,2571   26575 1                    NEGOUT
 0165   REF   3  LAST 1134   13,2572   24005 1                    DP1/2
 0166   REF   4  LAST 1135   13,2573   00025 0  ARCTANXX STORE    THETA
 0167                        13,2574   77616 0           RVQ

 0168                        13,2575   52025 1  NEGOUT   DSU      GOTO
 0169   REF   4  LAST 1135   13,2576   24005 1                    DP1/2
 0170   REF   2  LAST 1135   13,2577   26573 1                    ARCTANXX
 0171                        13,2600   75345 1  ATAN=90  DLOAD    SIGN
 0172   REF   1              13,2601   11040 0                    LODP1/4
 0173   REF  11  LAST 1135   13,2602   00023 0                    SINTH
 0174   REF   5  LAST 1135   13,2603   00025 0           STORE    THETA
 0175                        13,2604   77616 0           RVQ

 0176   REF   2  LAST  934   12,2006            2DZERO   =        DPZERO
```

```
R0177   ..... SETGAMMA SUBROUTINE .....
R0178   SUBROUTINE TO SET GAMMA FOR THE LAT-LONG AND LALOTORV SUBROUTINES

R0179    GAMMA = B**2/A**2 FOR EARTH (B-1)
R0180    GAMMA = 1 FOR MOON (B-1)

R0181   CALLING SEQUENCE
R0182    L        CALL
R0183    L+1               SETGAMMA

R0184   INPUT
R0185    LUNAFLAG=0 FOR EARTH,=1 FOR MOON

R0186   OUTPUT
R0187    GAMMA IN GAMRP  (B-1)

 0188                          13,2605   43145 0  SETGAMMA DLOAD  BOFF             BRANCH FOR EARTH
 0189   REF   1                13,2606   26542 0                  B2/A2            EARTH GAMMA
 0190   REF   8  LAST 1133     13,2607   01743 0                  LUNAFLAG
 0191   REF   1                13,2610   26613 1                  SETGMEX
 0192                          13,2611   77735 0           SLOAD
 0193   REF   1                13,2612   24005 1                  1B1              MOON GAMMA
 0194   REF   3  LAST 1133     13,2613   00011 1  SETGMEX  STORE  GAMRP
 0195                          13,2614   77616 0           RVQ
 0196                             0010            GAMRP    =      8D
```

```
P0197   .....SETRE SUBROUTINE .....
R0198   SUBROUTINE TO SET RE (EARTH OR MOON RADIUS)

R0199   RE= RM FOR MOON
R0200    RE= RREF FOR FIXED EARTH RADIUS OR COMPUTED RE FOR FISCHER ELLIPSOID

R0201   CALLING SEQUENCE
R0202    L        CALL
R0203    L+1              SETRE

R0204   SUBROUTINES USED
R0205    GETERAD

R0206   INPUT
R0207    ERADFLAG=0 FOR FIXED RE, 1 FOR COMPUTED RE
R0208    ALPHAV +4= 1/2 SINL IF GETERAD IS CALLED
R0209    LUNAFLAG=0 FOR EARTH,=1 FOR MOON

R0210   OUTPUT
R0211    ERADM= 504RM FOR MOON (METERS B-29)
R0212    ERADM= ERAD OR COMPUTED RE FOR EARTH (METERS B-29)

 0213                         13,2615   71220 1  SETRE     STQ     DLOAD
 0214   REF   1               13,2616   00051 0                    SETREX
 0215   REF   1               13,2617   10003 0                    504RM
 0216                         13,2620   71214 0            BON     DLOAD               BRANCH FOR MOON
 0217   REF   9  LAST 1136    13,2621   01703 1                    LUNAFLAG
 0218   REF   1               13,2622   26632 1                    TSTRLSRM
 0219   REF   1               13,2623   10001 1                    ERAD
 0220                         13,2624   45014 0            BOFF    CALL                ERADFLAG=0 FOR FIXED RE,1 FOR COMPUTED
 0221   REF   4  LAST  971    13,2625   00742 0                    ERADFLAG
 0222   REF   1               13,2626   26630 0                    SETRXX
 0223   REF   1               13,2627   26523 1                    GETERAD
 0224   REF   5  LAST 1134    13,2630   37673 1  SETRXX    STCALL  ERADM               EXIT WITH RE OR RM METERS B-29
 0225   REF   2  LAST 1137    13,2631   00051 0                    SETREX
 0226                         13,2632   77214 0  TSTRLSRM  BON     VLOAD               ERADFLAG=0,SET RO=RLS
 0227   REF   5  LAST 1137    13,2633   00702 1                    ERADFLAG                    =1      RO=RM
 0228   REF   2  LAST 1137    13,2634   26630 0                    SETRXX
 0229   REF  15  LAST  980    13,2635   02021 0                    RLS
 0230                         13,2636   64446 0            ABVAL   SR2R                SCALE FROM B-27 TO B-29
 0231                         13,2637   77650 1            GOTO
 0232   REF   3  LAST 1137    13,2640   26630 0                    SETRXX
 0233   REF  13  LAST  969       0051            SETREX    =       S2
```

```
P0001   ..... RP-TO-R SUBROUTINE .....
R0002   SUBROUTINE TO CONVERT RP (VECTOR IN PLANETARY COORDINATE SYSTEM,EITHER
R0003    EARTH-FIXED OR MOON-FIXED) TO R (SAME VECTOR IN THE BASIC REF. SYSTEM)

R0004    R=MT(T)*(RP+LPXRP)     MT= M MATRIX TRANSPOSE

R0005   CALLING SEQUENCE
R0006    L        CALL
R0007    L+1             RP-TO-R

R0008   SUBROUTINES USED
R0009    EARTHMX,MOONMX,EARTHL

R0010      ITEMS AVAILABLE FROM LAUNCH DATA
R0011       504LM= THE LIBRATION VECTOR L OF THE MOON AT TIME TIMSUBL,EXPRESSED
R0012       IN THE MOON-FIXED COORD. SYSTEM    RADIANS  B0
R0013         ITEMS NECESSARY FOR SUBR. USED (SEE DESCRIPTION OF SUBR.)

R0014   INPUT
R0015    MPAC= 0 FOR EARTH,NON-ZERO FOR MOON
R0016    0-5D= RP VECTOR
R0017    6-7D= TIME

R0018   OUTPUT
R0019    MPAC= R VECTOR METERS B-29 FOR EARTH, B-27 FOR MOON

 0020   REF   1              26,2000                  SETLOC PLANTIN1
 0021                        26,3716                  BANK

 0022   REF   2 LAST   54 TO  163:    20    20*       COUNT* $$/LUROT

 0023                        26,3716  46020 1 RP-TO-R  STQ    BHIZ
 0024   REF   1              26,3717  00050 1                RPREXIT
 0025   REF   1              26,3720  55733 0                RPTORA
 0026                        26,3721  77624 1          CALL                    COMPUTE M MATRIX FOR MOON
 0027   REF   1              26,3722  51674 0                MOONMX            LP=LM FOR MOON  RADIANS B0
 0028                        26,3723  77775 1          VLOAD
 0029   REF   1              26,3724  02013 1                504LM
 0030                        26,3725  53235 0 RPTORB   VXV    VAD
 0031   REF   1              26,3726  00001 0                504RPR
 0032   REF   2  LAST 1138   26,3727  00001 0                504RPP
 0033                        26,3730  52105 1          VXM    GOTO
 0034   REF   1              26,3731  00025 0                MMATRIX           MPAC=R=MT(T)*(RP+LPXRP)
 0035   REF   1              26,3732  51662 1                RPRPXXXX          RESET  PUSHLOC TO 0 BEFORE EXITING
 0036                        26,3733  77624 1 RPTORA   CALL                    EARTH COMPUTATIONS
 0037   REF   1              26,3734  55743 1                EARTHMX           M MATRIX B-1
 0038                        26,3735  77624 1          CALL
 0039   PEF   1              26,3736  15765 1                EARTHL            L VECTOR RADIANS B0
 0040                        26,3737  76521 0          MXV    VSL1              LP=M(T)*L  RAD B-0
 0041   REF   2  LAST 1138   26,3740  00025 0                MMATRIX
 0042                                26,3741   77650 1            GOTO
 0043    REF    1                    26,3742   55725 1                    RPTORB
 00432   REF    1                    24,2000                      SETLOC PLANTIN
 00434                               24,3644                      BANK
 00436   REF    1                                                 COUNT* $$/LUROT
```

```
..... R-TO-RP SUBROUTINE .....
SUBROUTINE TO CONVERT R (VECTOR IN REFERENCE COORD. SYSTEM) TO RP
 (VECTOR IN PLANETARY COORD SYSTEM) EITHER EARTH-FIXED OR MOON-FIXED

 RP=M(T)*(R-LXR)

CALLING SEQUENCE
 L        CALL
 L+1              R-TO-RP

SUBROUTINES USED
 EARTHMX,MOONMX,EARTHL

INPUT
 MPAC= 0 FOR EARTH,NON-ZERO FOR MOON
 0-5D= R VECTOR
 6-7D= TIME

   ITEMS AVAILABLE FROM LAUNCH DATA
    504LM= THE LIBRATION VECTOR L OF THE MOON AT TIME TIMSUBL,EXPRESSED
    IN THE MOON-FIXED COORD. SYSTEM   RADIANS B0
      ITEMS NECESSARY FOR SUBROUTINES USED (SEE DESCRIPTION OF SUBR.)

OUTPUT
 MPAC=RP VECTOR METERS B-29 FOR EARTH, B-27 FOR MOON

                        24,3644  46020 1  R-TO-RP   STQ      BHIZ
REF  2  LAST 1138       24,3645  00050 1                     RPREXIT
REF  1                  24,3646  51666 0                     RTORPA
                        24,3647  77624 1            CALL
REF  2  LAST 1138       24,3650  51674 0                     MOONMX
                        24,3651  61375 1            VLOAD    VXM
REF  2  LAST 1138       24,3652  02013 1                     504LM           LP=LM
REF  3  LAST 1138       24,3653  00025 0                     MMATRIX
                        24,3654  77772 0            VSL1                      L=MT(T)*LP  RADIANS B0
                        24,3655  51235 1  RTORPB    VXV      BVSU
REF  3  LAST 1138       24,3656  00001 0                     504RPR
REF  4  LAST 1140       24,3657  00001 0                     504RPR
                        24,3660  77721 0            MXV                      M(T)*(R-LXR) B-2
REF  4  LAST 1140       24,3661  00025 0                     MMATRIX
                        24,3662  40372 0  RPRPXXXX  VSL1     SETPD
                        24,3663  00001 0                     0D
                        24,3664  77650 1            GOTO
REF  3  LAST 1140       24,3665  00050 1                     RPREXIT
                        24,3666  77624 1  RTORPA    CALL                     EARTH COMPUTATIONS
REF  2  LAST 1138       24,3667  55743 1                     EARTHMX
                        24,3670  77624 1            CALL
REF  2  LAST 1138       24,3671  15765 1                     EARTHL
                        24,3672  77650 1            GOTO                     MPAC=L=(-AX,-AY,0) RAD B-0
REF  1                  24,3673  51655 0                     RTORPB
```

```
P0087    ..... MCONMX SUBROUTINE .....
R0088    SUBROUTINE TO COMPUTE THE TRANSFORMATION MATRIX M FOR THE MOON

R00B9    CALLING SEQUENCE.
R0090     L          CALL
R0091     L+1                 MOONMX

R0092    SUBROUTINES USEO
R0093     NEWANGLE

R0094    INPUT
R0095     6-7D= TIME
R0096       ITEMS AVAILABLE FROM LAUNCH OATA
R0097        BSLBO,BOOT
R009B        TIMSUBO,NODIO,NOODOT,FSUBC,FOOT
R0099        CCSI= COS(I) B-1
R0100        SINI= SIN(I) B-1
R0101          I  IS THE ANGLE BETWEEN THE MEAN LUNAR EQUATORIAL PLANE ANO THE
R0102          PLANE OF THE ECLIPTIC  (1 DEGREE  32.1 MINUTES)

R0103    OUTPUT
R0104     MMATRIX= 3X3 M MATRIX B-1   (STORED IN VAC AREA)

 0105                        24,3674   40220 0  MOONMX   STQ     SETPO
 0106    REF   1             24,3675   00051 0                   EARTHMXX
 0107                        24,3676   OCC11 1                   BO
 010B                        24,3677   77770 1           AXT,1                    B REQUIRES SL 0, SL 5 IN NEWANGLE
 0109                        24,3700   00005 1                   5
 0110                        24,3701   65345 0           OLOAO   PDDL             PD 100             B-9D=BSUBO
 0111    REF   1             24,3702   14017 1                   BSUBO                               10-11D= BDOT
 0112    REF   1             24,3703   14011 1                   BOOT
 0113                        24,3704   45006 0           PUSH    CALL             PD 12D
 0114    REF   1             24,3705   51743 0                   NEWANGLE         EXIT WITH PO BO AND MPAC= B  REVS BO
 0115                        24,3706   71406 0           PUSH    COS              PO 10D
 0116    REF   1             24,3707   14041 1           STOOL   COB              PD 80    COS(B) B-1
 0117                        24,3710   77756 0           SIN                               SIN(B) B-1
 0118    REF   1             24,3711   14043 0           STODL   SOB                         SETUP INPUT FOR NEWANGLE
 0119    REF   1             24,3712   14015 0                   FSUBO                               B-90=FSUBO
 0120                        24,3713   41525 0           PODL    PUSH             PO 10D THEN 12D    10-11D=FDOT
 0121    REF   1             24,3714   14007 0                   FDOT
 0122                        24,3715   45170 0           AXT,1   CALL             F REQUIRFS SL 1, SL 6 IN NEWANGLF
 0123                        24,3716   00004 0                   4
 0124    REF   2  LAST 1141  24,3717   51743 0                   NEWANGLE         EXIT WITH PO 8D ANO MPAC= F REVS BO
 0125    REF   1             24,3720   14027 1           STOOL   AVECTR +2        SAVE F TEMP
 0126    REF   1             24,3721   14013 0                   NODIO                               B-9D=NOOIO
 0127                        24,3722   41525 0           PODL    PUSH             PD 100 THEN 12D    10-110=NODDOT
 0128    REF   1             24,3723   14005 1                   NODOOT                              MPAC=T
 0129                        24,3724   45170 0           AXT,1   CALL             NOOE REQUIRES SL 0, SL 5 IN NEWANGLE
 0130                        24,3725   00005 1                   5
 0131    REF   3  LAST 1141  24,3726   51743 0                   NEWANGLE         EXIT WITH PD BD ANO MPAC= NODI REVS BO
```

```
0132                              24,3727     71406 0                PUSH    COS                 PD 10D     B-9D= NODI   REVS  B0
0133                              24,3730     77606 1                PUSH                        PD 12D I0-11D= COS(NODI)  B-1
0134    REF     2  LAST 1141      24,3731     00025 0                STORE   AVECTR
0135                              24,3732     76405 1                DMP     SL1R
0136    REF     2  LAST 1141      24,3733     00041 1                        COB                                              COS(NODI)     B-1
0137    REF     1                 24,3734     14035 1                STODL   BVECTR +2           PD 10D     20-25D=AVECTR= COB*SIN(NODI)
0138                              24,3735     76405 1                DMP     SL1R                                             SOB*SIN(NODI)
0139    REF     2  LAST 1141      24,3736     00043 0                        SOB
0140    REF     2  LAST 1142      24,3737     14037 0                STODL   BVECTR +4           PD 8D
0141                              24,3740     41556 1                SIN     PUSH                PD 10D                      -SIN(NODI)    B-1
0142                              24,3741     52076 1                DCOMP   GOTO                           26-31D=BVECTR= COV*COS(NODI)
0143    REF     1                 24,3742     53712 0                        MOONMXA
01475                             25,3712                            BANK    25
01476   REF     1                 25,2000                            SETLOC  PLANTIN3
01477                             25,3712                            BANK
0147E   REF     1                                                    COUNT*  $$/LUROT

0148    REF     3  LAST 1142      25,3712     14033 1    MOONMXA     STODL   BVECTR              PD BD                         SOB*COS(NODI)
01481   REF     3  LAST 1142      25,3713     00027 1                        AVECTR +2           MOVE F FROM TEMP LOC. TO 504F
014B2   REF     1                 25,3714     14007 0                STODL   504F
01483                             25,3715     76405 1                DMP     SL1R
014B4   REF     3  LAST 1142      25,3716     00041 1                        COB
01485   REF     4  LAST 1142      25,3717     14027 1                STODL   AVECTR +2
0149    REF     1                 25,3720     00011 1                        SINNODI             8-9D=SIN(NODI)  B-1
0150                              25,3721     76405 1                DMP     SL1R
0151    REF     3  LAST 1142      25,3722     0CC43 0                        SOB
0152    REF     5  LAST 1142      25,3723     14031 0                STODL   AVECTR +4                                        0
0153    REF    13  LAST  B55      25,3724     06505 1                        HI6ZEROS                     8-13D= CVECTR= -SOB   B-1
0154                              25,3725     57525 1                PDDL    DCOMP               PD 10D                      COB
0155    REF     4  LAST 1142      25,3726     0CC43 0                        SOB
0156                              25,3727     63325 0                PDDL    PDVL                PD 12D THEN PD 14D
0157    REF     4  LAST 1142      25,3730     00041 1                        COB
015B    REF     4  LAST 1142      25,3731     00033 1                        BVECTR
0159                              25,3732     63361 0                VXSC    PDVL                PD 20D          BVECTR*SINI  B-2
0160    REF     1                 25,3733     14003 1                        SINI
0161    REF     1                 25,3734     00011 1                        CVECTR
0162                              25,3735     53361 0                VXSC    VAD                 PD 14D          CVECTR*COSI  B-2
0163    REF     1                 25,3736     14001 0                        COSI
0164                              25,3737     77772 0                VSL1
0165    REF     5  LAST 1140      25,3740     24041 1                STOVL   MMATRIX +12D        PD BD  M2=BVECTR*SINI+CVECTR*COSI  B-I
0166                              25,3741     63361 0                VXSC    PDVL                PD 14D
0167    REF     2  LAST 1142      25,3742     14003 1                        SINI                                CVECTR*SINI  B-2
016B    REF     5  LAST 1142      25,3743     00033 1                        BVECTR
0169                              25,3744     52361 1                VXSC    VSU                 PD 8D           BVECTR*COSI  B-2
0170    REF     2  LAST 1142      25,3745     14001 0                        COSI
0171                              25,3746     65372 1                VSL1    PDDL                PD 14D
0172    REF     2  LAST 1142      25,3747     00007 0                        504F                8-13D=DVECTR=BVECTR*COSI-CVECTR*SINI B-1
0173                              25,3750     74346 0                COS     VXSC
0174    REF     1                 25,3751     00011 1                        DVECTR
0175                              25,3752     73525 1                PDDL    SIN                 PD 20D  14-19D= DVECTR*COSF  B-2
```

```
 0176   REF    3  LAST 1142    25,3753    00007 0                        504F
 0177                          25,3754    52361 1             VXSC       VSU              PD 14D          AVECTR*SINF  B-2
 0178   REF    6  LAST 1142    25,3755    00025 0                        AVECTR
 0179                          25,3756    77772 0             VSL1
 0180   REF    6  LAST 1142    25,3757    14033 1             STODL      MMATRIX +6       M1= AVECTR*SINF-DVECTR*COSF  8-1
 0181   REF    4  LAST 1143    25,3760    00007 0                        504F
 0182                          25,3761    74356 1             SIN        VXSC             PD 8D
 0183                          25,3762    71525 0             PDDL       COS              PD 14D  8-13D=DVECTR*SINF B-2
 0184   REF    5  LAST 1143    25,3763    0C007 0                        504F
 0185                          25,3764    53361 0             VXSC       VAD              PD 8D          AVECTR*COSF B-2
 0186   RFF    7  LAST 1143    25,3765    00025 0                        AVECTR
 0187                          25,3766    57572 0             VSL1       VCOMP
 0188   REF    7  LAST 1143    25,3767    34025 1             STCALL     MMATRIX          M0= -(AVFCTR*COSF+DVECTR*SINF)  B-1
 0189   REF    2  LAST 1141    25,3770    00051 0                        EARTHMXX
R0190   CCMPUTE X=X0+(XDOT)(T+TO)
R0191   8-9D= XO (REVS 8-0),PUSHLOC SET AT 12D
R0192   10-11D=XDOT (REVS/CSEC) SCALED 8+23 FOR WEARTH,8+28 FCR NODDOT AND 8DOT
R0193                              AND 8+27 FOR FDOT
R0194    X1=DIFFERENCE IN 23 AND SCALING OF XDOT,=0 FOR WEARTH,5 FOR NODDOT AND
R0195                                             BDOT AND 4 FOR FDOT
R0196   6-7D=T (CSEC B-28), TIMSU80= (CSEC B-42 TRIPLF PREC.)

 01962                         24,3743                        BANK       24
 01964  REF    2  LAST 1139    24,2000                        SETLOC     PLANTIN
 01966                         24,3743                        8ANK

 0197                          24,3743    54345 1  NEWANGLE   DLOAD      SR               ENTER PD 12D
 0198                          24,3744    0CC07 0                        6D
 0199                          24,3745    2C617 0                        14D
 0200                          24,3746    72371 1             TAD        TLOAD            CHANGE MODE TO TP
 0201   REF    1               24,3747    01707 0                        TIMSUBO
 0202   REF  724  LAST 1106    24,3750    00155 0                        MPAC
 0203   REF    1               24,3751    14017 1             STODL      TIMSU8M          T+TO CSFC B-42
 0204   REF    2  LAST 1143    24,3752    0C020 0                        TIMSU8M +1
 0205                          24,3753    77605 1             DMP                         PD 10D  MULT BY XDOT IN 10-11D
 0206                          24,3754    43257 0             SL*        DAD              PD 8D   ADD XO IN 8-9D AFTER SHIFTING
 0207                          24,3755    20206 1                        5,1                      SUCH THAT SCALING IS 8-0
 0208                          24,3756    67206 1             PUSH       SLOAD            PD 10D SAVE PARTIAL (X0+XDOT*T) IN 8-9D
 0209   REF    3  LAST 1143    24,3757    0C017 1                        TIMSUBM
 0210                          24,3760    41261 1             SL         DMP
 0211                          24,3761    20212 1                        9D
 0212                          24,3762    00013 0                        10D              XDOT
 0213                          24,3763    43257 0             SL*        DAD              PD 8D   SHIFT SUCH THAT THIS PART OF X
 0214                          24,3764    20213 0                        10D,1                    IS SCALED REVS/CSFC B-0
 02141                         24,3765    77600 1             8OV                         TURN OFF OVEPFLOW IF SET BY SHIFT
 02142                         24,3766    51767 0                        +1               INSTRUCTION BEFORE FXITING
 0215                          24,3767    77616 0             RVQ                         MPAC=X= X0+(XDOT)(T+TO)  REVS 80
```

```
R0216   ..... EARTHMX SUBROUTINE .....
R0217   SUBROUTINE TO COMPUTE THE TRANSFORMATION MATRIX M FOR THE EARTH

R0218   CALLING SEQUENCE
R0219    L       CALL
R0220    L+1            EARTHMX

R0221   SUBROUTINES USED
R0222    NEWANGLE

R0223   INPUT
R0224      INPUT AVAILABLE FROM LAUNCH DATA       AZO  REVS 8-0
R0225                                             TEPHEM  CSEC 8-42
R0226    6-7D= TIME CSEC 8-28

R0227   OUTPUT
R0228    MMATRIX= 3X3 M MATRIX 8-1   (STORED IN VAC AREA)

 02282                        26,3743                      BANK    26
 02284  REF   2  LAST 1138    26,2000                      SETLOC  PLANTIN1
 02286                        26,3743                      BANK
 02288  REF   3 LAST 1138 TO 1139:     21      41*         COUNT*  $$/LUROT

 0229                         26,3743   40220 0   EARTHMX  STQ     SETPD            SET    8-9D=AZO
 0230   REF   3  LAST 1143    26,3744   00051 0                    EARTHMXX
 0231                         26,3745   00011 1                    8D               10-11D=WEARTH
 0232                         26,3746   77770 1            AXT,1                    FOR SL 5, AND SL 10  IN NEWANGLE
 0233                         26,3747   00000 1                    0
 0234                         26,3750   65345 0            DLOAD   PDDL               LEAVING PD SET AT 12D FOR NEWANGLE
 0235   REF   1               26,3751   14023 0                    AZO
 0236   REF   1               26,3752   14021 1                    WEARTH
 0237                         26,3753   45006 0            PUSH    CALL
 0238   REF   4  LAST 1141    26,3754   51743 0                    NEWANGLE
 0239                         26,3755   41401 1            SETPD   PUSH             18-19D=504AZ
 0240                         26,3756   00023 0                    18D                                COS(AZ) SIN(AZ) 0
 0241                         26,3757   65346 0            COS     PDDL             20-37D=  MMATRIX= -SIN(AZ) COS(AZ) 0 8-1
 0242   REF   1               26,3760   00023 0                    504AZ                                0       0     1
 0243                         26,3761   65356 1            SIN     PDDL
 0244   REF  14  LAST 1142    26,3762   06505 1                    HI6ZEROS
 0245                         26,3763   73525 1            PDDL    SIN
 0246   REF   2  LAST 1144    26,3764   00023 0                    504AZ
 0247                         26,3765   65276 1            DCOMP   PDDL
 0248   REF   3  LAST 1144    26,3766   00023 0                    504AZ
 0249                         26,3767   63346 0            COS     PDVL
 0250   REF  15  LAST 1144    26,3770   06505 1                    HI6ZEROS
 0251                         26,3771   41525 0            PDDL    PUSH
 0252   REF   5  LAST  503    26,3772   06503 1                    HIDPHALF
 0253                         26,3773   77650 1            GOTO
 0254   REF   4  LAST 1144    26,3774   00051 0                    EARTHMXX
```

```
P0255    ..... EARTHL SUBROUTINE .....
R0256    SUBROUTINE TO COMPUTE L VECTOR FOR EARTH

R0257    CALLING SEQUENCE
R0258     L        CALL
R0259     L+1              EARTHL

R0260    INPUT
R0261     AXO,AYO SET AT LAUNCH TIME WITH AYO IMMEDIATELY FOLLOWING AXO IN CORE

R0262    OUTPUT
R0263              -AX
R0264      MPAC=   -AY     RADIANS B-0
R0265               0

 026505                          06,3765                           BANK    06
 02651  REF    1                 06,2000                           SETLOC  EARTHLOC
 026515                          06,3765                           BANK
 02652  REF    1                                                   COUNT*  $$/LUROT

 0266                            06,3765    57545 1   EARTHL       DLOAD   DCOMP
 0267   REF    1                 06,3766    01714 1                        AXO
 0268   REF    1                 06,3767    14017 1                STODL   504LPL
 0269   REF    1                 06,3770    01712 1                        -AYO
 0270   REF    2  LAST 1145      06,3771    14021 1                STODL   504LPL +2
 0271   REF    4  LAST  334      06,3772    24007 0                        L06ZEROS
 0272   REF    3  LAST 1145      06,3773    24023 0                STOVL   504LPL +4
 0273   REF    4  LAST 1145      06,3774    00017 1                        504LPL
 0274                            06,3775    77616 0                RVQ
```

```
P0275   CONSTANTS AND ERASABLE ASSIGNMENTS
 0276   REF   5  LAST 1135   12,2004          1B1       =       DP1/2            1  SCALED B-1
 0279   REF  13  LAST 1086      0050          RPREXIT   =       S1               R-TO-RP AND RP-TO-R SUBR EXIT
 0280   REF  14  LAST 1137      0051          EARTHMXX  =       S2               EARTHMX,MOONMX SUBR. EXITS
 0281                           0000          504RPR    =       0D               6 REGS   R OR RP VECTOR
 0282                           0010          SINNODI   =       8D               2        SIN(NODI)
 0283                           0010          DVECTR    =       8D               6        D VECTOR MOON
 0284                           0010          CVECTR    =       8D               6        C VECTR MOON
 0285                           0022          504AZ     =       18D              2       AZ
 0286                           0016          TIMSUBM   =       14D              3        TIME SUB M (MOON) T+TO IN GETAZ
 0287                           0016          504LPL    =       14D              6        L OR LP VECTOR
 0288                           0024          AVECTR    =       20D              6        A VECTOR (MOON)
 0289                           0032          BVECTR    =       26D              6        B VECTOR (MOON)
 0290                           0024          MMATRIX   =       20D              18       M MATRIX
 0291                           0040          COB       =       32D              2        COS(B) B-1
 0292                           0042          SOB       =       34D              2        SIN(B) B-1
 0293                           0006          504F      =       6D               2        F (MOON)
```

```
P0001    INCORP1--PERFORMS THE SIX DIMENSIONAL STATE VECTOR DEVIATION FOR POSITI
R0002   ON AND VELOCITY OR THE NINE DIMENSIONAL DEVIATION OF POSITION,VELOCITY,A
R0003   ND RADAR OR LANDMARK BIAS.THE OUTPUT OF THE BVECTOR ROUTINE ALONG WITH T
R0004   HE ERROR TRANSITION MATRIX(W) ARE USED AS INPUT TO THE ROUTINE.THE DEVIA
R0005   TION IS OBTAINED BY COMPUTING AN ESTIMATED TRACKING MEASUREMENT FROM THE
R0006   CURRENT STATE VECTOR AND COMPARING IT WITH AN ACTUAL TRACKING MEASUREMEN
R0007   T AND APPLYING A STATISTICAL WEIGHTING VECTOR.
R0008   INPUT
R0009      DMENFLG = 0 6DIMENSIONAL BVECTOR  1= 9DIMENSIONAL
R0010            W = ERROR TRANSITION MATRIX 6X6 OR 9X9
R0011     VARIANCE = VARIANCE (SCALAR)
R0012       DELTAQ = MEASURED DEVIATION(SCALAR)
R0013      BVECTOR = 6 OR 9 DIMENSIONAL BVECTOR

R0014   OUTPUT
R0015       DELTAX = STATE VECTOR DEVIATIONS 6 OR 9 DIMENSIONAL
R0016           ZI = VECTOR USED FOR THE INCORPORATION 6 OR 9 DIMENSIONAL
R0017      GAMMA = SCALAR
R0018      OMEGA = OMEGA WEIGHTING VECTOR 6 OR 9 DIMENTIONAL
R0019   CALLING SEQUENCE
R0020      L  CALL INCORP1

R0021   NORMAL EXIT

R0022      L+1 OF CALLING SEQUENCE

 0023                            37,3654                         BANK    37
 0024   REF    1                 23,2000                         SETLOC  MEASINC
 0025                            23,2514                         BANK

 0026   REF    1                                                 COUNT*  $$/INCOR

 0027   REF   18  LAST  616      E5,1400                         EBANK=  W

 0028                            23,2514   77620 0   INCORP1     STQ
 0029   REF    1                 23,2515   02767 0                       EGRESS
 0030                            23,2516   66370 0               AXT,1   SSP
 0031                            23,2517   00066 1                       54D
 0032   REF   14  LAST 1146      23,2520   00051 0                       S1
 0033                            23,2521   00022 1                       18D           IX1 = 54   S1= 18
 0034                            23,2522   66374 1               AXT,2   SSP
 0035                            23,2523   00022 1                       18D
 0036   REF   15  LAST 1146      23,2524   00052 0                       S2
 0037                            23,2525   00006 1                       6             IX2 = 18   S2=6
 0038                            23,2526   63775 1   Z123        VLOAD   MXV*
 0039   REF   23  LAST  601      23,2527   03525 0                       BVECTOR       BVECTOR (0)
 0040   REF   19  LAST 1147      23,2530   02467 0                       W +54D,1
 0041   REF    2  LAST  131      23,2531   12665 1               STORE   ZI +18D,2
 0042                            23,2532   77775 1               VLOAD
 0043   REF   24  LAST 1147      23,2533   03533 1                       BVECTOR +6    BVECTOR (1)
```

```
0044                        23,2534   52717 1             MXV*    VAD*
0045  REF  20  LAST 1147    23,2535   02555 0                     W +108D,1
0046  REF   3  LAST 1147    23,2536   75112 1                     ZI +18D,2
0047  REF   4  LAST 1148    23,2537   12665 1             STORE   ZI +18D,2
0048                        23,2540   77775 1             VLOAD
0049  REF  25  LAST 1147    23,2541   03541 1                     BVECTOR +12D      BVECTOR (2)
0050                        23,2542   52717 1             MXV*    VAD*
0051  REF  21  LAST 1148    23,2543   02643 1                     W +162D,1
0052  REF   5  LAST 1148    23,2544   75112 1                     ZI +18D,2         8(0)*W+B(1)*(W+54)+B(2)*(W+108)FIRST PAS
0053  REF   6  LAST 1148    23,2545   12665 1             STORE   ZI +18D,2         ZI THEN Z2 THEN Z3
0054                        23,2546   77700 0             TIX,1
0055  REF   1               23,2547   46550 0                     INCOR1
0056                        23,2550   43104 0   INCOR1    TIX,2   BON
0057  REF   1               23,2551   46526 1                     Z123              LOOP FOR Z1,Z2,Z3
0058  REF   3  LAST  603    23,2552   02706 1                     DMENFLG
0059  REF   1               23,2553   46557 1                     INCOR1A
0060                        23,2554   77775 1             VLOAD
0061  REF  17  LAST  917    23,2555   06505 1                     ZEROVECS
0062  REF   7  LAST 1148    23,2556   02657 1             STORE   ZI +12D
0063                        23,2557   77201 1   INCOR1A   SETPD   VLOAD
0064                        23,2560   00001 0                     0
0065  REF   8  LAST 1148    23,2561   02643 1                     ZI
0066                        23,2562   47036 1             VSQ     RTB
0067  REF   6  LAST  602    23,2563   21643 0                     TPMODE
0068                        23,2564   47515 0             PDVL    VSQ
0069  REF   9  LAST 1148    23,2565   02651 1                     ZI +6
0070                        23,2566   76234 0             RTB     TAD
0071  REF   7  LAST 1148    23,2567   21643 0                     TPMODE
0072                        23,2570   47515 0             PDVL    VSQ
0073  REF  10  LAST 1148    23,2571   02657 1                     ZI +12D
0074                        23,2572   76234 0             RTB     TAD
0075  REF   8  LAST 1148    23,2573   21643 0                     TPMODE
0076                        23,2574   77171 0             TAD     AXT,2
0077  REF  11  LAST  602    23,2575   02707 0                     VARIANCE
0078                        23,2576   00000 1                     0
0079  REF   2  LAST  131    23,2577   02665 0             STORE   TRIPA             ZI*2 + Z2*2 + Z3*2 + VARIANCE
0080                        23,2600   40151 0             TLOAD   BOV
0081  REF  12  LAST 1148    23,2601   02707 0                     VARIANCE          CLEAR OVFIND
0082                        23,2602   46603 0                     +1
0083  REF   1               23,2603   02670 1             STORE   TEMPVAR           TEMP STORAGE FOR VARIANCE
0084                        23,2604   77654 0             BZE
0085  REF   1               23,2605   46614 0                     INCOR1C
0086                        23,2606   40112 1   INCOR1B   SL2     BOV
0087  REF   2  LAST 1148    23,2607   46614 0                     INCOR1C
0088  REF   2  LAST 1148    23,2610   02670 1             STORE   TEMPVAR
0089                        23,2611   52114 1             INCR,2  GOTO
0090                        23,2612   00001 0             DEC     1
0091  REF   1               23,2613   46606 0                     INCOR1B
0092                        23,2614   61551 1   INCOR1C   TLOAD   ROUND
0093  REF   3  LAST 1148    23,2615   02665 0                     TRIPA
```

```
0094                          23,2616   75405 1            DMP      SQRT
0095    REF   3  LAST 1148    23,2617   02670 1                     TEMPVAR
0096                          23,2620   76257 0            SL*      TAD
0097                          23,2621   57576 1                     0,2
0098    REF   4  LAST 1148    23,2622   02665 0                     TRIPA
0099                          23,2623   63101 1            NORM     INCR,2
0100    REF  19  LAST 1014    23,2624   00050 1                     X2
0101                          23,2625   77775 1            DEC      -2
0102                          23,2626   77134 1            SXA,2    AXT,2
0103    REF   2  LAST  119    23,2627   02102 0                     NORMGAM           NORMALIZATION COUNT -2 FOR GAMMA
0104                          23,2630   00242 0                     162D
0105                          23,2631   40265 1            8DDV     SETPD
0106    REF   7  LAST  917    23,2632   06475 1                     DP1/4TH
0107                          23,2633   00001 0                     0
0108    REF   2  LAST  151    23,2634   03500 1            STORE    GAMMA
0109                          23,2635   60351 0            TLOAD    NORM
0110    REF   5  LAST 1149    23,2636   02665 0                     TRIPA
0111    REF  35  LAST 1086    23,2637   00047 1                     X1
0112                          23,2640   65345 0            DLOAD    PDDL              PD 0-1 = NORM (A)
0113    REF 725  LAST 1143    23,2641   00155 0                     MPAC
0114    REF   8  LAST  602    23,2642   03547 1                     DELTAQ
0115                          23,2643   77701 1            NORM
0116    REF  15  LAST 1147    23,2644   00051 0                     S1
0117                          23,2645   70460 1            XSU,1    SR1
0118    REF  16  LAST 1149    23,2646   00050 1                     S1
0119                          23,2647   41471 0            DDV      PUSH              PD 0-1 = DELTAQ/A
01193                         23,2650   77650 1            GOTO
01196   REF   1               23,2651   45712 1                     NEWZCOMP
0120                          23,2652   77731 1     -3     SSP
0121    REF  16  LAST 1147    23,2653   00052 0                     S2
0122                          23,2654   00066 1                     54D
0123                          23,2655   60775 1   INCOR2   VLOAD    VXM*              COMPUTE OMEGA1,2,3
0124    REF  11  LAST 1148    23,2656   02643 1                     ZI
0125    REF  22  LAST 1148    23,2657   75134 0                     W +162D,2
0126                          23,2660   77206 0            PUSH     VLOAD
0127    REF  12  LAST 1149    23,2661   02651 1                     ZI +6
0128                          23,2662   53303 1            VXM*     VAD
0129    REF  23  LAST 1149    23,2663   75112 1                     W +180D,2
0130                          23,2664   77206 0            PUSH     VLOAD
0131    REF  13  LAST 1149    23,2665   02657 1                     ZI +12D
0132                          23,2666   53303 1            VXM*     VAD
0133    REF  24  LAST 1149    23,2667   75070 1                     W +198D,2
0134                          23,2670   61006 0            PUSH     TIX,2             PD 2-7=OMEGA1,8-13=OMEGA2,14-19=OMEGA3
0135    REF   1               23,2671   46655 0                     INCOR2
0136                          23,2672   45575 1            VLOAD    STADR
0137    REF   2  LAST  151    23,2673   74260 0            STORE    OMEGA +12D
0138                          23,2674   45575 1            VLOAD    STADR
0139    REF   3  LAST 1149    23,2675   74266 0            STORE    OMEGA +6
0140                          23,2676   45575 1            VLOAD    STADR
0141    REF   4  LAST 1149    23,2677   74274 0            STORE    OMEGA
```

```
 0142                            23,2700   77214 0              BON     VLOAD
 0143   REF   4  LAST 1148       23,2701   02706 1                      DMENFLG
 0144   REF   1                  23,2702   46705 1                      INCOR2AB
 0145   REF  18  LAST 1148       23,2703   06505 1                      ZEROVECS
 0146   REF   5  LAST 1149       23,2704   03517 1              STORE   OMEGA +12D
 0147                            23,2705   66374 1   INCOR2AB   AXT,2   SSP
 0148                            23,2706   00022 1                      18D
 0149   REF  17  LAST 1149       23,2707   00052 0                      S2
 0150                            23,2710   00006 1                      6
 0151                            23,2711   77773 1   INCOR3     VLOAD*
 0152   REF   6  LAST 1150       23,2712   74252 1                      OMEGA +18D,2
 0153                            23,2713   53761 1              VXSC    VSL*
 0154                            23,2714   00001 0                      0                    DELTAQ/A
 0155                            23,2715   20201 0                      0,1
 0156   REF   5  LAST  606       23,2716   12707 1              STORE   DELTAX +18D,2
 0157                            23,2717   77304 0              TIX,2   VLOAD
 0158   REF   1                  23,2720   46711 1                      INCOR3
 0159   REF   6  LAST 1150       23,2721   02673 1                      DELTAX +6
 0160                            23,2722   77732 1              VSL3
 0161   REF   7  LAST 1150       23,2723   02673 1              STORE   DELTAX +6
 0162                            23,2724   77650 1              GOTO
 0163   REF   2  LAST 1147       23,2725   02767 0                      EGRESS
```

```
P0164    INCORP2 -INCORPORATES THE COMPUTED STATE VECTOR DEVIATIONS INTO THE
R0165   ESTIMATED STATE VECTOR. THE STATE VECTOR UPDATED MAY BE FOR EITHER THE
R0166   LEM OR THE CSM.DETERMINED BY FLAG VEHUPFLG.(ZERO = LEM) (1 = CSM)
R0167   INPUT
R0168      PERMANENT STATE VECTOR FOR EITHER THE LEM OR CSM
R0169      VEHUPFLG = UPDATE VEHICLE 0=LEM  1=CSM
R0170      W =          ERROR TRANSITION MATRIX
R0171      DELTAX   =  COMPUTED STATE VECTOR DEVIATIONS
R0172      DMENFLG =  SIZE OF W MATRIX (ZERO =6X6) (1=9X9)
R0173      GAMMA    =  SCALAR FOR INCORPORATION
R0174      ZI       =  VECTOR USED IN INCORPORATION
R0175      OMEGA    =  WEIGHTING VECTOR

R0176   OUTPUT
R0177      UPDATED PERMANENT STATE VECTOR

R0178   CALLING SEQUENCE
R0179      L  CALL INCORP2

R0180   NORMAL EXIT
R0181      L+1 OF CALLING SEQUENCE

 0182   REF   1                 23,2000                       SETLOC MEASINC1
 0183                           23,2726                       BANK

 0184   REF   2 LAST 1147 TO 1151:   138   138*               COUNT* $$/INCOR

 0185                           23,2726   45020 1  INCORP2   STQ     CALL
 0186   REF   3  LAST 1150      23,2727   02767 0                    EGRESS
 0187   REF  27  LAST  783      23,2730   27447 0                    INTSTALL
 0188                           23,2731   74375 0            VLOAD   VXSC           CALC. GAMMA * OMEGA1,2,3
 0189   REF   7  LAST 1150      23,2732   03503 1                    OMEGA
 0190   REF   3  LAST 1149      23,2733   03500 1                    GAMMA
 0191   REF   2  LAST  131      23,2734   26713 0            STOVL   OMEGAM1
 0192   REF   8  LAST 1151      23,2735   03511 1                    OMEGA +6
 0193                           23,2736   77761 1            VXSC
 0194   REF   4  LAST 1151      23,2737   03500 1                    GAMMA
 0195   REF   2  LAST  131      23,2740   26721 1            STOVL   OMEGAM2
 0196   REF   9  LAST 1151      23,2741   03517 1                    OMEGA +12D
 0197                           23,2742   77761 1            VXSC
 0198   REF   5  LAST 1151      23,2743   03500 1                    GAMMA
 0199   REF   2  LAST  131      23,2744   02727 1            STORE   OMEGAM3
 0200                           23,2745   77776 1            EXIT
 0201   REF   1                 23,2746  3 3227 0            CAF     54DD           INITIAL IX 1 SETTING FOR W MATRIX
 0202   REF   2  LAST  110      23,2747  55'315 0            TS      WIXA
 0203   REF   1                 23,2750  55'316 0            TS      WIXB
 0204   REF 232  LAST 1126      23,2751  3 4746 0            CAF     ZERO
 0205   REF   1                 23,2752  55'317 1            TS      ZIXA           INITIAL IX 2 SETTING FOR Z COMPONENT
 0206   REF   1                 23,2753  55'320 0            TS      ZIXB
 0207   REF 107  LAST  978      23,2754  0 5355 1  FAZA      TC      PHASCHNG
```

```
0208                        23,2755   04022 0             OCT     04022
0209  REF  71  LAST  981    23,2756  0 5506 1             TC      UPFLAG
0210  REF   2  LAST  713    23,2757   00236 0             ADRES   REINTFLG
0212  REF   2  LAST 1151    23,2760  3 1316 1   FAZA1     CA      WIXB              START FIRST PHASE OF INCORP2
0213  REF   3  LAST 1151    23,2761  55'315 0             TS      WIXA               TO UPDATE 6 OR 9 DIM. W MATRIX IN TEMP
0214  REF   2  LAST 1151    23,2762  3 1320 1             CA      ZIXB
0215  REF   2  LAST 1151    23,2763  55'317 1             TS      ZIXA
0216  REF 218  LAST 1021    23,2764  0 6060 1             TC      INTPRET
0217                        23,2765   73150 1             LXA,1   LXA,2
0218  REF   4  LAST 1152    23,2766   01315 1                     WIXA
0219  REF   3  LAST 1152    23,2767   01317 0                     ZIXA
0220                        23,2770   70731 0             SSP     DLOAD*
0221  REF  17  LAST 1149    23,2771   00051 0                     S1
0222                        23,2772   00006 1                     6
0223  REF  14  LAST 1149    23,2773   75134 0                     ZI,2
0224                        23,2774   60276 1             DCOMP   NORM              CALC UPPER 3X9 PARTITION OF W MATRIX
0225  REF  18  LAST 1150    23,2775   00052 0                     S2
0226                        23,2776   65161 1             VXSC    XCHX,2
0227  REF   3  LAST 1151    23,2777   02713 0                     OMEGAM1
0228  REF  19  LAST 1152    23,3000   00051 0                     S2
0229                        23,3001   57144 1             LXC,2   XAD,2
0230  REF  20  LAST 1149    23,3002   00047 1                     X2
0231  REF   3  LAST 1149    23,3003   02102 0                     NORMGAM
0232                        23,3004   65057 0             VSL*    XCHX,2
0233                        23,3005   57576 1                     0,2
0234  REF  20  LAST 1152    23,3006   00051 0                     S2
0235                        23,3007   77653 1             VAD*
0236  REF  25  LAST 1149    23,3010   02467 0                     W +54D,1
0237  REF   1               23,3011   02735 1             STORE   HOLDW
0238                        23,3012   57543 1             DLOAD*  DCOMP             CALC MIDDLE 3X9 PARTITION OF W MATRIX
0239  REF  15  LAST 1152    23,3013   75134 0                     ZI,2
0240                        23,3014   74301 0             NORM    VXSC
0241  REF  21  LAST 1152    23,3015   00052 0                     S2
0242  REF   3  LAST 1151    23,3016   02721 1                     OMEGAM2
0243                        23,3017   71124 0             XCHX,2  LXC,2
0244  REF  22  LAST 1152    23,3020   00051 0                     S2
0245  REF  21  LAST 1152    23,3021   00047 1                     X2
0246                        23,3022   53674 1             XAD,2   VSL*
0247  REF   4  LAST 1152    23,3023   02102 0                     NORMGAM
0248                        23,3024   57576 1                     0,2
0249                        23,3025   52724 1             XCHX,2  VAD*
0250  REF  23  LAST 1152    23,3026   00051 0                     S2
0251  REF  26  LAST 1152    23,3027   02555 0                     W +108D,1
0252  REF   2  LAST 1152    23,3030   02743 0             STORE   HOLDW +6
0253                        23,3031   77614 1             BOFF
0254  REF   5  LAST 1150    23,3032   02746 0                     DMENFLG           BRANCH IF 6 DIMENSIONAL
0255  REF   1               23,3033   47053 1                     FAZB
0256                        23,3034   57543 1             DLOAD*  DCOMP             CALC LOWER 3X9 PARTITION OF W MATRIX
0257  REF  16  LAST 1152    23,3035   75134 0                     ZI,2
0258                        23,3036   74301 0             NORM    VXSC
```

```
0259    REF   24  LAST 1152   23,3037   00052 0                    S2
0260    REF    3  LAST 1151   23,3040   02727 1                    OMEGAM3
0261                          23,3041   71124 0            XCHX,2  LXC,2
0262    REF   25  LAST 1153   23,3042   00051 0                    S2
0263    REF   22  LAST 1152   23,3043   00047 1                    X2
0264                          23,3044   53674 1            XAD,2   VSL*
0265    REF    5  LAST 1152   23,3045   02102 0                    NORMGAM
0266                          23,3046   57576 1                    0,2
0267                          23,3047   52724 1            XCHX,2  VAD*
0268    REF   26  LAST 1153   23,3050   00051 0                    S2
0269    REF   27  LAST 1152   23,3051   02643 1                    W +162D,1
0270    REF    3  LAST 1152   23,3052   02751 0            STORE   HOLDW +12D
0271                          23,3053   77624 1   FAZB     CALL
0272    REF   16  LAST  603   23,3054   51770 0                    GRP2PC
0273                          23,3055   77776 1            EXIT
0274    REF    5  LAST 1152   23,3056   3 1315 1  FAZB1    CA      WIXA                START 2ND PHASE OF INCORP2 TO TRANSFER
0275    REF    1              23,3057   6 3230 0           AD      6DD                    TEMP REG TO PERM W MATRIX
0276    REF    3  LAST 1152   23,3060   55'316 0           TS      WIXB
0277    REF    4  LAST 1152   23,3061   3 1317 0           CA      ZIXA
0278    REF    2  LAST  230   23,3062   6 7767 0           AD      MINUS2
0279    REF    3  LAST 1152   23,3063   55'320 0           TS      ZIXB
0280    REF  219  LAST 1152   23,3064   0 6060 1           TC      INTPRET
0281                          23,3065   66350 1            LXA,1   SSP
0282    REF    6  LAST 1153   23,3066   01315 1                    WIXA
0283    REF   18  LAST 1152   23,3067   00051 0                    S1
0284                          23,3070   00006 1                    6
0285                          23,3071   77775 1            VLOAD
0286    REF    4  LAST 1153   23,3072   02735 1                    HOLDW
0287    REF   28  LAST 1153   23,3073   06467 1            STORE   W +54D,1
0288                          23,3074   77775 1            VLOAD
0289    REF    5  LAST 1153   23,3075   02743 0                    HOLDW +6
0290    REF   29  LAST 1153   23,3076   06555 1            STORE   W +108D,1
0291                          23,3077   77214 0            BOFF    VLOAD
0292    REF    6  LAST 1152   23,3100   02746 0                    DMENFLG
0293    REF    1              23,3101   47111 0                    FAZB5
0294    REF    6  LAST 1153   23,3102   02751 0                    HOLDW +12D
0295    REF   30  LAST 1153   23,3103   06643 0            STORE   W +162D,1
0296                          23,3104   52100 1   FAZB2    TIX,1   GOTO
0297                          23,3105   47107 1                    +2
0298    REF    1              23,3106   47117 0                    FAZC                DONE WITH W MATRIX. UPDATE STATE VECTOR
0299                          23,3107   77634 0            RTB
0300    REF    1              23,3110   46754 0                    FAZA
0301                          23,3111   43335 0   FAZB5    SLOAD   DAD
0302    REF    4  LAST 1153   23,3112   01321 0                    ZIXB
0303    REF    1              23,3113   07232 0                    12DD
0304                          23,3114   52030 0            BHIZ    GOTO
0305    REF    2  LAST 1153   23,3115   47117 0                    FAZC
0306    REF    1              23,3116   47104 1                    FAZB2
0307                          23,3117   77624 1   FAZC     CALL
0308    REF   17  LAST 1153   23,3120   51770 0                    GRP2PC
```

```
0309                          23,3121   53375 0            VLOAD   VAD              START 3RD PHASE OF INCORP2
0310   REF   5  LAST  602     23,3122   01701 0                    X789             7TH,8TH,9TH,COMPONENT OF STATE VECTOR
0311   REF   8  LAST 1150     23,3123   02701 0                    DELTAX +12D      INCORPORATION FOR X789
0312   REF   2  LAST  151     23,3124   03472 0            STORE   TX789
0313                          23,3125   47014 1            BON     RTB
0314   REF  12  LAST  601     23,3126   00707 1                    VEHUPFLG
0315   REF   1                23,3127   47217 0                    DOCSM
0316   REF   1                23,3130   27026 0                    MOVEPLEM
0317                          23,3131   77004 0  FAZAB     BOVB    AXT,2
0318   REF   2  LAST  583     23,3132   57756 1                    TCDANZIG
0319                          23,3133   00000 1                    0
0320                          23,3134   77014 1            BOFF    AXT,2
0321   REF   5  LAST  720     23,3135   04344 0                    MOONTHIS
0322                          23,3136   47140 1                    +2
0323                          23,3137   00002 0                    2
0324                          23,3140   53775 1            VLOAD   VSR*
0325   REF   9  LAST 1154     23,3141   02665 0                    DELTAX           B27 IF MOON ORBIT, B29 IF EARTH
0326                          23,3142   57205 1                    0 -7,2
0327                          23,3143   40055 0            VAD     BOV
0328   REF   4  LAST  333     23,3144   01521 0                    TDELTAV
0329   REF   1                23,3145   47157 1                    FAZAB1
0330   REF   5  LAST 1154     23,3146   25521 0            STOVL   TDELTAV
0331   REF  10  LAST 1154     23,3147   02673 1                    DELTAX +6        B5 IF MOON ORBIT, B7 IF EARTH
0332                          23,3150   53257 1            VSR*    VAD
0333                          23,3151   57202 0                    0 -4,2
0334   REF   4  LAST  333     23,3152   01527 0                    TNUV
0335                          23,3153   77600 1            BOV
0336   REF   1                23,3154   47163 0                    FAZAB2
0337   REF   5  LAST 1154     23,3155   35527 1            STCALL  TNUV
0338   REF   1                23,3156   47172 0                    FAZAB3
0339                          23,3157   53375 0  FAZAB1    VLOAD   VAD
0340   REF  13  LAST  784     23,3160   01535 0                    RCV
0341   REF  11  LAST 1154     23,3161   02665 0                    DELTAX
0342   REF  14  LAST 1154     23,3162   01535 0            STORE   RCV
0343                          23,3163   53375 0  FAZAB2    VLOAD   VAD
0344   REF  11  LAST  784     23,3164   01543 1                    VCV
0345   REF  12  LAST 1154     23,3165   02673 1                    DELTAX +6
0346   REF  12  LAST 1154     23,3166   01543 1            STORE   VCV
0347                          23,3167   45134 0            SXA,2   CALL
0348   REF   3  LAST  309     23,3170   02030 0                    PBODY
0349   REF   1                23,3171   27720 1                    RECTIFY
03491                         23,3172   77624 1  FAZAB3    CALL
03492  REF  18  LAST 1153     23,3173   51770 0                    GRP2PC
0350                          23,3174   47014 1            BON     RTB
0351   REF  13  LAST 1154     23,3175   00707 1                    VEHUPFLG
0352   REF   1                23,3176   47222 0                    DOCSM1
0353   REF   2  LAST   38     23,3177   27005 1                    MOVEALEM
0354                          23,3200   77624 1            CALL
0355   REF   1                23,3201   26070 1                    SVDWN2           STORE DOWNLINK STATE VECTOR
0356                          23,3202   77624 1  FAZAB4    CALL
```

```
0357   REF  19  LAST 1154   23,3203   51770 0                      GRP2PC          PHASE CHANGE
0358                        23,3204   77214 0             BOFF     VLOAD
0359   REF   7  LAST 1153   23,3205   02746 0                      DMENFLG
0360   REF   1              23,3206   47211 0                      FAZAB5          6 DIMENSIONAL
0361   REF   3  LAST 1154   23,3207   03472 0                      TX789           9 DIMENSIONAL
0362   REF   6  LAST 1154   23,3210   01701 0             STORE    X789
0363                        23,3211   66150 0  FAZAB5     LXA,1    SXA,1
0364   REF   4  LAST 1151   23,3212   02767 0                      EGRESS
0365   REF   9  LAST 1089   23,3213   00052 0                      QPRET
0366                        23,3214   77776 1             EXIT
0367   REF  57  LAST  871   23,3215  0 4626 1             TC       POSTJUMP        EXIT
0368   REF   3  LAST  617   23,3216   27460 0             CADR     INTWAKE
0369                        23,3217   52034 1  DOCSM      RTB      GOTO
0370   REF   1              23,3220   26761 0                      MOVEPCSM
0371   REF   1              23,3221   47131 1                      FAZAB
0372                        23,3222   45034 1  DOCSM1     RTB      CALL
0373   REF   1              23,3223   26732 0                      MOVEACSM
0374   REF   2  LAST  309   23,3224   26114 1                      SVDWN1          STORE DOWNLINK STATE VECTOR
0375                        23,3225   77650 1             GOTO
0376   REF   1              23,3226   47202 1                      FAZAB4
0377   REF  19  LAST 1150   23,2504            ZERUO      =        ZEROVECS
0378                        23,3227   00066 1  54DD       DEC      54
0379                        23,3230   77771 0  6DD        DEC      -6
0380                        23,3231   00014 1  12DD       DEC      12
0400   REF   1              22,2000                       SETLOC   RENDEZ
0401                        22,3712                       BANK
0402   REF   1                                            COUNT*   $$/INCOR

0403                        22,3712   51575 1  NEWZCOMP   VLOAD    ABVAL
0404   REF  17  LAST 1152   22,3713   02643 1                      ZI
0405   REF   1              22,3714   24045 0             STOVL    NORMZI
0406   REF  18  LAST 1155   22,3715   02651 1                      ZI +6
0407                        22,3716   41446 1             ABVAL    PUSH
0408                        22,3717   50025 0             DSU      BMN
0409   REF   2  LAST 1155   22,3720   00045 0                      NORMZI
0410                        22,3721   45724 1                      +3
0411                        22,3722   45545 1             DLOAD    STADR
0412   REF   3  LAST 1155   22,3723   77732 1             STORE    NORMZI
0413                        22,3724   51575 1             VLOAD    ABVAL
0414   REF  19  LAST 1155   22,3725   02657 1                      ZI +12D
0415                        22,3726   45206 1             PUSH     DSU
0416   REF   4  LAST 1155   22,3727   00045 0                      NORMZI
0417                        22,3730   71240 1             BMN      DLOAD
0418                        22,3731   45734 0                      +3
0419                        22,3732   77626 0             STADR
0420   REF   5  LAST 1155   22,3733   77732 1             STORE    NORMZI          LARGEST ABVAL
0421                        22,3734   66145 1             DLOAD    SXA,1
0422   REF   6  LAST 1155   22,3735   00045 0                      NORMZI
0423   REF   7  LAST 1155   22,3736   00044 1                      NORMZI          SAVE X1
0424                        22,3737   62101 0             NORM     INCR,1
```

```
0425   REF  36  LAST 1149   22,3740   00047 1                     X1
0426                        22,3741   00002 0               DEC       2
0427                        22,3742   53775 1               VLOAD     VSL*
0428   REF  2C  LAST 1155   22,3743   02643 1                         ZI
0429                        22,3744   20201 0                         0,1
0430   REF  21  LAST 1156   22,3745   26643 1               STOVL     ZI
0431   REF  22  LAST 1156   22,3746   02651 1                         ZI +6
0432                        22,3747   77657 0               VSL*
0433                        22,3750   20201 0                         0,1
0434   REF  23  LAST 1156   22,3751   26651 1               STOVL     ZI +6
0435   REF  24  LAST 1156   22,3752   02657 1                         ZI +12D
0436                        22,3753   66057 0               VSL*      SXA,1
0437                        22,3754   20201 0                         0,1
0438   REF   8  LAST 1155   22,3755   00045 0                         NORMZI +1         SAVE SHIFT
0439   REF  25  LAST 1156   22,3756   02657 1               STORE     ZI +12D
0440                        22,3757   54150 1               LXA,1     XSU,1
0441   REF   6  LAST 1153   22,3760   02102 0                         NORMGAM
0442   REF   9  LAST 1156   22,3761   00045 0                         NORMZI +1
0443                        22,3762   77660 1               XSU,1
0444   REF  10  LAST 1156   22,3763   00045 0                         NORMZI +1
0445                        22,3764   70130 1               SXA,1     LXC,1
0446   REF   7  LAST 1156   22,3765   02102 0                         NORMGAM
0447   REF  11  LAST 1156   22,3766   00045 0                         NORMZI +1
0448                        22,3767   40270 0               XAD,1     SETPD
0449   REF  12  LAST 1156   22,3770   00044 1                         NORMZI
0450                        22,3771   00003 1                         2D
0451                        22,3772   77650 1               GOTO
0452   REF   2  LAST 1149   22,3773   46652 1                         INCOR2 -3
0453                             0044           NORMZI      =         36D
```

```
L       CONIC  SUBROUTINES                                                          USER'S PAGE NO.   1       EO S3

P0001   PROGRAM DESCRIPTION - ENTIRE CONIC SUBROUTINE LOG SECTION                      DATE - 1 SEPTEMBER 1967
R0003   MOD NO. - 0                                                                    LOG SECTION - CONIC SUBROUTINES
R0005   MOD BY KRAUSE                                                                  ASSEMBLY - COLOSSUS REVISION 88
R0007


R0008   FUNCTIONAL DESCRIPTION -                                            80       90      98
      5 9√      ....√........30√      √       √       √        √       √        √
R0009      ...THE FOLLOWING SET.OF.SUBROUTINES.SOLVE VARIOUS PROBLEMS.INVOLVING.THE TRAJECTORY.PRODUCED BY A CENTRAL
R0011   INVERSE-SQUARE FORCE ACTING ON A POINT MASS, AS OUTLINED IN THE CMC AND LGC LUNAR LANDING MISSION GSOP, SECTION
R0013   5.5.1.2.  A GENERAL USAGE POINT-OF-VIEW WAS TAKEN IN FORMULATING, MECHANIZING, AND SCALING THE SUBROUTINES,
R0015   RATHER THAN OPTIMIZING EACH FOR A PARTICULAR USE.  THEREFORE, MULTIPLE USAGE CAN BE MADE OF THE SUBROUTINES
R0017   INVOLVING ANY REALISTIC SET OF CONSTRAINTS.  IT SHOULD BE NOTED THAT ONLY ONE SET OF CODING IS USED, WHETHER THE
R0019   EARTH, MOON, OR ANY OTHER CELESTIAL BODY IS SPECIFIED AS THE CENTRAL BODY OF THE PROBLEM, PROVIDED ONE OBSERVES
R0021   THE INHERENT SCALE CHANGE REQUIRED IN POSITION, VELOCITY, MU, AND TIME, AS OUTLINED IN MISSION PROGRAMMING
R0023   DEFINITION MEMO NO. 10.  THIS CAN BE ACCOMPLISHED BY SIMPLY ADDING TO THE MUTABLE AND INITIALIZING THE SUBROU-
R0025   TINES APPROPRIATELY.
R0026        DUE TO THE UNIFORMITY OF THE EQUATIONS INVOLVED, CODING WAS MINIMIZED BY TREATING INDIVIDUAL EQUATIONS AND
R0028   BLOCKS OF EQUATIONS AS SUBROUTINES OF LOWER RANK WHENEVER POSSIBLE.  AS A RESULT, THREE BY-PRODUCTS SUBROUTINES,
R0030   DIRECTLY USABLE AS INDEPENDENT SUBROUTINES, WERE GENERATED.


R0031   RESTRICTIONS -

R0032        THE ONLY LIMITATION IN THE SCOPE OF PROBLEM WHICH CAN BE SOLVED BY A PARTICULAR SUBROUTINE IS THE SCALING
R0034   LIMIT OF EACH PARAMETER AS SPECIFIED IN THE GSOP.  THESE SCALING LIMITS WERE CHOSEN SO THAT ALL FEASIBLE TRAJEC-
R0036   TORIES COULD BE HANDLED.
R0037        SINCE THE SUBROUTINES (EXCEPT KEPLER) USE COMMON SUBROUTINES OF LOWER RANK WHICH USE ERASABLE OTHER THAN
R0039   THE PUSHLIST (DUE TO ITS LIMITED SIZE) AND COMMON INTERPRETIVE SWITCHES, THE CONIC SUBROUTINES CANNOT BE ALLOWED
R0041   TO INTERRUPT EACH OTHER.  IT IS UP TO THE USER TO GUARANTEE THIS CONDITION.
R0043
```

```
L       CONIC SUBROUTINES                                                      USER'S PAGE NO.   2      EO S3

P0044   PROGRAM DESCRIPTION - KEPLER SUBROUTINE                             DATE - 11 OCTOBER 1967
R0046   MOD NO. -1                                                                 LOG SECTION - CONIC SUBROUTINES
R0048   MOD BY KRAUSE                                                       ASSEMBLY - COLOSSUS 103 AND SUNDANCE 222
R0050   MOD NO. - 2  (AUGUST 1968) BY ROBERTSON: TO PERMIT BACKDATING BY MORE THAN ONE ORBITAL PERIOD.


R00502  MOD NO. - 3  (DEC 1968) BY ROBERTSON: SUPPRESSION OF X-MODULO-ING


R00503  MOD. NO. - 4  (JAN 1969) BY ROBERTSON: CLEAR OVFIND AT KEPLER ENTRY


R0051   FUNCTIONAL DESCRIPTION -
R0052        THIS SUBROUTINE, GIVEN AN INITIAL STATE VECTOR AND THE DESIRED TRANSFER TIME THROUGH WHICH THE STATE IS TO
P0054   BE UPDATED ALONG A CONIC TRAJECTORY, COMPUTES THE NEW, UPDATED STATE VECTOR.  THE TRAJECTORY MAY BE ANY CONIC
R0056   SECTION - CIRCULAR, ELLIPTIC, PARABOLIC, HYPERBOLIC, OR RECTILINEAR WITH RESPECT TO THE EARTH OR THE MOON.  THE
R0058   USE OF THE SUBROUTINE CAN BE EXTENDED USING OTHER PRIMARY BODIES BY SIMPLE ADDITIONS TO THE MUTABLE WITHOUT
R0060   INTRODUCING ANY CODING CHANGES, ACCEPTING THE INHERENT SCALE FACTOR CHANGES IN POSITION AND VELOCITY.  AN ITERA-
R0062   TION TECHNIQUE IS UTILIZED IN THE COMPUTATION.
R0063        IF A NEGATIVE TIME-OF-FLIGHT IS INPUT, THE PROGRAM WILL SOLVE FOR THE STATE WHICH WOULD BE PRODUCED BY
R0065   EXTRAPOLATING THE POSITION BACKWARD IN TIME.
R00651       IF THE ABSOLUTE VALUE OF THE DESIRED TRANSFER TIME EXCEEDS THE ORBITAL PERIOD, THE SUBROUTINE, THROUGH A
R00653  MODULAR TECHNIQUE, WILL COMPUTE THE STATE CORRESPONDING TO THE DESIRED TIME (WHETHER POSITIVE OR NEGATIVE).
R0066

R0067   THE RESTRICTIONS ARE -
R0068        1. (PREVIOUS RESTRICTION ON THE NEGATIVE DESIRED TRANSFER TIME IS NOW DELETED.)
R0071        2.  THE PARAMETERS IN THE PROBLEM CANNOT EXCEED THEIR SCALING LIMITS AS SPECIFIED IN THE GSOP.  IF
R0073   ANY OF THESE LIMITS ARE EXCEEDED, THE RESULTING SOLUTION WILL BE MEANINGLESS.
R0075

R0076        THE NUMBER OF ITERATIONS AND, THEREFORE, THE COMPUTATION SPEED IS DEPENDENT ON THE ACCURACY OF THE
R0078   GUESS, XKEPNEW.  THE AGC COMPUTATION TIME IS APPROXIMATELY .061 SECONDS FOR INITIALIZATION, .065 SECONDS FOR THE
R0080   FINAL COMPUTATIONS, PLUS .083 SECONDS FOR EACH ITERATION.
R0081


R0082   REFERENCES -
R0083        R-479, MISSION PROGRAMMING DEFINITION MEMO NO. 10, LUNAR LANDING MISSION GSOP, SECTION 5.5, SGA
R0085   MEMO 67-4.
R0086


R0087   INPUT - ERASABLE INITIALIZATION REQUIRED

R0088           * SCALE FACTOR *
R0089   VARIABLE*IN POWERS OF 2*                    DESCRIPTION AND REMARKS
R0090   --------*--------------*                    -----------------------
R0091   RRECT   * +29 FOR EARTH*DP INITIAL POSITION VECTOR IN METERS
R0092           * +27 FOR MOON *
```

```
R0093   VRECT    * +7 FOR EARTH *DP INITIAL VELOCITY VECTOR IN METERS/CENTISECOND
R0094            * +5 FOR MOON  *
R0095   XI (3BD)* NONE           *INDEX REGISTER SET TO -2D OR -10D ACCORDING TO WHETHER THE EARTH OR MOON,
R0097            *                *RESPECTIVELY, IS THE CENTRAL BODY
R0098   TAU.     * +28            *DESIRED TRANSFER TIME IN CENTISECONDS (DP)
R00987           *                *     MAY BE POS OR NEG AND ABSOLUTE VALUE MAY BE GREATER OR LESS THAN ONE ORBITAL PERIOD.
R0099   XKEPNEW * +17 FOR EARTH*DP GUESS OF ROOT X OF KEPLERS EQN IN SQRT(METERS). SIGN SHOULD AGREE WITH THAT OF TAU.
R0100            * +16 FOR MOON *     AND ABS VALUE SHOULD BE LESS THAN THAT CORRESPONDING TO A PERIOD,VIZ, 2PI SQRT(SEMI-
R0101            *                *     MAJOR AXIS),FOR SPEED OF CONVERGENCE,BUT IF EITHER CONDITION FAILS, XKEPNEW IS RESET
R01017           *                *     BY KEPLER TO A POOR BUT VALID GUESS.
R0102   TC       * +28            *DP PREV. VALUE OF TIME IN CENTISECS.  MUST BE LESS THAN ONE ORBITAL PERIOD.
R0103   XPREV    * +17 FOR EARTH*DP PREV. VALUE OF X IN SQRT(METERS).  MUST BE LESS THAN AN X CORRESPONDING TO ONE
R0105            * +16 FOR MOON *     ORBITAL PERIOD,VIZ,2PI SQRT(SEMI-MAJOR AXIS)
R0106


R0107   SUBROUTINES CALLED -
R0108        DELTIME
R0109


R0110   CALLING SEQUENCE AND NORMAL EXIT MODES -

R0111   KEPRTN-2 GOTO                       MUST BE IN INTERPRETIVE MODE BUT OVFIND ARBITRARY.
R0113   KEPRTN-1         KEPLER             RETURNS WITH XPREV IN MPAC. PL IS AT 0.
R0114   KEPRTN   ...                        CONTINUE

R0115   KEPLER MUST NOT BE CALLED DIRECTLY SINCE AN INTERRUPTION OF IT WOULD DESTROY THE ERASABLES IT NEEDS TO COMPLETE
R0117   THE INTERRUPTED JOB.  THEREFORE THE USER MUST CALL CSMCONIC OR LEMCONIC WHICH GUARANTEES NO INTERRUPTS AND WHICH
R0119   ALSO CALLS KEPPREP TO COMPUTE A GUESS OF XKEPNEW.
R0120


R0121   ABORT EXIT MODES -
R0122        NONE
R0123


R0124   OUTPUT -

R0125            * SCALE FACTOR *
R0126   VARIABLE*IN POWERS OF 2*                                DESCRIPTION AND REMARKS
R0127   --------*---------------*                               -----------------------
R0128   RCV      * +29 FOR EARTH*DP TERMINAL POSITION VECTOR IN METERS
R0129            * +27 FOR MOON *
R0130   VCV      * +7 FOR EARTH *DP TERMINAL VELOCITY VECTOR IN METERS/CENTISEC
R0131            * +5 FOR MOON  *
R0132   TC       * +28            *DP TRANSFER TIME IN CENTISECS TO WHICH KEPLER CONVERGED. ALWAYS LESS THAN ONE PERIOD.
R0134   XPREV    * +17 FOR EARTH*DP VALUE OF X IN SQRT(METERS) TO WHCIH KEPLER CONVERGED. ALWAYS LESS THAN THE X
R0136            * +16 FOR MOON *     CORRESPONDING TO ONE PERIOD.
```

```
R0137   FOR OTHER OUTPUT WHICH MAY BE OF USE, SEE DEBRIS.
R0138

R0139   DEBRIS -

R0140        PARAMETERS WHICH MAY BE OF USE -

R0141           * SCALE FACTOR *
R0142   VARIABLE*IN POWERS OF 2*                        DESCRIPTION AND REMARKS
R0143   --------*--------------*                        -----------------------
R0144   URRECT  * +1           *DP UNIT VECTOR OF INITIAL POSITION
R0145   R1      * +29 FOR EARTH*DP MAGNITUDE OF INITIAL POSITION IN METERS
R0146           * +27 FOR MOON *
R0147   ALPHA   * -22 FOR EARTH*DP INVERSE OF SEMIMAJOR AXIS IN 1/METERS
R0148           * -20 FOR MOON *
R01481  TMODULO * +28          *DP INTEGRAL NUMBER OF PERIODS IN  CENTISECS. WHICH WAS SUBTRACTED FROM TAU. TO PRODUCE A
R01483          *              *TAU. OF LESS THAN ONE PERIOD.

R0149        PARAMETERS OF NO USE -
R0150   DP PARAMETERS - EPSILONT, DELX, DELT, RCNORM, XMODULO, PLUS PUSHLIST REGISTERS 0 THROUGH 39D.
R0152
```

```
P0153   PROGRAM DESCRIPTION - LAMBERT SUBROUTINE                                       DATE - 1 SEPTEMBER 1967
R0155   MOD NO. - 0                                                                    LOG SECTION - CONIC SUBROUTINES
R0157   MOD BY KRAUSE                                                                  ASSEMBLY - COLOSSUS REVISION 88
R0159

R0160   FUNCTIONAL DESCRIPTION -

R0161        THIS SUBROUTINE CALCULATES THE INITIAL VELOCITY REQUIRED TO TRANSFER A POINT-MASS ALONG A CONIC TRAJECTORY
R0163   FROM AN INITIAL POSITION TO A TERMINAL POSITION IN A PRESCRIBED TIME INTERVAL.  THE RESULTING TRAJECTORY MAY BE
R0165   A SECTION OF A CIRCLE, ELLIPSE, PARABOLA, OR HYPERBOLA WITH RESPECT TO THE EARTH OR THE MOON.  THE USE OF THE
R0167   SUBROUTINE CAN BE EXTENDED USING OTHER PRIMARY BODIES BY SIMPLE ADDITIONS TO THE MUTABLE WITHOUT INTRODUCING ANY
R0169   CODING CHANGES, ACCEPTING THE INHERENT SCALE FACTOR CHANGES IN POSITION AND VELOCITY.  AN ITERATION TECHNIQUE IS
R0171   UTILIZED IN THE COMPUTATION.
R0172

R0173   THE RESTRICTIONS ARE -
R0174        1. RECTILINEAR TRAJECTORIES CANNOT BE COMPUTED.
R0175        2. AN ACCURACY DEGRADATION OCCURS AS THE COSINE OF THE TRUE ANOMALY DIFFERENCE APPROACHES +1.0.
R0177        3. THE ANGLE BETWEEN ANY POSITION VECTOR AND ITS VELOCITY VECTOR MUST BE GREATER THAN 1 DEGREE 47.5 MINUTES
R0179   AND LESS THAN 178 DEGREES 12.5 MINUTES.
R0180        4. NEGATIVE TRANSFER TIME IS AMBIGUOUS AND WILL RESULT IN NO SOLUTION.
R0182        5. THE PARAMETERS IN THE PROBLEM MUST NOT EXCEED THEIR SCALING LIMITS SPECIFIED IN THE GSOP.  IF THE
R0184   LIMITS ARE EXCEEDED, THE RESULTING SOLUTION WILL BE MEANINGLESS.
R0185        THE NUMBER OF ITERATIONS AND, THEREFORE, THE COMPUTATIONS SPEED IS DEPENDENT ON THE ACCURACY OF THE FIRST
R0187   GUESS OF THE INDEPENDENT VARIABLE, COGA.                         THE AGC COMPUTATION TIME IS APPROXIMATE-
R0189   LY .105 SECONDS FOR INITIALIZATION, .069 SECONDS FOR FINAL COMPUTATIONS, PLUS .205 SECONDS FOR EACH ITERATION.
R0191


R0192   REFERENCES -
R0193        R-479, MISSION PROGRAMMING DEFINITION MEMO NO. 10, LUNAR LANDING MISSION GSOP-SECTION 5.5, SGA MEMO 67-8,
R0195   SGA MEMO 67-4.
R0196


R0197   INPUT - ERASABLE INITIALIZATION REQUIRED

R0198           * SCALE FACTOR *
R0199   VARIABLE*IN POWERS OF 2*                        DESCRIPTION AND REMARKS
R0200   --------*--------------*                        -----------------------
R0201   R1VEC    * +29 FOR EARTH*DP INITIAL POSITION VECTOR IN METERS
R0202            * +27 FOR MOON *
R0203   R2VEC    * +29 FOR EARTH*DP TARGET OR TERMINAL POSITION VECTOR IN METERS
R0204            * +27 FOR MOON *
R0205   TDESIRED* +28          *DP DESIRED TRANSFER TIME IN CENTISECONDS
R0206   X1 (38D)* NONE         *INDEX REGISTER SET TO -2D OR -10D ACCORDING TO WHETHER THE EARTH OR MOON,
R0208            *             *RESPECTIVELY, IS THE CENTRAL BODY
R0209   GEOMSGN * NONE         *SP +.5 IF DESIRED TRANSFER ANGLE IS LESS THAN 180 DEGREES, -.5 IF GREATER THAN 180 DEG.
R0211   GUESSW  * NONE         *AN INTERPRETER SWITCH TO BE SET IF NO GUESS OF COGA IS AVAILABLE, CLEAR IF A GUESS OF
```

```
R0213              *                *COGA IS TO BE USED BY LAMBERT
R0214   COGA       * +5             *DP GUESS OF COTANGNT OF FLIGHT PATH ANGLE (MEASURED FROM VERTICAL).  THIS WILL BE
R0216                               *IGNORED IF GUESSW IS SET.
R0217   NORMSW     * NONE           *AN INTERPRETER SWITCH TO BE SET IF UN IS TO BE AN INPUT TO THE SUBROUTINE, CLEAR IF
R0219              *                *LAMBERT IS TO COMPUTE ITS OWN NORMAL (UN).
R0220   UN         * +1             *DP UNIT  NORMAL TO THE DESIRED ORBIT PLANE IN THE DIRECTION OF THE RESULTING ANGULAR
R0222              *                *MOMENTUM VECTOR.  THIS WILL BE IGNORED IF NORMSW IS CLEAR.
R0224   VTARGTAG*  NONE             *A S.P. TAG TO BE SET TO ZERO IF LAMBERT IS TO COMPUTE THE VELOCITY AT R2VEC AS WELL AS
R0226              *                *AT R1VEC.
R0227   ITERCTR *  NONE             *A S.P. COUNTER WHICH SPECIFIES THE MAXIMUM NUMBER OF ITERATIONS ALLOWABLE.
R02271             *                *(AN ITERATION MEANS A PASS THRU KEPLER EQN (DELTIME). AT LEAST ONE OF THESE MUST
R02272             *                *ALWAYS OCCUR, EVEN IF COGA CORRESPONDING TO SOLUTION WERE INPUT AS A GUESS.)
R02273             *                *TWENTY ITERATIONS ARE SUFFICIENT TO SOLVE ALL PROBLEMS INCLUDING THOSE WITHOUT GUESS.
R02274

R0228   SUBROUTINES CALLED -
R0229        GEOM, GETX, DELTIME, ITERATOR, LAMENTER (PART OF NEWSTATE)
R0230


R0231   CALLING SEQUENCE AND NORMAL EXIT MODES -

R0232   L          CALL                         MUST BE IN INTERPRETIVE MODE BUT OVFIND ARBITRARY.
R0234   L+1                LAMBERT              RETURNS WITH PL AT 0 AND WITH VVEC IN MPAC IF VTARGTAG WAS NON-ZERO OR VTARGET
R0236                                           IN MPAC IF VTARGTAG WAS ZERO
R0237   L+2        BON                          CONTINUE IF SOLNSW CLEAR SINCE SOLUTION IS ACCEPTABLE
R0239   L+3                SOLNSW
R0240   L+4                LAMABORT
R0241        IF A LAMBERT RESULT IS TO BE A FIRST GUESS FOR THE NEXT LAMBERT CALCULATION, COGA MUST BE PRESERVED AND
R0243   GUESSW MUST BE CLEAR FOR EACH SUCCEEDING LAMBERT CALL.
R0244


R0245   ABORT EXIT MODES -
R0246        IF SOLNSW WAS SET UPON EXITING, EITHER LAMBERT WAS ASKED TO COMPUTE A TRANSFER TOO NEAR 0 OR 360 DEG, OR T
R0248   WAS TOO SMALL TO PRODUCE A REALISTIC TRANSFER BETWEEN R1VEC AND R2VEC.  IN EITHER CASE THE FIX MUST BE MADE
R0250   ACCORDING TO THE NEEDS OF THE PARTICULAR USER.  THE ABORT EXIT MODE MAY BE CODED AS ...
R0252   LAMABORT DLOAD  ABS                           A MEASURE OF PROXIMITY TO 0 OR
R0253                   1-CSTH                        360 DEGREES.
R0254            DSU    BMN
R0255                   ONEBIT
R0256                   CHANGER2                      CHANGE R2VEC DIRECTION SLIGHTLY.
R0257            DLOAD  DAD
R0258                   TDESIRED
R0259                   SOMETIME
R0260            STCALL TDESIRED                      INCREASE TDESIRED
R0261                   LAMBERT
R0262
```

```
R0263   OUTPUT -
R0264           * SCALE FACTOR *
R0265   VARIABLE*IN POWERS OF 2*                         DESCRIPTION AND REMARKS
R0266   --------*--------------*                         -----------------------
R0267   VVEC    * +7 FOR EARTH *DP INITIAL VELOCITY VECTOR IN METERS/CENTISECOND REQUIRED TO SATISFY THE BOUNDARY VALUE
R0269           * +5 FOR MOON  *PROBLEM.
R0270   VTARGET * +7 FOR EARTH *DP RESULTANT VELOCITY VECTOR AT R2VEC IN METERS/CENTISECOND.
R0272           * +5 FOR MOON  *
R0273   SOLNSW  * NONE         *INTERPRETER SWITCH WHICH IS SET IF THE SUBROUTINE CANNOT SOLVE THE PROBLEM, CLEAR IF THE
R0275           *              *SOLUTION EXISTS.
R0276   FOR OTHER OUTPUT WHICH MAY BE OF USE, SEE DEBRIS.
R0277


R0278   DEBRIS -
R0279        PARAMETERS WHICH MAY BE OF USE -

R0280           * SCALE FACTOR *
R0281   VARIABLE*IN POWERS OF 2*                         DESCRIPTION AND REMARKS
R0282   --------*--------------*                         -----------------------
R0283   SNTH    * +1           *DP SIN OF ANGLE BETWEEN R1VEC AND R2VEC
R0284   CSTH    * +1           *DP COSINE OF ANGLE
R0285   1-CSTH  * +2           *DP 1-CSTH
R0286   COGA    * +5           *DP COTAN OF INITIAL REQUIRED FLIGHT PATH ANGLE MEASURED FROM VERTICAL
R0289   P       * +4           *DP RATIO  OF SEMILATUS RECTUM TO INITIAL RADIUS
R0290   R1A     * +6           *DP RATIO OF INITIAL RADIUS TO SEMIMAJOR AXIS
R0291   R1 (32D)* +29 FOR EARTH*DP INITIAL RADIUS IN METERS
R0292           * +27 FOR MOON *
R0293   UR1     * +1           *DP UNIT VECTOR OF R1VEC
R0294   U2      * +1           *DP UNIT VECTOR OF R2VEC

R0295        PARAMETERS OF NO USE
R0296   DP PARAMETERS - EPSILONL, CSTH-RHO, TPREV, TERRLAMB, R2, RTNLAMB (SP),  PLUS PUSHLIST REGISTER 0 THROUGH 41D
R0298   ADDITIONAL INTERPRETIVE SWITCHES USED - INFINFLG, 360SW, SLOPESW, ORDERSW
R0300
```

```
L       CONIC SUBROUTINES                                                                USER'S PAGE NO.   8      EO S3

P0301   PROGRAM DESCRIPTION - TIME-THETA SUBROUTINE                                         DATE - 1 SEPTEMBER 1967
R0303   MOD NO. - 0                                                                         LOG SECTION - CONIC SUBROUTINES
R0305   MOD BY KRAUSE                                                                       ASSEMBLY - COLOSSUS REVISION 88
R0307

R0308   FUNCTIONAL DESCRIPTION -

R0309        THIS SUBROUTINE, GIVEN AN INITIAL STATE VECTOR AND A DESIRED TRUE-ANOMALY-DIFFERENCE THROUGH WHICH THE
R0311   STATE IS TO BE UPDATED ALONG A CONIC TRAJECTORY, CALCULATES THE CORRESPONDING TIME-OF-FLIGHT AND, IN ADDITION,
R0313   PROVIDES THE OPTION OF COMPUTING THE NEW UPDATED STATE VECTOR.  THE RESULTING TRAJECTORY MAY BE A SECTION OF A
R0315   CIRCLE, ELLIPSE, PARABOLA, OR HYPERBOLA WITH RESPECT TO THE EARTH OR THE MOON.  THE USE OF THE SUBROUTINE CAN BE
R0317   EXTENDED USING OTHER PRIMARY BODIES BY SIMPLE ADDITIONS TO THE MUTABLE WITHOUT INTRODUCING ANY CODING CHANGES,
R0319   ACCEPTING THE INHERENT SCALE FACTOR CHANGES IN POSITION AND VELOCITY.
R0320

R0321   THE RESTRICTIONS ARE -
R0322        1. THE ANGLE BETWEEN ANY POSITION VECTOR AND ITS VELOCITY VECTOR MUST BE GREATER THAN 1 DEGREE 47.5 MINUTES
R0324   AND LESS THAN 178 DEGREES 12.5 MINUTES.
R0325        2. THE PARAMETERS IN THE PROBLEM MUST NOT EXCEED THEIR SCALING LIMITS SPECIFIED IN THE GSOP.  IF THE LIMITS
R0327   ARE EXCEEDED, THE RESULTING SOLUTION WILL BE MEANINGLESS.

R0328        THE AGC COMPUTATION TIME IS APPROXIMATELY .292 SECONDS.
R0329


R0330   REFERENCES -
R0331        R-479, MISSION PROGRAMMING DEFINITION MEMO NO. 10, LUNAR LANDING MISSION GSOP-SECTION 5.5, SGA MEMO 67-8.
R0333


R0334   INPUT - ERASABLE INITIALIZATION REQUIRED

R0335          * SCALE FACTOR *
R0336   VARIABLE*IN POWERS OF 2*                        DESCRIPTION AND REMARKS
R0337   --------*--------------*                        -----------------------
R0338   RVEC     * +29 FOR EARTH*DP INITIAL POSITION VECTOR IN METERS
R0339            * +27 FOR MOON *
R0340   VVEC     * +7 FOR EARTH *DP INITIAL VELOCITY VECTOR IN METERS/CENTISECOND
R0341            * +5 FOR MOON  *
R0342   SNTH     * +1           *DP SINE OF TRUE-ANOMALY-DIFFERENCE THROUGH WHICH THE STATE IS TO BE UPDATED
R0344   CSTH     * +1           *DP COSINE OF THE ANGLE
R0345   PVSW     * NONE         *AN INTERPRETIVE SWITCH TO BE SET IF ONLY TIME IS TO BE AN OUTPUT, CLEAR IF THE NEW STATE
R0347            *              *IS TO BE COMPUTED ALSO.
R0348   X1 (38D)*NONE           *INDEX REGISTER TO BE SET TO -2D OR -10D ACCORDING TO WHETHER THE EARTH OR MOON,
R0350            *              *RESPECTIVELY, IS THE CENTRAL BODY.
R0351


R0352   SUBROUTINES CALLED -
```

```
R0353         PARAM, GEOM, GETX, DELTIME, NEWSTATE
R0354


R0355   CALLING SEQUENCE AND NORMAL EXIT MODES -

R0356      IF ONLY TIME IS DESIRED AS OUTPUT -
R0357   L         SET     CALL             MUST BE IN INTERPRETIVE MODE BUT OVFIND ARBITRARY.
R0359   L+1               RVSW
R0360   L+2               TIMETHET         RETURN WITH PL AT 0 AND T IN MPAC
R0361   L+3       ...                      CONTINUE
R0362

R0363      IF THE UPDATE STATE VECTOR IS DESIRED AS WELL -
R0364   L         CLEAR   CALL             MUST BE IN INTERPRETIVE MODE BUT OVFIND ARBITRARY.
R0366   L+1               RVSW
R0367   L+2               TIMETHET         RETURNS WITH PL AT 6.  THE INITIAL POSITION VECTOR IS IN 0D OF THE PUSHLIST AND
R0369                                      THE INITIAL VELOCITY VECTOR IN MPAC.
R0370   L+3       STOVL   NEWVVEC
R0371   L+4       STADR
R0372   L+5       STORE   NEWRVEC                  NEWVVEC AND NEWRVEC ARE SYMBOLIC REPRESENTATIONS OF THE USERS LOCATIONS.
R0374   L+6       ...                              CONTINUE
R0375


R0376   ABORT EXIT MODES -
R0377             IF COGAFLAG AND/OR INFINFLG IS SET AT THE EXIT TO TIME-THETA, TIME-THETA WILL TRANSFER TO POODOO WITH
R0379             AN ALARM CODE (ORIGINALLY 00607), AND NOT RETURN TO THE CALLING PROGRAM. (PCP 692 AND 721).
R0386


R0387   OUTPUT -
R0388           * SCALE FACTOR *
R0389   VARIABLE*IN POWERS OF 2*                           DESCRIPTION AND REMARKS
R0390   --------*--------------*                           -----------------------
R0391   T (30D) * +28           *DP TRANSFER TIME IN CENTISECONDS
R0392   INFINFLG* NONE          *AN INTERPRETIVE SWITCH WHICH IS SET IF THE TRANSFER ANGLE REQUIRES CLOSURE THROUGH
R0394           *               *INFINITY (NO SOLUTION), CLEAR IF A PHYSICAL SOLUTION IS POSSIBLE.
R0396   COGAFLAG* NONE          *AN INTERPRETIVE SWITCH WHICH IS SET IF RESTRICTION 1 HAS BEEN VIOLATED (NO SOLUTION),
R0398           *               *CLEAR IF NOT.

R0399   IN ADDITION, IF RVSW IS CLEAR, THE FOLLOWING ARE OUTPUT-

R0400   MPAC -  * +7 FOR EARTH *DP TERMINAL VELOCITY VECTOR IN METERS/CENTISEC.
R0401    MPAC +5* +5 FOR MOON  *
R0402   0D - 5D * +29 FOR EARTH*DP TERMINAL POSITION VECTOR IN METERS (PL AT 6D)
R0403           * +27 FOR MOON *

R0404   FOR OTHER OUTPUT WHICH MAY BE OF USE, SEE DEBRIS.
R0405
```

```
R0406  DEBRIS -
R0407       PARAMETERS WHICH MAY BE OF USE -
R0408           * SCALE FACTOR *
R0409  VARIABLE*IN POWERS OF 2*                          DESCRIPTION AND REMARKS
R0410  --------*---------------*                          -----------------------
R0411  R1 (32D)* +29 FOR EARTH*DP MAGNITUDE OF INITIAL POSITION VECTOR, RVEC, IN METERS
R0413          * +27 FOR MOON *
R0414  R1A     * +6            *DP RATIO OF R1 TO SEMIMAJOR AXIS (NEG. FOR HYPERBOLIC TRAJECTORIES)
R0416  P       * +4            *DP RATIO OF SEMILATUS RECTUM TO R1
R0417  COGA    * +5            *DP COTAN OF ANGLE BETWEEN RVEC AND VVEC
R0419  UR1     * +1            *DP UNIT VECTOR OF RVEC
R0420  U2      * +1            *DP UNIT VECTOR OF VVEC
R0421  UN      * +1            *DP UNIT VECTOR OF UR1*U2
R0422
R0423       PARAMETERS OF NO USE -
R0424  SP PARAMETERS -  RTNTT, GEOMSGN, RTNPRM, MAGVEC2=R2 (DP), PLUS PUSHLIST LOCATIONS 0-11D, 14D-21D, 24D-39D, 41D
R0426  ADDITIONAL INTERPRETIVE SWITCHES USED - NORMSW, 360SW
R0427
```

```
R0428   PROGRAM DESCRIPTION - TIME-RADIUS SUBROUTINE                           DATE - 11 OCTOBER 1967
R0430   MOD NO. -1                                                                   LOG SECTION - CONIC SUBROUTINES
R0432   MOD BY KRAUSE                                                                ASSEMBLY - COLOSSUS REVISION 88
R0434

R0435   FUNCTIONAL DESCRIPTION -

R0436        THIS SUBROUTINE, GIVEN AN INITIAL STATE VECTOR AND A DESIRED RADIUS TO WHICH THE
R0438   STATE IS TO BE UPDATED ALONG A CONIC TRAJECTORY, CALCULATES THE CORRESPONDING TIME-OF-FLIGHT AND, IN ADDITION,
R0440   PROVIDES THE OPTION OF COMPUTING THE NEW UPDATED STATE VECTOR.  THE RESULTING TRAJECTORY MAY BE A SECTION OF A
R0442   CIRCLE, ELLIPSE, PARABOLA, OR HYPERBOLA WITH RESPECT TO THE EARTH OR THE MOON.  THE USE OF THE SUBROUTINE CAN BE
R0444   EXTENDED USING OTHER PRIMARY BODIES BY SIMPLE ADDITIONS TO THE MUTABLE WITHOUT INTRODUCING ANY CODING CHANGES,
R0446   ACCEPTING THE INHERENT SCALE FACTOR CHANGES IN POSITION AND VELOCITY.
R0447        IF THE DESIRED RADIUS IS BEYOND THE RADIUS OF APOCENTER OF THE CONIC OR BELOW THE RADIUS OF PERICENTER,
R0449   APSESW WILL BE SET AND THE SUBROUTINE WILL RETURN THE APOCENTER OR PERICENTER SOLUTION, RESPECTIVELY.
R0451

R0452   THE RESTRICTIONS ARE -
R0453        1. THE ANGLE BETWEEN ANY POSITION VECTOR AND ITS VELOCITY VECTOR MUST BE GREATER THAN 1 DEGREE 47.5 MINUTES
R0455   AND LESS THAN 178 DEGREES 12.5 MINUTES.
R0456        2. THE PARAMETERS IN THE PROBLEM MUST NOT EXCEED THEIR SCALING LIMITS SPECIFIED IN THE GSOP.  IF THE LIMITS
R0458   ARE EXCEEDED, THE RESULTING SOLUTION WILL BE MEANINGLESS.
R04581       3. AN ACCURACY DEGRADATION OCCURS AS THE SENSITIVITIES OF TIME AND UPDATED STATE VECTOR TO CHANGES IN
R04583  RDESIRED INCREASE.  THIS WILL OCCUR NEAR EITHER APSIS OF THE CONIC AND WHEN THE CONIC IS NEARLY CIRCULAR.  IN
R04585  PARTICULAR, IF THE CONIC IS AN EXACT CIRCLE, THE PROBLEM IS UNDEFINED AND THE SUBROUTINE WILL ABORT.
R04587

R0459        THE AGC COMPUTATION TIME IS APPROXIMATELY .363 SECONDS
R0460


R0461   REFERENCES -
R0462        R-479, MISSION PROGRAMMING DEFINITION MEMO NO. 10, LUNAR LANDING MISSION GSOP-SECTION 5.5, SGA MEMO 67-8.
R0464


R0465   INPUT - ERASABLE INITIALIZATION REQUIRED

R0466           * SCALE FACTOR *
R0467   VARIABLE*IN POWERS OF 2*                    DESCRIPTION AND REMARKS
R0468   --------*---------------*                   -----------------------
R0469   RVEC    * +29 FOR EARTH*DP INITIAL POSITION VECTOR IN METERS
R0470           * +27 FOR MOON *
R0471   VVEC    * +7 FOR EARTH *DP INITIAL VELOCITY VECTOR IN METERS/CENTISECOND
R0472           * +5 FOR MOON  *
R0473   RDESIRED* +29 FOR EARTH*DP TERMINAL RADIAL DISTANCE ON CONIC TRAJECTORY FOR WHICH TRANSFER TIME IS TO BE
R0475           * +27 FOR MOON *COMPUTED.
R0476   SGNRDOT * NONE          *SP TAG SET TO +.5 OR -.5 ACCORDING TO WHETHER THE RADIAL VELOCITY AT RDESIRED IS TO BE
R0478           *               *POSITIVE OR NEGATIVE, RESPECTIVELY.  THIS TAG REDUCES THE DOUBLE-VALUED PROBLEM TO A
```

```
                *                  *SINGLE-VALUED PROBLEM.
X1 (38D)*NONE                      *INDEX REGISTER TO BE SET TO -2D OR -10D ACCORDING TO WHETHER THE EARTH OR MOON,
                *                  *RESPECTIVELY, IS THE CENTRAL BODY.
RVSW       * NONE                  *AN INTERPRETIVE SWITCH TO BE SET IF ONLY TIME IS TO BE AN OUTPUT, CLEAR IF THE NEW STATE
                *                  *IS TO BE COMPUTED ALSO.


SUBROUTINES CALLED -
     PARAM, GEOM, GETX, DELTIME, NEWSTATE


CALLING SEQUENCE AND NORMAL EXIT MODES -

   IF ONLY TIME IS DESIRED AS OUTPUT -
L          SET      CALL              MUST BE IN INTERPRETIVE MODE BUT OVFIND ARBITRARY.
L+1                 RVSW
L+2                 TIMERAD           RETURN WITH PL AT 0 AND T IN MPAC
L+3        ...                        CONTINUE

   IF THE UPDATE STATE VECTOR IS DESIRED AS WELL -
L          CLEAR    CALL              MUST BE IN INTERPRETIVE MODE BUT OVFIND ARBITRARY.
L+1                 RVSW
L+2                 TIMERAD           RETURNS WITH PL AT 6.  THE INITIAL POSITION VECTOR IS IN 0D OF THE PUSHLIST AND
                                      THE INITIAL VELOCITY VECTOR IN MPAC.
L+3        STOVL    NEWVVEC
L+4        STADR
L+5        STORE    NEWRVEC                   NEWVVEC AND NEWRVEC ARE SYMBOLIC REPRESENTATIONS OF THE USERS LOCATIONS.
L+6        ...                                CONTINUE


ABORT EXIT MODES -
         IF SOLNSW AND/OR COGAFLAG AND/OR INFINFLG IS SET AT THE EXIT TO TIME-RADIUS, TIME-RADIUS WILL TRANSFER
         TO POODOO WITH AN ALARM CODE (ORIGINALLY 00607), AND NOT RETURN TO THE CALLING PROGRAM. (PCR 692 & 721)


OUTPUT -
        * SCALE FACTOR *
VARIABLE*IN POWERS OF 2*                           DESCRIPTION AND REMARKS
--------*--------------*                           -----------------------
T (30D) * +28          *DP TRANSFER TIME IN CENTISECONDS
INFINFLG* NONE         *AN INTERPRETIVE SWITCH WHICH IS SET IF RDESIRED AND SGNRDOT REQUIRE CLOSURE THROUGH
        *              *INFINITY (NO SOLUTION), CLEAR IF A PHYSICAL SOLUTION IS POSSIBLE.
COGAFLAG* NONE         *AN INTERPRETIVE SWITCH WHICH IS SET IF RESTRICTION 1 HAS BEEN VIOLATED (NO SOLUTION),
        *              *CLEAR IF NOT.
APSESW  * NONE         *AN INTERPRETIVE SWITCH WHICH IS SET IF RDESIRED WAS GREATER THAN RADIUS OF APOCENTER OR
```

```
R0537            *                    *LESS THAN RADIUS OF PERICENTER.  THE APOCENTER OR PERICENTER SOLUTION, RESPECTIVELY,
R0539            *                    *WILL THEN BE RETURNED.  THE SWITCH IS CLEAR IF RDESIRED WAS BETWEEN PERICENTER AND
R0541            *                    *APOCENTER.
R05411 SOLNSW    * NONE               *AN INTERPRETIVE SWITCH WHICH IS SET IF THE CONIC IS SO CLOSE TO A CIRCLE THAT THE TERMIN
R05413                                *POINT IS AMBIGUOUS, VIOLATING RESTRICTION 3.  IF ECCENTRICITY IS GREATER THAN 2-TO-THE-
R05415                                *MINUS-18, THE SWITCH IS CLEAR.
R0542

R0543  IN ADDITION, IF RVSW IS CLEAR, THE FOLLOWING ARE OUTPUT-

R0544  MPAC -   * +7 FOR EARTH *DP TERMINAL VELOCITY VECTOR IN METERS/CENTISEC.
R0545   MPAC +5* +5 FOR MOON  *
R0546  0D - 5D * +29 FOR EARTH*DP TERMINAL POSITION VECTOR IN METERS (PL AT 6D)
R0547          * +27 FOR MOON *

R0548  FOR OTHER OUTPUT WHICH MAY BE OF USE, SEE DEBRIS.
R0549


R0550  DEBRIS -

R0551       PARAMETERS WHICH MAY BE OF USE -

R0552          * SCALE FACTOR *
R0553  VARIABLE*IN POWERS OF 2*                            DESCRIPTION AND REMARKS
R0554  --------*--------------*                            -----------------------
R0555  R1 (32D)* +29 FOR EARTH*DP MAGNITUDE OF INITIAL POSITION VECTOR, RVEC, IN METERS
R0557          * +27 FOR MOON *
R0558  R1A     * +6           *DP RATIO OF R1 TO SEMIMAJOR AXIS (NEG. FOR HYPERBOLIC TRAJECTORIES)
R0560  P       * +4           *DP RATIO OF SEMILATUS RECTUM TO R1
R0561  COGA    * +5           *DP COTAN OF ANGLE BETWEEN PVEC AND VVEC
R0563  UR1     * +1           *DP UNIT VECTOR OF RVEC
R0564  U2      * +1           *DP UNIT VECTOR OF VVEC
R0565  UN      * +1           *DP UNIT VECTOR OF UR1*U2
R0566  CSTH    * +1           *DP COSINE OF TRUE ANOMALY DIFFERENCE BETWEEN RVEC AND RDESIRED.
R0568  SNTH    * +1           *DP SINE OF TRUE ANOMALY DIFFERENCE.
R0569

R0570       PARAMETERS OF NO USE -
R0571  SP PARAMETERS -  RTNTT, GEOMSGN, RTNPRM, MAGVEC2=R2 (DP), PLUS PUSHLIST LOCATIONS 0-11D, 14D-21D, 24D-39D, 41D
R0573  ADDITIONAL INTERPRETIVE SWITCHES USED - NORMSW, 360SW
R0574
```

```
L        CONIC SUBROUTINES                                                                          USER'S PAGE NO.  14      FO S3

P0575    PROGRAM DESCRIPTION - APSIDES SUBROUTINE                                                      DATE - 1 SEPTEMBER 1967
R0577    MOD NO. - 0                                                                                   LOG SECTION - CONIC SUBROUTINES
R0579    MOD BY KRAUSE                                                                                 ASSEMBLY - COLOSSUS REVISION 88
R0581

R0582    FUNCTIONAL DESCRIPTION -

R0583         THIS SUBROUTINE, GIVEN AN INITIAL STATE VECTOR CALCULATES THE RADIUS OF PERICENTER AND OF APOCENTER AND THE
R0585    ECCENTRICITY OF THE RESULTING CONIC TRAJECTORY, WHICH MAY BE A STRAIGHT LINE,
R0587    CIRCLE, ELLIPSE, PARABOLA, OR HYPERBOLA WITH RESPECT TO THE EARTH OR THE MOON.  THE USE OF THE SUBROUTINE CAN BE
R0589    EXTENDED USING OTHER PRIMARY BODIES BY SIMPLE ADDITIONS TO THE MUTABLE WITHOUT INTRODUCING ANY CODING CHANGES,
R0591    ACCEPTING THE INHERENT SCALE FACTOR CHANGES IN POSITION AND VELOCITY.
R0592

R0593    THE RESTRICTIONS ARE -
R0594         1.  IF APOCENTER IS BEYOND THE SCALING OF POSITION, THE SCALE FACTOR LIMIT (536,870,910 METERS WITH RESPECT
R0596    TO THE EARTH OR 134,217,727.5 METERS WITH RESPECT TO THE MOON) WILL BE RETURNED.
R0598         2. THE PARAMETERS IN THE PROBLEM MUST NOT EXCEED THEIR SCALING LIMITS SPECIFIED IN THE GSOP.  IF THE LIMITS
R0600    ARE EXCEEDED, THE RESULTING SOLUTION WILL BE MEANINGLESS.

R0601         THE AGC COMPUTATION TIME IS APPROXIMATELY .103 SECONDS.
R0602

R0603    REFERENCES -
R0604         MISSION PROGRAMMING DEFINITION MEMO NO. 10, LUNAR LANDING MISSION GSOP-SECTION 5.5
R0606

R0607    INPUT - ERASABLE INITIALIZATION REQUIRED

R0608            * SCALE FACTOR *
R0609    VARIABLE*IN POWERS OF 2*                          DESCRIPTION AND REMARKS
R0610    --------*---------------*                          -----------------------
R0611    RVEC     * +29 FOR EARTH*DP INITIAL POSITION VECTOR IN METERS
R0612             * +27 FOR MOON *
R0613    VVEC     * +7 FOR EARTH *DP INITIAL VELOCITY VECTOR IN METERS/CENTISECOND
R0614             * +5 FOR MOON  *
R0615    X1 (38D)*NONE             *INDEX REGISTER TO BE SET TO -2D OR -10D ACCORDING TO WHETHER THE EARTH OR MOON,
R0617             *                *RESPECTIVELY, IS THE CENTRAL BODY.
R0618

R0619    SUBROUTINES CALLED -
R0620         PARAM, GEOM
R0621

R0622    CALLING SEQUENCE AND NORMAL EXIT MODES -
```

```
R0623       IF ONLY TIME IS DESIRED AS OUTPUT -
R0624   L        CALL                    MUST BE IN INTERPRETIVE MODE BUT OVFIND ARBITRARY.
R0626   L+1              APSIDES         RETURNS WITH PL AT 0, RADIUS OF APOCENTER IN MPAC AND RADIUS OF PERICENTER IN 0D
R0628   L+2      STODL   APOAPSE
R0629   L+3              0D
R0630   L+4      STORE   PERIAPSE                APOAPSE AND PERIAPSE ARE SYMBOLIC REPRESENTATIONS OF THE USERS LOCATIONS
R0632   L+5      ...                     CONTINUE
R0633


R0634   OUTPUT -
R0635            * SCALE FACTOR *
R0636   VARIABLE*IN POWERS OF 2*                          DESCRIPTION AND REMARKS
R0637   --------*--------------*                          -----------------------
R0638   MPAC     * +29 FOR EARTH*DP RADIUS OF APOCENTER IN METERS
R0639            * +27 FOR MOON *
R0640   0D-1D    * +29 FOR EARTH*DP RADIUS OF PERICENTER IN METERS
R0641            * +27 FOR MOON *
R0642   ECC      * +3           *DP ECCENTRICITY OF CONIC TRAJECTORY.

R0643   FOR OTHER OUTPUT WHICH MAY BE OF USE, SEE DEBRIS.
R0644


R0645   DEBRIS -

R0646        PARAMETERS WHICH MAY BE OF USE -

R0647            * SCALE FACTOR *
R0648   VARIABLE*IN POWERS OF 2*                          DESCRIPTION AND REMARKS
R0649   --------*--------------*                          -----------------------
R0650   R1 (32D)* +29 FOR EARTH*DP MAGNITUDE OF INITIAL POSITION VECTOR, RVEC, IN METERS
R0652            * +27 FOR MOON *
R0653   R1A      * +6           *DP RATIO OF R1 TO SEMIMAJOR AXIS (NEG. FOR HYPERBOLIC TRAJECTORIES)
R0655   P        * +4           *DP RATIO OF SEMILATUS RECTUM TO R1
R0656   COGA     * +5           *DP COTAN OF ANGLE BETWEEN RVEC AND VVEC
R0658   UR1      * +1           *DP UNIT VECTOR OF RVEC
R0659   U2       * +1           *DP UNIT VECTOR OF VVEC
R0660   UN       * +1           *DP UNIT VECTOR OF UR1*U2
R0661   MAGVEC2 * +7 FOR EARTH *DP MAGNITUDE OF VVEC
R0662            * +5 FOR MOON  *
R0663

R0664        PARAMETERS OF NO USE -
R0665   SP PARAMETERS - RTNAPSE, GEOMSGN, RTNPRM, PLUS PUSHLIST LOCATIONS 0-5,10D-11D, 14D-21D, 31D-38D.
R0667   ADDITIONAL INTERPRETIVE SWITCHES USED - NORMSW
R0668


 0669   REF    1               12,2000                        SETLOC CONICS
```

```
0670                          12,2023                        BANK

0671  REF   1                                                COUNT*  $$/CONIC
0672  REF   2  LAST   130     E5,1721                        EBANK=  UR1
0678                          12,2023   40001 1  KEPLERN     SETPD   BOV
0679                          12,2024   00001 0                      0
0680                          12,2025   24026 0                      +1
0681                          12,2026   77773 1              VLOAD*
0683  REF   4  LAST   696     12,2027   10005 0                      MUTABLE,1
0684                          12,2030   24017 1              STOVL   14D
0685  REF   4  LAST   713     12,2031   01503 0                      RRECT
0686                          12,2032   66256 0              UNIT    SSP
0687  REF   2  LAST   691     12,2033   00027 1                      ITERCTR
0688                          12,2034   00024 1                      20D
0689  REF   2  LAST   130     12,2035   16647 0              STODL   URRECT
0690                          12,2036   00045 0                      36D
0691  REF   5  LAST   693     12,2037   24041 1              STOVL   R1
0692  REF   5  LAST  1172     12,2040   01503 0                      RRECT
0693                          12,2041   76441 1              DOT     SL1R
0694  REF   3  LAST   510     12,2042   01511 0                      VRECT
0695                          12,2043   76405 1              DMP     SL1R
0696  REF   1                 12,2044   00023 0                      1/ROOTMU           1/ROOTMU (-17 OR -14)
0697  REF   1                 12,2045   24043 0              STOVL   KEPC1              C1=R.V/ROOTMU (+17 OR +16)

0698  REF   4  LAST  1172     12,2046   01511 0                      VRECT
0699                          12,2047   57236 1              VSQ     DMPR
0700  REF   1                 12,2050   00017 1                      1/MU               1/MU (-34 OR -28)
0701                          12,2051   52405 1              DMP     SL3
0702  REF   6  LAST  1172     12,2052   00041 1                      R1
0703                          12,2053   61425 0              DSU     ROUND
0704  REF   1                 12,2054   11036 1                      D1/64
0705  REF   1                 12,2055   00045 0              STORE   KEPC2              C2=RV.V/MU -1 (+6)

0706                          12,2056   74421 0              BDSU    SR1R
0707  REF   2  LAST  1172     12,2057   11036 1                      D1/64
0708                          12,2060   77671 1              DDV
0709  REF   7  LAST  1172     12,2061   00041 1                      R1
0710  REF   1                 12,2062   00011 1              STORE   ALPHA              ALPHA=(1-C2)/R1 (-22 OR -20)


0711                          12,2063   71244 0              BPL     DLOAD              MAXIMUM X DEPENDS ON TYPE OF CONIC
0712  REF   1                 12,2064   24073 0                      1REV
0713  REF   1                 12,2065   11054 0                      -50SC              -50SC (+12)
0714                          12,2066   40071 0              DDV     BOV
0715  REF   2  LAST  1172     12,2067   00011 1                      ALPHA
0716  REF   1                 12,2070   24077 1                      STOREMAX
0717                          12,2071   52166 1              SQRT    GOTO
0718  REF   2  LAST  1172     12,2072   24077 1                      STOREMAX

0719                          12,2073   55366 1  1REV        SQRT    BDDV
```

```
0720   REF   1               12,2074   11056 1                     2PISC          2PISC (+6)
0721                         12,2075   77600 1           BDV
0722   REF   3  LAST 1172    12,2076   24077 1                     STOREMAX
0723   REF   1               12,2077   00013 0  STOREMAX STORE     XMAX
0724                         12,2100   65205 0           DMP       PDDL
0725   REF   2  LAST 1172    12,2101   00023 0                     1/ROOTMU
0726   REF   3  LAST 1172    12,2102   00011 1                     ALPHA
0727                         12,2103   65301 0           NORM      PDDL
0728   REF  37  LAST 1156    12,2104   00047 1                     X1
0729                         12,2105   56257 1           SL*       DDV
073C                         12,2106   2C173 0                     0 -6,1
0731                         12,2107   50000 1           BOV       BMN
0732   REF   1               12,2110   24124 0                     MDDDONE
0733   REF   2  LAST 1173    12,2111   24124 0                     MUDDDNE        MPAC=PERIOD
0734                         12,2112   51525 1  PERIODCH PDDL      ABS            OD=PERIOD
0735   REF   2  LAST  119    12,2113   02074 0                     TAU.
0736                         12,2114   50025 0           DSU       BMN
0737                         12,2115   00C01 0                     OD
0738   REF   3  LAST 1173    12,2116   24124 0                     MDDDONE
0739                         12,2117   77765 0           SIGN
0740   REF   3  LAST 1173    12,2120   02074 0                     TAU.
0741   REF   4  LAST 1173    12,2121   16C74 0           STODL     TAU.
0750                         12,2122   77650 1           GOTO
0751   REF   1               12,2123   24112 0                     PERIODCH
0752                         12,2124   71201 1  MDDDONE  SETPD     DLOAD
0753                         12,2125   00001 0                     0
0754   REF   2  LAST  119    12,2126   02121 1                     XKEPNEW
0755   REF   1               12,2127   00025 0           STORE     X
07555                        12,2130   53165 0           SIGN      BZE
0756   REF   5  LAST 1173    12,2131   02074 0                     TAU.
07565  REF   1               12,2132   24302 0                     BADX
0757                         12,2133   51440 0           BMN       ABS
07575  REF   2  LAST 1173    12,2134   24302 0                     BADX
0758                         12,2135   51C25 1  .        DSU       BPL
07585  REF   2  LAST 1173    12,2136   00013 0                     XMAX
0759   REF   3  LAST 1173    12,2137   24302 0                     BADX
07595                        12,2140   51145 0  STDRBNDS DLOAD     BPL
0760   REF   6  LAST 1173    12,2141   02C74 0                     TAU.
07605  REF   1               12,2142   24152 1                     STOREMIN
0761                         12,2143   57545 1           DLUAD     DCOMP
07615  REF   3  LAST 1173    12,2144   0CC13 0                     XMAX
0762   REF   1               12,2145   14C15 0           STODL     XMIN
07625  REF   1               12,2146   24007 0                     KEPZERD
0763   REF   4  LAST 1173    12,2147   00013 0           STORE     XMAX
07635                        12,2150   77650 1           GDTU
0764   REF   1               12,2151   24155 0                     DXCDMP
07645                        12,2152   77745 1  STDRFMIN DLOAD
0765   REF   2  LAST 1173    12,2153   24007 0                     KEPZERD
07655  REF   2  LAST 1173    12,2154   00015 0           STDRE     XMIN
0766                         12,2155   57345 1  DXCUMP   DLOAC     DMPR
```

```
0767   REF   7  LAST 1173  12,2156  02074 0                   TAU.
0768   REF   1             12,2157  11047 1                   BEE22
07685                      12,2160  77646 0           ABS
0769   REF   1             12,2161  16170 0           STODL   EPSILONT
0770   REF   1             12,2162  01553 0                   XPREV
0779                       12,2163  77621 1  XDIFF    BDSU
0780   REF   2  LAST 1173  12,2164  00025 0                   X
0781   REF   2  LAST  130  12,2165  02643 1           STORE   DELX


0782                       12,2166  63545 0  KEPLOOP  DLOAD   DSQ
0783   REF   3  LAST 1174  12,2167  00025 0                   X               X=XKEP
0784                       12,2170  41501 0           NORM    PUSH            OD=XSQ (+34 OR +32 -N1)       PL AT 2
0785   REF  38  LAST 1173  12,2171  00047 1                   X1
0786                       12,2172  53605 1           DMP     SRR*
0787   REF   4  LAST 1173  12,2173  00011 1                   ALPHA
0788                       12,2174  21573 0                   0 -6,1
0789   REF   1             12,2175  34031 1           STCALL  XI              XI=ALPHA XSQ (+6)
0790   REF   1             12,2176  24421 0                   DELTIME
0791                       12,2177  44200 0           BOV     BDSU
0792   REF   1             12,2200  24311 1                   TIMEOVFL        UNLIKELY
0793   REF   8  LAST 1174  12,2201  02074 0                   TAU.
0794   REF   2  LAST  130  12,2202  02645 1           STORE   DELT            DELT=DELINDEP
0795                       12,2203  44246 1           ABS     BDSU
0796   REF   2  LAST 1174  12,2204  02170 0                   EPSILONT
0797                       12,2205  71244 0           BPL     DLOAD
0798   REF   1             12,2206  24333 1                   KEPCONVG
0799   REF   3  LAST  666  12,2207  00037 0                   T
0800                       12,2210  60225 1           DSU     NORM
0801   REF   2  LAST  115  12,2211  01551 1                   TC
0802   REF  39  LAST 1174  12,2212  00047 1                   X1
0803                       12,2213  60325 0           PDDL    NORM
0804   REF   3  LAST 1174  12,2214  02643 1                   DELX
0805   REF  23  LAST 1153  12,2215  00050 1                   X2
0806                       12,2216  41260 0           XSU,1   DMP
0807   REF  24  LAST 1174  12,2217  00047 1                   X2
0808   REF   3  LAST 1174  12,2220  02645 1                   DELT
0809                       12,2221  56257 1           SLR*    DDV
0810                       12,2222  21202 1                   1,1
0811                       12,2223  41542 1           SR1     PUSH            OD=TRIAL DELX                 PL AT 2
0812                       12,2224  71244 0           BPL     DLOAD
0813   REF   1             12,2225  24246 1                   POSDELX
0814   REF   4  LAST 1174  12,2226  00025 0                   X
0815   REF   5  LAST 1173  12,2227  00013 0           STORE   XMAX            MOVE MAX BOUND IN
0816                       12,2230  45221 1           BDSU    DSU                                           PL AT 0
0817   REF   3  LAST 1173  12,2231  00015 0                   XMIN
0818                       12,2232  51000 0           BOV     BPL
0819   REF   1             12,2233  24240 1                   NDXCHNGE
0820   REF   2  LAST 1174  12,2234  24240 1                   NDXCHNGE
0821                       12,2235  52145 0           DLOAD   GOTO
```

```
0822                       12,2236   00001 0                   OD
0823   REF   1             12,2237   24260 0                   NEWDELX

0824                       12,2240   45345 1  NDXCHNGE DLOAD   DSU
0825   REF   4  LAST 1174  12,2241   00015 0                   XMIN
0826   REF   5  LAST 1174  12,2242   00025 0                   X
0827                       12,2243   52075 1           DMPR    GOTO            TO FORCE MPAC +2 TO ZERO
0828   REF   1             12,2244   11052 0                   DP9/10
0829   REF   2  LAST 1175  12,2245   24260 0                   NEWDELX

0830                       12,2246   77745 1  POSDELX  DLOAD
0831   REF   6  LAST 1175  12,2247   00025 0                   X
0832   REF   5  LAST 1175  12,2250   00015 0           STORE   XMIN            MOVE MIN BOUND IN
0833                       12,2251   45221 1           BDSU    DSU                                   PL AT 0
0834   REF   6  LAST 1174  12,2252   00013 0                   XMAX
0835                       12,2253   50000 1           BOV     BMN
0836   REF   1             12,2254   24274 0                   PDXCHNGE
0837   REF   2  LAST 1175  12,2255   24274 0                   PDXCHNGE
0838                       12,2256   77745 1           DLOAD
0839                       12,2257   00001 0                   OD
0840   REF   4  LAST 1174  12,2260   02643 1  NEWDELX  STORE   DELX
0841                       12,2261   43254 0           BZE     DAD
0842   REF   2  LAST 1174  12,2262   24333 1                   KEPCONVG
0843   REF   7  LAST 1175  12,2263   00025 0                   X
0844   REF   8  LAST 1175  12,2264   14025 0           STODL   X
0845   REF   4  LAST 1174  12,2265   00037 0                   T
0846   REF   3  LAST 1174  12,2266   01551 1           STORE   TC
0847                       12,2267   46034 1  BRNCHCTR RTB     BHIZ
0848   REF   1             12,2270   24644 1                   CHECKCTR
0849   REF   3  LAST 1175  12,2271   24333 1                   KEPCONVG
0850                       12,2272   77650 1           GOTO
0851   REF   1             12,2273   24166 0                   KEPLOOP         ITERATE

0852                       12,2274   45345 1  PDXCHNGE DLOAD   DSU
0853   REF   7  LAST 1175  12,2275   00013 0                   XMAX
0854   REF   9  LAST 1175  12,2276   00025 0                   X
0855                       12,2277   52075 1           DMPR    GOTO            TO FORCE MPAC +2 TO ZERO
0856   REF   2  LAST 1175  12,2300   11052 0                   DP9/10
0857   REF   3  LAST 1175  12,2301   24260 0                   NEWDELX

0858                       12,2302   70545 1  BADX     DLOAD   SR1
0859   REF   8  LAST 1175  12,2303   00013 0                   XMAX
0860                       12,2304   77765 0           SIGN
0861   REF   9  LAST 1174  12,2305   02074 0                   TAU.
0862   REF  10  LAST 1175  12,2306   00025 0           STORE   X
0863                       12,2307   77650 1           GOTO
```

```
 0864    REF   1               12,2310   24140 1                       STORBNDS
 0879                          12,2311   50145 1   TIMEOVFL DLOAD      BMN                X WAS TOO BIG
 0880    REF  11   LAST 1175   12,2312   00025 0                       X
 08805   REF   1               12,2313   24330 1                       NEGTOVFL
 0881    REF   9   LAST 1175   12,2314   00013 0            STORE      XMAX
 0882                          12,2315   70545 1   CMNTOVFL DLOAD      SR1
 0883    REF   5   LAST 1175   12,2316   02643 1                       DELX
 0884    REF   6   LAST 1176   12,2317   02643 1            STORE      DELX
 0885                          12,2320   44254 1            BZE        BDSU
 08855   REF   1               12,2321   02111 1                       KEPRTN
 0886    REF  12   LAST 1176   12,2322   00025 0                       X
 0887    REF  13   LAST 1176   12,2323   14025 0            STODL      X
 0888    REF   4   LAST 1175   12,2324   01551 1                       TC
 0889    REF   5   LAST 1175   12,2325   00037 0            STORE      T
 0890                          12,2326   77650 1            GOTO
 0891    REF   1               12,2327   24267 1                       BRNCHCTR
 08911   REF   6   LAST 1175   12,2330   00015 0   NEGTOVFL STORE      XMIN
 08912                         12,2331   77650 1            GOTO
 08913   REF   1               12,2332   24315 0                       CMNTOVFL
 0892                          12,2333   44545 0   KEPCONVG DLOAD      SR4R
 0893    REF   8   LAST 1172   12,2334   00041 1                       R1
 0894                          12,2335   74225 1            DSU        VXSC
 0895    REF   1               12,2336   00035 1                       XSQC(XI)
 0896    REF   3   LAST 1172   12,2337   02647 0                       URRECT
 0897                          12,2340   65372 1            VSL1       PDDL               0D=(R1-XSQC(XI))URRECT (+33 OR +31)
 0898    REF  14   LAST 1176   12,2341   00025 0                       X
 0899                          12,2342   60316 0            DSQ        NORM
 0900    REF  40   LAST 1174   12,2343   00047 1                       X1
 0901                          12,2344   57275 0            DMPR       DMPR
 0902    REF   3   LAST 1173   12,2345   00023 0                       1/ROOTMU
 0903    REF  15   LAST 1176   12,2346   00025 0                       X
 0904                          12,2347   53605 1            DMP        SRR*
 0905    REF   1               12,2350   00033 1                       S(XI)
 0906                          12,2351   21572 1                       0 -7,1
 0907                          12,2352   77621 1            BDSU
 0908    REF   6   LAST 1176   12,2353   00037 0                       T
 0909                          12,2354   74352 0            SL1        VXSC
 0910    REF   5   LAST 1172   12,2355   01511 0                       VRECT
 0911                          12,2356   53372 1            VSL1       VAD                                            PL AT 0
 0912                          12,2357   77712 0            VSL4
 0913    REF  15   LAST 1154   12,2360   01535 0            STORE      RCV                RCV (+29 OR +27)


 0914                          12,2361   60246 1            ABVAL      NORM
 0915    REF  25   LAST 1174   12,2362   00050 1                       X2
 0916    REF   1               12,2363   14043 0            STODL      RCNORM
 0917    REF   2   LAST 1174   12,2364   00031 0                       XI
 0918                          12,2365   45275 0            DMPR       DSU
 0919    REF   2   LAST 1176   12,2366   00033 1                       S(XI)
 0920    REF   1               12,2367   11034 0                       D1/128
```

```
0921                         12,2370   76405 1          DMP      SL1R
0922   REF   1               12,2371   00021 1                   ROOTMU
0923                         12,2372   53605 1          DMP      SLR*
0924   REF  16  LAST 1176    12,2373   00025 0                   X
0925                         12,2374   56601 0                   0 -3,2
0926                         12,2375   74271 0          DDV      VXSC
0927   REF   2  LAST 1176    12,2376   00043 0                   RCNORM
0928   REF   4  LAST 1176    12,2377   02647 0                   URRECT
0929                         12,2400   65372 1          VSL1     PDDL              0D=URRECT(XI S(XI)-1)X ROOTMU/RCV (+15
0930   REF   2  LAST 1176    12,2401   00035 1                   XSQC(XI)          OR +13)                          PL AT 6
0931                         12,2402   56257 1          SLR*     DDV
0932                         12,2403   56602 0                   0 -4,2
0933   REF   3  LAST 1177    12,2404   00043 0                   RCNORM
0934                         12,2405   74221 0          BDSU     VXSC
0935   REF   1               12,2406   11050 1                   D1/256
0936   REF   6  LAST 1176    12,2407   01511 0                   VRECT
0937                         12,2410   42455 0          VAD      VSL8                                             PL AT 0
0938                         12,2411   77626 0          STADR
0939   REF  13  LAST 1154    12,2412   62234 0          STODL    VCV               VCV (+7 OR +5)
0940   REF   7  LAST 1176    12,2413   00037 0                   T
0943   REF   5  LAST 1176    12,2414   15551 1          STODL    TC
0944   REF  17  LAST 1177    12,2415   00025 0                   X
0947   REF   2  LAST 1174    12,2416   01553 0          STORE    XPREV
0948                         12,2417   77650 1          GOTO
0949   REF   2  LAST 1176    12,2420   02111 1                   KEPRTN
```

```
0950                           12,2421   77776 1  DELTIME  EXIT                        MPAC=XI (+6), OD=XSQ (+34 OR +32 -N1)
0951     REF   4  LAST 1083    12,2422  0 7243 0           TC        POLY
0952                           12,2423   00010 0           DEC       8
0953                           12,2424   02525 1           2DEC      .083333334
0953                           12,2425   12526 0
0954                           12,2426   67356 0           2DEC      -.266666684
0954                           12,2427   75666 0
0955                           12,2430   15001 1           2DEC      .406349155
0955                           12,2431   23771 1
0956                           12,2432   64342 0           2DEC      -.361198675
0956                           12,2433   43674 0
0957                           12,2434   06563 1           2DEC      .210153242
0957                           12,2435   04645 1
0958                           12,2436   75173 0           2DEC      -.086221951
0958                           12,2437   52672 0
0959                           12,2440   00656 1           2DEC      .026268812
0959                           12,2441   14331 0
0960                           12,2442   77633 1           2DEC      -.006163316
0960                           12,2443   40512 0
0961                           12,2444   00023 0           2DEC      .001177342
0961                           12,2445   11210 1
0962                           12,2446   77774 0           2DEC      -.000199055
0962                           12,2447   67506 0
0963     REF 220  LAST 1153    12,2450  0 6060 1           TC        INTPRET
0964     REF   3  LAST 1176    12,2451   14033 1           STODL     S(XI)
0965     REF   3  LAST 1176    12,2452   00031 0                     XI
0966                           12,2453   77776 1           EXIT
0967     REF   5  LAST 1178    12,2454  0 7243 0           TC        POLY
0968                           12,2455   00010 0           DEC       8
0969                           12,2456   01000 0           2DEC      .031250001
0969                           12,2457   00000 1
0970                           12,2460   72525 0           2DEC      -.166666719
0970                           12,2461   52506 0
0971                           12,2462   13301 1           2DEC      .355555413
0971                           12,2463   15337 1
0972                           12,2464   62776 0           2DEC      -.406347410
0972                           12,2465   54733 1
0973                           12,2466   11176 1           2DEC      .288962094
0973                           12,2467   13267 0
0974                           12,2470   73410 0           2DEC      -.140117894
0974                           12,2471   51674 0
0975                           12,2472   01446 0           2DEC      .049247387
0975                           12,2473   33641 1
0976                           12,2474   77451 1           2DEC      -.013081923
0976                           12,2475   65233 0
0977                           12,2476   00055 1           2DEC      .002806389
0977                           12,2477   37266 1
0978                           12,2500   77767 1           2DEC      -.000529414
0978                           12,2501   52336 0
0979     REF 221  LAST 1178    12,2502  0 6060 1           TC        INTPRET
```

```
0980                         12,2503   53605 1          DMP     SRR*                                          PL AT 0
0981                         12,2504   00001 0                  0D
0982                         12,2505   21574 1                  0 -5,1
0983   REF   3  LAST 1177    12,2506   00035 1          STORE   XSQC(XI)          XSQC(XI) (+33 OR +31)
0984                         12,2507   72405 0          DMP     SL1
0985   REF   2  LAST 1172    12,2510   00043 0                  KEPC1
0986                         12,2511   65234 1          RTB     PDDL              XCH WITH PL. 0D=C1 XSQ C(XI) (+49 OR +46
0987   REF   9  LAST 1148    12,2512   21643 0                  TPMODE                                        PL AT 0,3
0988                         12,2513   53605 1          DMP     SRR*
0989   REF   4  LAST 1178    12,2514   00033 1                  S(XI)
0990                         12,2515   21574 1                  0 -5,1
0991                         12,2516   72405 0          DMP     SL1
0992   REF   2  LAST 1172    12,2517   00045 0                  KEPC2
0993                         12,2520   65234 1          RTB     PDDL              3D=C2 XSQ S(XI) (+35 OR +33)  PL AT 6
0994   REF  10  LAST 1179    12,2521   21643 0                  TPMODE
0995   REF   9  LAST 1176    12,2522   00041 1                  R1
0996                         12,2523   76261 0          SR      TAD                                           PL AT 3
0997                         12,2524   20607 1                  6
0998                         12,2525   41301 0          NORM    DMP               TO PRESERVE SIGNIF.
0999   REF  41  LAST 1176    12,2526   00047 1                  X1
1000   REF  18  LAST 1177    12,2527   00025 0                  X
1001                         12,2530   76257 0          SR*     TAD               X(C2 XSQ S(XI) +R1) (+49 OR +46) PL AT 0
1002                         12,2531   20576 1                  0 -3,1
1003                         12,2532   57232 0          SL4R    DMPR
1004   REF   4  LAST 1176    12,2533   00023 0                  1/ROOTMU
1005   REF   8  LAST 1177    12,2534   00037 0          STORE   T
1006                         12,2535   77616 0          RVQ
```

```
1007                          12,2536   71214 0  ITERATOR BONCLR DLOAD
1008    REF   1               12,2537   00614 1                   SLOPESW
1009    REF   1               12,2540   24606 1                   FIRSTIME
1010    REF   1               12,2541   00037 0                   DEP
1011                          12,2542   60225 1           DSU     NORM
1012    REF   3  LAST   130   12,2543   02762 0                   DEPREV
1013    REF  42  LAST  1179   12,2544   00047 1                   X1
1014                          12,2545   60325 0           PDDL    NORM
1015    REF   1               12,2546   00015 0                   DELINDEP
1016    REF  26  LAST  1176   12,2547   00050 1                   X2
1017                          12,2550   41260 0           XSU,1   DMP
1018    REF  27  LAST  1180   12,2551   00047 1                   X2
1019    REF   3  LAST   130   12,2552   02760 1                   DELDEP
1020                          12,2553   56257 1           SLR*    DDV                                    PL UP 2
1021                          12,2554   21202 1                   1,1
1022                          12,2555   43142 1           SR1     BOFF
1023    REF   1               12,2556   04351 1                   ORDERSW
1024    REF   1               12,2557   24562 0                   SGNCHECK
1025                          12,2560   75246 0           ABS     SIGN       IN CASE 2ND DERIV. CHANGED SIGN, MUST
1026    REF   4  LAST  1180   12,2561   02760 1                   DELDEP     DISREGARD IT TO FIND MIN.

1027                          12,2562   51006 0  SGNCHECK PUSH    BPL        TRIAL DELINDEP              PL DOWN 2
1028    REF   1               12,2563   24620 0                   POSDEL
1029                          12,2564   43145 0           DLOAD   BON
1030    REF   1               12,2565   02766 1                   INDEP
1031    REF   2  LAST  1180   12,2566   04311 0                   ORDERSW
1032    REF   1               12,2567   24571 1                   MINCHECK
1033    REF   1               12,2570   00017 1           STORE   MAX        IF NOT 2ND ORDER, CAN MOVE MAX BOUND IN.

1034                          12,2571   45221 1  MINCHECK BDSU    DSU
1035    REF   1               12,2572   00011 1                   MIN
1036                          12,2573   51000 0           BOV     BPL
1037    REF   1               12,2574   24600 1                   MODNGDEL
1038    REF   2  LAST  1180   12,2575   24600 1                   MODNGDEL
1039                          12,2576   77650 1           GOTO
1040    REF   1               12,2577   24632 0                   DELOK


1041                          12,2600   45345 1  MODNGDEL DLOAD   DSU        TRIAL DELINDEP WOULD EXCEED MIN BOUND
1042    REF   2  LAST  1180   12,2601   00011 1                   MIN
1043    REF   2  LAST  1180   12,2602   02766 1                   INDEP
1044                          12,2603   52005 0           DMP     GOTO
1045    REF   3  LAST  1175   12,2604   11052 0                   DP9/10
1046    REF   1               12,2605   24634 0                   NEWDEL


1047                          12,2606   41345 0  FIRSTIME DLOAD   DMP
1048    REF   3  LAST  1180   12,2607   00011 1                   MIN
1049    REF   1               12,2610   00051 0                   TWEEKIT    DLOAD TWEEKIT(40D) SENSITIVE TO CHANGE.
1050                          12,2611   41325 0           PDDL    DMP        S2(41D) SHOULDNT CONTAIN HI ORDER ONES
```

```
1051    REF   2  LAST 1180    12,2612    00017 1                   MAX
1052    REF   2  LAST 1180    12,2613    00051 0                   TWEEKIT
1053                          12,2614    77625 0            DSU
1054                          12,2615    52165 1            SIGN   GOTO
1055    REF   5  LAST 1180    12,2616    02760 1                   DELDEP
1056    REF   2  LAST 1180    12,2617    24562 0                   SGNCHECK


1057                          12,2620    43145 0  POSDEL    DLOAD  BON
1058    REF   3  LAST 1180    12,2621    02766 1                   INDEP
1059    REF   3  LAST 1180    12,2622    04311 0                   ORDERSW
1060    REF   1               12,2623    24625 0                   MAXCHECK
1061    REF   4  LAST 1180    12,2624    00011 1            STORE  MIN            IF NOT 2ND ORDER, CAN MOVE MIN BOUND IN.

1062                          12,2625    45221 1  MAXCHECK  BDSU   DSU
1063    REF   3  LAST 1181    12,2626    00017 1                   MAX
1064                          12,2627    50000 1            BOV    BMN
1065    REF   1               12,2630    24636 1                   MODPSDEL
1066    REF   2  LAST 1181    12,2631    24636 1                   MODPSDEL
1067                          12,2632    77745 1  DELOK     DLOAD
1068                          12,2633    00001 0                   OD
1069    REF   2  LAST 1180    12,2634    00015 0  NEWDEL    STORE  DELINDEP
1070                          12,2635    77616 0            RVQ


1071                          12,2636    45345 1  MODPSDEL  DLOAD  DSU
1072    REF   4  LAST 1181    12,2637    00017 1                   MAX
1073    REF   4  LAST 1181    12,2640    02766 1                   INDEP
1074                          12,2641    52005 0            DMP    GOTO
1075    REF   4  LAST 1180    12,2642    11052 0                   DP9/10
1076    REF   2  LAST 1180    12,2643    24634 0                   NEWDEL


1077    REF 112  LAST 1125    12,2644   4 4744 0  CHECKCTR  CS     ONE
1078    REF  61  LAST 1106    12,2645   50 120 1            INDEX  FIXLOC
1079    REF   3  LAST 1172    12,2646   6 0026 0            AD     ITERCTR
1080    REF  62  LAST 1181    12,2647   50 120 1            INDEX  FIXLOC
1081    REF   4  LAST 1181    12,2650   54 026 1            TS     ITERCTR
1082    REF 726  LAST 1149    12,2651   54 154 0            TS     MPAC
1083    REF  56  LAST 1092    12,2652   0 6102 1            TC     DANZIG
```

```
 1084                            12,2653   44545 0  NEWSTATE DLOAD   SR4R
 1085     REF  10  LAST 1179     12,2654   00041 1                    R1
 1089                            12,2655   74225 1           DSU      VXSC
 1090     REF   4  LAST 1179     12,2656   00035 1                    XSQC(XI)
 1091     REF   3  LAST 1172     12,2657   02722 1                    UR1
 1092                            12,2660   65372 1           VSL1     PDDL                 0D=(R1-XSQC(XI))UR1 (+33 OR 31) PL AT 6
 1093     REF  19  LAST 1179     12,2661   00025 0                    X
 1094                            12,2662   60316 0           DSQ      NORM
 1095     REF  43  LAST 1180     12,2663   00047 1                    X1
 1096                            12,2664   57275 0           DMPR     DMPR
 1097     REF   5  LAST 1179     12,2665   00023 0                    1/ROOTMU
 1098     REF  20  LAST 1182     12,2666   00025 0                    X
 1099                            12,2667   53605 1           DMP      SRR*
 1100     REF   5  LAST 1179     12,2670   00033 1                    S(XI)
 1101                            12,2671   21572 1                    0 -7,1
 1102                            12,2672   77621 1           BDSU
 1103     REF   9  LAST 1179     12,2673   00037 0                    T
 1104                            12,2674   74352 0           SL1      VXSC
 1105     REF  10  LAST  698     12,2675   02744 1                    VVEC
 1106                            12,2676   53372 1           VSL1     VAD                                            PL AT 0
 1107                            12,2677   41512 1           VSL4     PUSH
 1108                            12,2700   77646 0           ABVAL
 1109                            12,2701   77701 1  LAMENTER NORM
 1110     REF  44  LAST 1182     12,2702   00047 1                    X1
 1111     REF   1                12,2703   16720 0           STODL    R2
 1112     REF   4  LAST 1178     12,2704   00031 0                    XI
 1113                            12,2705   45205 1           DMP      DSU
 1114     REF   6  LAST 1182     12,2706   00033 1                    S(XI)
 1115     RCF   2  LAST 1176     12,2707   11034 0                    D1/128
 1116                            12,2710   76405 1           DMP      SL1R
 1117     REF   2  LAST 1177     12,2711   00021 1                    ROOTMU
 1118                            12,2712   53605 1           DMP      SLR*
 1119     REF  21  LAST 1182     12,2713   00025 0                    X
 1120                            12,2714   21176 1                    0 -3,1
 1121                            12,2715   74271 0           DDV      VXSC
 1122     REF   2  LAST 1182     12,2716   02720 0                    R2
 1123     REF   4  LAST 1182     12,2717   02722 1                    UR1
 1124                            12,2720   65372 1           VSL1     PDDL                 6D=V2VEC PART (+15 OR 13)        PL AT 12
 1125     REF   5  LAST 1182     12,2721   00035 1                    XSQC(XI)
 1126                            12,2722   56257 1           SLR*     DDV
 1127                            12,2723   21175 1                    0 -4,1
 1128     REF   3  LAST 1182     12,2724   02720 0                    R2
 1129                            12,2725   77621 1           BDSU
 1130     REF   2  LAST 1177     12,2726   11050 1                    D1/256
 1131                            12,2727   53361 0           VXSC     VAD                                            PL AT 6
 1132     REF  11  LAST 1182     12,2730   02744 1                    VVEC
 1133                            12,2731   43412 1           VSL8     RVQ
R1134
```

```
 1135   REF    3  LAST    47   04,2000                         SETLOC CONICS1
 1136                          04,3030                         BANK

 1137   REF    2 LAST    47 TO    48:     16    16*            COUNT* $$/CONIC
R1138   DO NOT DISTURB THE ORDER OF THESE CDS, OVERLAYS HAVE BEEN MADE.
 1139                          04,3030   00000 1  BEE17        DEC      0                 KEEP WITH D1/8 2DEC 1.0B-17 (0000004000)
 1140                          04,3031   04000 0  D1/8         2DEC     1.0 B-3
 1140                          04,3032   00000 1
 1141                          04,3033   00200 0  D1/128       2DEC     1.0 B-7
 1141                          04,3034   00000 1
 1142                          04,3035   00400 0  D1/64        2DEC     1.0 B-6
 1142                          04,3036   00000 1
 1143                          04,3037   10000 0  D1/4         2DEC     1.0 B-2
 1143                          04,3040   00000 1
 1144                          04,3041   02000 0  D1/16        2DEC     1.0 B-4
 1144                          04,3042   00000 1
 1145                          04,3043   01000 0  D1/32        2DEC     1.0 B-5
 1145                          04,3044   00000 1
 1146                          04,3045   00020 0  D1/1024      2DEC     1.0 B-10
 1146                          04,3046   00000 1
 1147                          04,3047   00100 0  D1/256       2DEC     1.0 B-8
 1147                          04,3050   00000 1
 1148                          04,3051   34631 1  DP9/10       2DEC     .9
 1148                          04,3052   23146 0
 1149   REF    5  LAST 1145    12,2006            KEPZERO      EQUALS LO6ZEROS
 1150                          04,3053   77467 1  -50SC        2DEC    -50.0 B-12
 1150                          04,3054   77777 0
 1151                          04,3055   03110 1  2PISC        2DEC     6.28318530 B-6
 1151                          04,3056   17665 1
 1152   REF    1               04,3042            BEE19        EQUALS D1/32 -1           2DEC 1.0 B-19 (00000 01000)
 1153   REF    3  LAST 1182    04,3046            BEE22        EQUALS D1/256 -1          2DEC 1.0 B-22 (00000 00100)
 1154                          04,3057   00000 1  ONEBIT       2DEC     1.0 B-28
 1154                          04,3060   00001 0
 1155                          04,3061   37767 0  COGUPLIM 2DEC     .999511597
 1155                          04,3062   37737 0
 1156                          04,3063   40010 1  COGLOLIM 2DEC    -.999511597
 1156                          04,3064   40040 1
R1157
```

```
 1158    REF   2  LAST 1171    12,2000                       SETLOC CONICS
 1159                          12,2732                       BANK

 1160    REF   2 LAST 1172 TO  1183:    455   455*           COUNT* $$/CONIC
 1161                          12,2732   40220 0  TIMETHET   STQ    SETPD                                      PL AT 0
 1162    REF   1               12,2733   02710 0                    RTNTT
 1163                          12,2734   00001 0                    0
 11635                         12,2735   77600 1             BOV
 11636                         12,2736   24737 1                    +1
 1164                          12,2737   63375 0 -           VLOAD  PDVL          SETUP FOR PARAM CALL         PL AT 6
 1165    REF   8  LAST  698    12,2740   02655 0                    RVEC
 1166    REF  12  LAST 1182    12,2741   02744 1                    VVEC
 1167                          12,2742   77624 1             CALL
 1168    REF   1               12,2743   11065 1                    PARAM
 1169                          12,2744   45000 0             BOV    CALL                                       PL AT 0
 1170    REF   1               12,2745   24764 1                    COGAOVFL
 1171    REF   1               12,2746   24767 1                    GETX
 1172                          12,2747   43145 0  COMMNOUT   DLOAD  BON
 1173    REF   5  LAST 1182    12,2750   00031 0                    XI
 1174    REF   1               12,2751   04310 1                    INFINFLG
 1175    REF   1               12,2752   25752 0                    ABTCONIC
 1176                          12,2753   45014 0             CLEAR  CALL
 1177    REF   1               12,2754   04273 0                    COGAFLAG
 1178    REF   2  LAST 1174    12,2755   24421 0                    DELTIME
 1179                          12,2756   45014 0             BON    CALL
 1180    REF   7  LAST  666    12,2757   03706 0                    RVSW
 1181    REF   2  LAST 1184    12,2760   02710 0                    RTNTT
 1182    REF   1               12,2761   24653 1                    NEWSTATE
 1183                          12,2762   77650 1             GOTO
 1184    REF   3  LAST 1184    12,2763   02710 0                    RTNTT


 1185                          12,2764   77614 1  COGAOVFL   SETGO
 1186    REF   2  LAST 1184    12,2765   04033 0                    COGAFLAG
 1187    REF   2  LAST 1184    12,2766   25752 0                    ABTCONIC
 11872                         04,3065                       BANK   4
 11874   REF   4  LAST 1183    04,2000                       SETLOC CONICS1
 11876                         04,3065                       BANK
 11878   REF   3 LAST 1183 TO  1184:    29     45*           COUNT* $$/CONIC
 1188                          04,3065   43020 1  PARAM      STQ    CLEAR         MPAC=V1VEC, OD=R1VEC         PL AT 6
 1189    REF   2  LAST  130    04,3066   02753 1                    RTNPRM
 1190    REF   7  LAST  774    04,3067   03665 1                    NORMSW
 11901                         04,3070   77614 1             CLEAR
 11902   REF   3  LAST 1184    04,3071   04273 0                    COGAFLAG
 1191                          04,3072   45131 0             SSP    CALL
 1192    REF   7  LAST  775    04,3073   02673 1                    GEOMSGN
 1193                          04,3074   27777 0                    37777         GAMMA ALWAYS LESS THAN 180DEG
 1194    REF   1               04,3075   11131 1                    GEOM          MPAC=SNGA (+1), OD=CSGA (+1) PL AT 2
 1195                          04,3076   14045 0             STODL  36D           36D=SIN GAMMA (+1)           PL AT 0
 1196                          04,3077   56261 1             SR     DDV
 1197                            04,3100   20606 0                 5

 1198                            04,3101   00045 0                 36D
 1199    REF   3  LAST  131      04,3102   32766 1          STOVL* COGA
 1200    REF   5  LAST 1172      04,3103   10005 0                 MUTABLE,1
 1201    REF   2  LAST 1172      04,3104   14017 1          STODL  1/MU
 1202    REF   3  LAST  130      04,3105   02720 0                 MAGVEC2
 1203                            04,3106   60316 0          DSQ    NORM
 1204    REF  45  LAST 1182      04,3107   00047 1                 X1
 1205                            04,3110   41275 1          DMPR   DMP
 1206    REF   3  LAST 1185      04,3111   00017 1                 1/MU
 1207    REF  11  LAST 1182      04,3112   00041 1                 R1
 1208                            04,3113   77657 0          SRR*
 1209                            04,3114   21576 0                 0 -3,1
 1210                            04,3115   44206 0          PUSH   BDSU          0D=R1 V1SQ/MU (+6)       PL AT 2
 1211    REF   2  LAST 1183      04,3116   11044 1                 D1/32
 1212    REF   4  LAST  693      04,3117   16742 1          STODL  R1A           R1A (+6)                 PL AT 0

 1213                            04,3120   60205 0          DMP    NORM
 1214                            04,3121   00045 0                 36D
 1215    REF  46  LAST 1185      04,3122   00047 1                 X1
 1216                            04,3123   53605 1          DMP    SR*
 1217                            04,3124   00045 0                 36D
 1218                            04,3125   20575 1                 0 -4,1
 1219    REF   4  LAST  641      04,3126   02740 0          STORF  P             P (+4)
 1220                            04,3127   77650 1          GOTO
 1221    REF   3  LAST 1184      04,3130   02753 1                 RTNPRM
 1225                          04,3131   77656 1  GEOM     UNIT                     MPAC=V2VEC, OD=R1VEC          PL AT 6
 1226   REF   2  LAST  130     04,3132   16712 1           STODL    U2              U2 (+1)
 1227                          04,3133   00045 0                    36D
 1228   REF   4  LAST 1185     04,3134   26720 0           STOVL    MAGVEC2                                       PL AT 0
 1229                          04,3135   77656 1           UNIT
 1230   REF   5  LAST 1182     04,3136   02722 1           STORE    UR1             UR1 (+1)
 1231                          04,3137   72441 0           DOT      SL1
 1232   REF   3  LAST 1186     04,3140   02712 1                    U2
 1233                          04,3141   77725 1           PDDL                     OD=CSTH (+1)                  PL AT 2
 1234                          04,3142   00045 0                    36D
 1235   REF  12  LAST 1185     04,3143   24041 1           STOVL    R1              R1 (+29 OR +27)
 1236   REF   6  LAST 1186     04,3144   02722 1                    UR1
 1237                          04,3145   76435 1           VXV      VSL1
 1238   REF   4  LAST 1186     04,3146   02712 1                    U2
 1239                          04,3147   75214 1           BON      SIGN
 1240   REF   8  LAST 1184     04,3150   03705 0                    NORMSW
 1241   REF   1                04,3151   11163 0                    HAVENORM
 1242   REF   8  LAST 1184     04,3152   02673 1                    GEOMSGN
 1243                          04,3153   40056 0           UNIT     BOV
 1244   REF   1                04,3154   11161 1                    COLINEAR
 1245   REF   6  LAST  775     04,3155   16674 0  UNITNORM STODL    UN              UN (+1)
 1246                          04,3156   00045 0                    36D
 1247                          04,3157   43565 0           SIGN     RVQ             MPAC=SNTH (+1), 34D=SNTH.SNTH (+2)
 1248   REF   9  LAST 1186     04,3160   02673 1                    GEOMSGN


 1249                          04,3161   52162 0  COLINEAR VSR1     GOTO
 1250   REF   1                04,3162   11155 0                    UNITNORM


 1251                          04,3163   75246 0  HAVENORM ABVAL    SIGN
 1252   REF  10  LAST 1186     04,3164   02673 1                    GEOMSGN
 1253                          04,3165   77616 0           RVQ                      MPAC=SNTH (+1), 34D=SNTH.SNTH (+2)
 1254                          12,2767                          BANK    12
 1255   REF    3  LAST 1184    12,2000                          SETLOC  CONICS
 1256                          12,2767                          BANK

 12565  REF    3 LAST 1184 TO 1184:     29    484*              COUNT*  $$/CONIC
 1257                          12,2767   66374 1  GETX          AXT,2   SSP                ASSUMES P (+4) IN MPAC
 1258                          12,2770   00003 1                        3
 1259   REF   27  LAST 1153    12,2771   00052 0                        S2
 1260                          12,2772   00001 0                        1
 1261                          12,2773   77614 1                CLEAR
 1262   REF    1               12,2774   04276 0                        360SW
 1263                          12,2775   65366 1                SQRT    PDDL               0D=SQRT(P)                 PL AT 2
 1264   REF    5  LAST  665    12,2776   02732 0                        CSTH
 1265                          12,2777   44342 1                SR1     BDSU
 1266   REF    2  LAST   38    12,3000   11040 0                        D1/4
 1267                          12,3001   54325 1                PDDL    SRR                                       PL AT 4D
 1268   REF    7  LAST  665    12,3002   02730 1                        SNTH
 1269                          12,3003   21607 0                        6
 1270                          12,3004   77671 1                DDV                                               PL AT 2
 1271                          12,3005   77600 1                BOV
 1272   REF    1               12,3006   25122 1                        360CHECK
 1273                          12,3007   41225 1                DSU     DMP
 1274   REF    4  LAST 1185    12,3010   02766 1                        COGA                          PL AT 0
 1275                          12,3011   40132 0                SL2R    BOV
 1276   REF    2  LAST 1187    12,3012   25122 1                        360CHECK
 1277                          12,3013   63406 0  WLOOP         PUSH    DSQ                0D=W (+5)                  PL AT 2
 1278                          12,3014   65351 0                TLOAD   PDDL               2D=WSQ (+10)               PL AT 5
 1279   REF 727  LAST 1181    12,3015   00155 0                        MPAC
 1280   REF    5  LAST 1185    12,3016   02742 1                        R1A
 1281                          12,3017   76202 0                SR4     TAD                                       PL AT 2
 1282                          12,3020   75440 0                BMN     SQRT
 1283   REF    1               12,3021   25205 1                        INFINITY
 1284                          12,3022   43306 0                ROUND   DAD                                       PL AT 0D
 1285                          12,3023   61000 0                BOV     TIX,2
 1286   REF    1               12,3024   25120 0                        RESETX2
 1287   REF    1               12,3025   25013 1                        WLOOP


 1288                          12,3026   40065 0                BDDV    BOV
 1289   REF    3  LAST 1182    12,3027   11034 0                        D1/128
 1290   REF    2  LAST 1187    12,3030   25205 1                        INFINITY
 1291                          12,3031   41440 1  POLYCOEF BMN     PUSH               0D=1/W (+2) OR 16/W (+6)   PL AT 2
 1292   REF    3  LAST 1187    12,3032   25205 1                        INFINITY
 1293                          12,3033   77716 1                DSQ
 1294                          12,3034   41301 0                NORM    DMP
 1295   REF   47  LAST 1185    12,3035   00047 1                        X1
 1296   REF    6  LAST 1187    12,3036   02742 1                        R1A
 1297                          12,3037   77457 1                SRR*    EXIT
 1298                          12,3040   21567 0                        0 -10D,1
 1299   REF    6  LAST 1178    12,3041   0 7243 0                TC      POLY
```

```
1300                        12,3042   00005 1              DEC      5
1301                        12,3043   20000 0              2DEC     .5
1301                        12,3044   00000 1
1302                        12,3045   72525 0              2DEC     -.166666770
1302                        12,3046   52471 1
1303                        12,3047   03146 1              2DEC     .100000392
1303                        12,3050   15003 0
1304                        12,3051   75556 0              2DEC     -.071401086
1304                        12,3052   45210 0
1305                        12,3053   01615 1              2DEC     .055503292
1305                        12,3054   13553 0
1306                        12,3055   76371 0              2DEC     -.047264098
1306                        12,3056   63777 0
1307                        12,3057   01232 0              2DEC     .040694204
1307                        12,3060   27367 0
1308  REF 222  LAST 1178    12,3061  0 6060 1              TC       INTPRET
1309                        12,3062   76405 1              DMP      SL1R                                   PL AT 0D
1310                        12,3063   43006 0              PUSH     BON
1311  REF   2  LAST 1187    12,3064   04316 1                       360SW
1312  REF   1               12,3065   25172 1                       TRUE360X
1313                        12,3066   60316 0   XCOMMON    DSQ      NORM
1314  REF  48  LAST 1187    12,3067   00047 1                       X1
1315                        12,3070   53605 1              DMP      SRR*
1316  REF   7  LAST 1187    12,3071   02742 1                       R1A
1317                        12,3072   21565 1                       0 -12D,1
1318  REF   6  LAST 1184    12,3073   14031 0              STODL    XI                XI (+6)


1319  REF  13  LAST 1186    12,3074   00041 1                       R1
1320                        12,3075   75542 0              SR1      SQRT
1321                        12,3076   41306 1              ROUND    DMP
1322                        12,3077   77632 0              SL4R                                            PL AT 0
1323  REF  22  LAST 1182    12,3100   00025 0              STORF    X                 X (+17 OR +16)


1324                        12,3101   60316 0              DSQ      NORM
1325  REF  49  LAST 1188    12,3102   00047 1                       X1
1326                        12,3103   41325 0              PDDL     DMP               0D=XSQ (+34 OR +32 -N1)      PL AT 2
1327  REF   5  LAST 1185    12,3104   02740 0                       P
1328  REF  14  LAST 1188    12,3105   00041 1                       R1
1329                        12,3106   75452 0              SL3      SQRT
1330                        12,3107   56405 0              DMP      SL3R
1331  REF   5  LAST 1187    12,3110   02766 1                       COGA
1332  REF   3  LAST 1179    12,3111   14043 0              STODL    KEPC1
1333  REF   8  LAST 1188    12,3112   02742 1                       R1A
1334                        12,3113   43021 0              BDSU     CLEAR
1335  REF   3  LAST 1172    12,3114   11036 1                       D1/64
1336  REF   2  LAST 1184    12,3115   04270 0                       INFINFLG
1337  REF   3  LAST 1179    12,3116   00045 0              STORE    KEPC2
1338                        12,3117   77616 0              RVQ
```

```
1339                            12,3120   77774 0  RESETX2  AXT,2
1340                            12,3121   00003 1                    3

1341                            12,3122   51001 1  360CHECK SETPD   BPL
1342                            12,3123   00001 0                    0D
1343   REF    1                 12,3124   25127 1                    INVRSEQN
1344                            12,3125   77614 1           SET
1345   REF    3  LAST 1188      12,3126   04076 1                    360SW

1346                            12,3127   75545 1  INVRSEQN DLOAD   SQRT
1347   REF    6  LAST 1188      12,3130   02740 0                    P
1348                            12,3131   41325 0           PDDL    DMP               0D=SQRT(P)  (+2)                PL  AT  2
1349   REF    8  LAST 1187      12,3132   02730 1                    SNTH
1350   REF    6  LAST 1188      12,3133   02766 1                    COGA
1351                            12,3134   65352 0           SL1     PDDL              2D=SNTH COGA (+5)               PL  AT  4
1352   REF    6  LAST 1187      12,3135   02732 0                    CSTH
1353                            12,3136   43202 0           SR4     DAD
1354   REF    3  LAST 1185      12,3137   11044 1                    D1/32
1355                            12,3140   41225 1           DSU     DMP                                        PL  AT  2,0
1356                            12,3141   55301 0           NORM    BDDV
1357   REF   50  LAST 1188      12,3142   00047 1                    X1
1358   REF    9  LAST 1189      12,3143   02730 1                    SNTH
1359                            12,3144   51457 0           SLR*    ABS               NOTE: NEAR 360 CASE TREATED DIFFERENTLY
1360                            12,3145   21174 0                    0 -5,1
1361                            12,3146   63406 0           PUSH    DSQ               0D=1/W (-1)                PL  AT  2
1362                            12,3147   14043 0           STODL   34D
1363   REF    1                 12,3150   11042 1                    D1/16
1364                            12,3151   63406 0  1/WLOOP  PUSH    DSQ               2D=G  (+4)                      PL  AT  4
1365                            12,3152   65234 1           RTB     PDDL                                       PL  AT  7
1366   REF   11  LAST 1179      12,3153   21643 0                    TPMODE
1367   REF    9  LAST 1188      12,3154   02742 1                    R1A
1368                            12,3155   40405 1           DMP     SR4
1369                            12,3156   00043 0                    34D
1370                            12,3157   77771 0           TAD                                                       PL  AT  4
1371                            12,3160   75440 0           BMN     SQRT
1372   REF    4  LAST 1187      12,3161   25205 1                    INFINITY
1373                            12,3162   77615 0           DAD                                        PL  AT  2
1374                            12,3163   60304 0           TIX,2   NORM
1375   REF    1                 12,3164   25151 0                    1/WLOOP
1376   REF   51  LAST 1189      12,3165   00047 1                    X1
1377                            12,3166   77665 1           BDDV                                                      PL  AT  0
1378                            12,3167   52057 1           SLR*    GDTD
1379                            12,3170   21172 0                    0 -7,1
1380   REF    1                 12,3171   25031 1                    POLYCOEF

1381                            12,3172   50145 1  TRUE360X DLOAD   BMN
1382   REF   10  LAST 1189      12,3173   02742 1                    R1A
```

```
 1383    REF   5  LAST 1189   12,3174   25205 1                   INFINITY
 1384                         12,3175   60366 1          SQRT     NORM
 1385    REF  52  LAST 1189   12,3176   00047 1                   X1
 1386                         12,3177   53665 1          BDDV     SL*
 1387    REF   2  LAST 1173   12,3200   11056 1                   2PISC
 1388                         12,3201   20176 0                   0 -3,1
 1389                         12,3202   41425 1          DSU      PUSH              OD=2PI/SQRT(R1A) -X          PL AT 0,2
 1390                         12,3203   77650 1          GOTO
 1391    REF   1              12,3204   25066 0                   XCOMMON
 1392                         12,3205   40001 1 INFINITY SETPD    BOV               NO SOLUTION EXISTS SINCE CLOSURE THROUGH
 1393                         12,3206   00001 0                   0                 INFINITY IS REQUIRED
 1394    REF   1              12,3207   25210 0                   OVFLCLR
 1395                         12,3210   43414 1 OVFLCLR  SET      RVQ
 1396    REF   3  LAST 1188   12,3211   04070 1                   INFINFLG
```

```
1397                        12,3212   40220 0  LAMBERT  STQ     SETPD
1398    REF   5  LAST  130  12,3213   02710 0                   RTNLAMB
1399                        12,3214   00001 0                   0D
13995                       12,3215   77600 1           BOV
13996                       12,3216   25217 1                   +1
1400                        12,3217   76614 0           CLEAR   VLOAD*
1401    REF   1             12,3220   02674 0                   SOLNSW
1403    REF   6  LAST 1185  12,3221   10005 0                   MUTABLE,1
1404    REF   4  LAST 1185  12,3222   14017 1           STODL   1/MU
1405    REF   3  LAST  690  12,3223   02671 0                   TDESIRED
1406                        12,3224   77675 0           DMPR
1407    REF   1             12,3225   11043 0                   BEE19
1408    REF   2  LAST  130  12,3226   02764 0           STORE   EPSILONL
1409                        12,3227   77214 0           SET     VLOAD
1410    REF   2  LAST 1180  12,3230   00474 0                   SLOPESW
1411    REF   6  LAST  692  12,3231   02655 0                   R1VEC
1412                        12,3232   45115 0           PDVL    CALL          0D=R1VEC (+29 OR +27)             PL AT 6
1413    REF  10  LAST  692  12,3233   02663 0                   R2VEC         MPAC=R2VEC (+29 OR +27)
1414    REF   2  LAST 1184  12,3234   11131 1                   GEOM
1415    REF  10  LAST 1189  12,3235   16730 1           STODL   SNTH          0D=CSTH (+1)                      PL AT 2
1416    REF   5  LAST 1186  12,3236   02720 0                   MAGVEC2
1417                        12,3237   65301 0           NORM    PDDL                                            PL AT 4
1418    REF  53  LAST 1190  12,3240   00047 1                   X1
1419    REF  15  LAST 1188  12,3241   00041 1                   R1
1420                        12,3242   56342 1           SR1     DDV                                             PL AT 2
1421                        12,3243   65257 1           SL*     PDDL          DXCH WITH 0D, 0D=R1/R2 (+7)       PL AT 0,2
1422                        12,3244   20173 0                   0 -6,1
1423                        12,3245   77626 0           STADR
1424    REF   7  LAST 1189  12,3246   75045 1           STORE   CSTH          CSTH (+1)
1425                        12,3247   44342 1           SR1     BDSU
1426    REF   3  LAST 1187  12,3250   11040 0                   D1/4
1427    REF   2  LAST  130  12,3251   02734 0           STORE   1-CSTH        1-CSTH (+2)

1428                        12,3252   53106 0           ROUND   BZE
1429    REF   1             12,3253   25473 0                   360LAMB
1430                        12,3254   65301 0           NORM    PDDL                                            PL AT 4
1431    REF  54  LAST 1191  12,3255   00047 1                   X1
1432                        12,3256   00001 0                   0D
1433                        12,3257   56342 1           SR1     DDV                                             PL AT 2
1434                        12,3260   75457 0           SL*     SQRT
1435                        12,3261   20176 0                   0 -3,1
1436                        12,3262   54325 1           PDDL    SR            2D=SQRT(2R1/R2(1-CSTH)) (+5)      PL AT 4
1437    REF  11  LAST 1191  12,3263   02730 1                   SNTH
1438                        12,3264   20607 1                   6
1439                        12,3265   43271 1           DDV     DAD                                             PL AT 2
1440    REF   3  LAST 1191  12,3266   02734 0                   1-CSTH
14401                       12,3267   77626 0           STADR
14402   REF   1             12,3270   77760 0           STORE   COGAMAX
1441                        12,3271   50000 1           BOV     BMN           IF OVFL, COGAMAX=COGUPLIM
1442    REF   1             12,3272   25277 1                   UPLIM         IF NEG, USE EVEN IF LT COGLOLIM, SINCE
```

```
 14421  REF   1              12,3273   25302 1                     MAXCOGA        THIS WOULD BE RESET IN LAMBLOOP
 14422                       12,3274   50025 0             DSU     BMN           IF COGAMAX GT COGUPLIM, COGAMAX=COGUPLIM
 14423  REF   1              12,3275   11062 0                     COGUPLIM
 14424  REF   2  LAST 1192   12,3276   25302 1                     MAXCOGA       OTHERWISE OK, SO GO TO MAXCOGA
 14425                       12,3277   77745 1  UPLIM      DLOAD
 14426  REF   2  LAST 1192   12,3300   11062 0                     COGUPLIM      COGUPLIM=.999511597 = MAX VALUE OF COGA
 14427  REF   2  LAST 1191   12,3301   00017 1             STORE   COGAMAX         NOT CAUSING OVFL IN R1A CALCULATION
 1443                        12,3302   77745 1  MAXCOGA    DLOAD
 1444   REF   8  LAST 1191   12,3303   02732 0                     CSTH
 1445                        12,3304   45261 0             SR      DSU                                          PL AT 0
 1446                        12,3305   20607 1                     6
 1447                        12,3306   77626 0             STADR
 1448   REF   2  LAST  130   12,3307   61041 0             STODL   CSTH-RHO
 1449   REF  11  LAST 1186   12,3310   02673 1                     GEOMSGN
 1450                        12,3311   71240 1             BMN     DLOAD
 1451   REF   1              12,3312   25513 1                     LOLIM
 1452   REF   3  LAST 1192   12,3313   02736 1                     CSTH-RHO
 1453                        12,3314   56352 0             SL1     DDV
 1454   REF  12  LAST 1191   12,3315   02730 1                     SNTH
 1455                        12,3316   77600 1             BOV
 1456   REF   2  LAST 1192   12,3317   25513 1                     LOLIM
 1457   REF   1              12,3320   00011 1  MINCOGA    STORE   COGAMIN       COGAMIN (+5)
 1458                        12,3321   66214 0             BON     SSP
 1459   REF   3  LAST  691   12,3322   00715 1                     GUESSW
 1460   REF   1              12,3323   25477 1                     NOGUESS
 1461   REF   3  LAST 1181   12,3324   00051 0                     TWEEKIT
 1462                        12,3325   00001 0                     00001
 1463                        12,3326   77745 1             DLOAD
 1464   REF   7  LAST 1189   12,3327   02766 1                     COGA


 1465                        12,3330   77605 1  LAMBLOOP   DMP
 1466   REF  13  LAST 1192   12,3331   02730 1                     SNTH
 1467                        12,3332   45342 0             SR1     DSU
 1468   REF   4  LAST 1192   12,3333   02736 1                     CSTH-RHO
 1469                        12,3334   65301 0             NORM    PDDL          OD=SNTH COGA-(CSTH-RHO) (+7+C(X1)) PL=2
 1470   REF  55  LAST 1191   12,3335   00047 1                     X1
 1471   REF   4  LAST 1191   12,3336   02734 0                     1-CSTH
 1472                        12,3337   56257 1             SL*     DDV           1-CSTH  (+2)                   PL AT 0
 1473                        12,3340   20170 0                     0 -9D,1
 1474                        12,3341   53040 0             BMN     BZE
 1475   REF   1              12,3342   25427 1                     NEGP
 1476   REF   2  LAST 1192   12,3343   25427 1                     NEGP
 1477   REF   7  LAST 1189   12,3344   16740 0             STODL   P             P=(1-CSTH)/(SNTH COGA-(CSTH-RHO)) (+4)
 1478   REF   8  LAST 1192   12,3345   02766 1                     COGA
 1479                        12,3346   43316 1             DSQ     DAD
 1480   REF   1              12,3347   11046 0                     D1/1024
 1481                        12,3350   41301 0             NORM    DMP
 1482   REF  56  LAST 1192   12,3351   00047 1                     X1
 1483   REF   8  LAST 1192   12,3352   02740 0                     P
 1484                          12,3353   44257 1               SR*     BDSU
 1485                          12,3354   20571 0                       0 -8D,1
 1486   REF   4  LAST 1189     12,3355   11044 1                       D1/32
 1487   REF  11  LAST 1189     12,3356   16742 1               STODL   R1A                 R1A=2-P(1+COGA COGA) (+6)

 1488   REF   9  LAST 1192     12,3357   02740 0                       P
 1489                          12,3360   45000 0               BOV     CALL
 1490   REF   1                12,3361   25432 0                       HIENERGY
 1491   REF   2  LAST 1184     12,3362   24767 1                       GETX
 1492                          12,3363   77745 1               DLOAD
 1493   REF  10  LAST 1182     12,3364   00037 0                       T
 1494   REF   1                12,3365   16762 0               STODL   TPREV
 1495   REF   7  LAST 1188     12,3366   00031 0                       XI
 1496                          12,3367   45014 0               BON     CALL
 1497   REF   4  LAST 1190     12,3370   04310 1                       INFINFLG
 1498   REF   3  LAST 1192     12,3371   25427 1                       NEGP                HAVE EXCEEDED THEORETICAL BOUNDS
 1499   REF   3  LAST 1184     12,3372   24421 0                       DELTIME
 1500                          12,3373   44200 0               BOV     BDSU
 1501   REF   1                12,3374   25447 1                       BIGTIME
 1502   REF   4  LAST 1191     12,3375   02671 0                       TDESIRED
 1503   REF   1                12,3376   02760 1               STORE   TERRLAMB
 1504                          12,3377   44246 1               ABS     BDSU
 1505   REF   3  LAST 1191     12,3400   02764 0                       EPSILONL
 1506                          12,3401   47044 1               BPL     RTB
 1507   REF   1                12,3402   25516 1                       INITV
 1508   REF   2  LAST 1175     12,3403   24644 1                       CHECKCTR
 1509                          12,3404   43030 0               BHIZ    BON
 15091  REF   1                12,3405   25460 1                       SUFFCHEK
 15092  REF   3  LAST 1191     12,3406   00714 0                       SLOPESW
 15093  REF   1                12,3407   25415 0                       GOITER
 15094                         12,3410   45345 1               DLOAD   DSU
 15095  REF  11  LAST 1193     12,3411   00037 0                       T
 15096  REF   2  LAST 1193     12,3412   02762 0                       TPREV
 15097                         12,3413   77654 0               BZE
 1510   REF   2  LAST 1193     12,3414   25460 1                       SUFFCHEK
 15105                         12,3415   77624 1   GOITER      CALL
 1511   REF   1                12,3416   24536 1                       ITERATOR
 1512                          12,3417   53145 1               DLOAD   BZE
 1513   REF 728  LAST 1187     12,3420   00155 0                       MPAC
 1514   REF   3  LAST 1193     12,3421   25460 1                       SUFFCHEK
 1515                          12,3422   77615 0               DAD
 1516   REF   9  LAST 1192     12,3423   02766 1                       COGA
 1517   REF  10  LAST 1193     12,3424   02766 1               STORE   COGA
 1518                          12,3425   77650 1               GOTO
 1519   REF   1                12,3426   25330 0                       LAMBLOOP


 1520                          12,3427   51145 0   NEGP        DLOAD   BPL                 IMPOSSIBLE TRAJECTORY DUE TO INACCURATE
 1521   REF   1                12,3430   00015 0                       DCOGA               BOUND CALCULATION. TRY NEW COGA.
 1522   REF   1                12,3431   25452 0                       LOENERGY
 1523                          12,3432   71201 1  HIENERGY SETPD  DLOAD          HIGH ENERGY TRAJECTORY RESULTED
 1524                          12,3433   00001 0                  0
 1525     REF  11  LAST 1193   12,3434   02766 1                  COGA           IN OVFL OF P OR R1A, OR XI EXCEEDING 50.
 1526     REF   2  LAST 1192   12,3435   00011 1           STORE  COGAMIN        THIS IS THE NEW BOUND.
 1527                          12,3436   70545 1  COMMONLM DLOAD  SR1
 1528     REF   2  LAST 1193   12,3437   00015 0                  DCOGA
 1529     REF   3  LAST 1194   12,3440   00015 0           STORE  DCOGA          USE DCOGA/2 AS DECREMENT
 1530                          12,3441   44254 1           BZE    BDSU
 15301    REF   4  LAST 1193   12,3442   25460 1                  SUFFCHEK
 1531     REF  12  LAST 1194   12,3443   02766 1                  COGA
 1532     REF  13  LAST 1194   12,3444   02766 1           STORE  COGA
 1533                          12,3445   77650 1           GOTO                  RESTART THIS LOOP
 1534     REF   2  LAST 1193   12,3446   25330 0                  LAMBLOOP


 1535                          12,3447   77745 1  BIGTIME  DLOAD
 1536     REF   3  LAST 1193   12,3450   02762 0                  TPREV
 1537     REF  12  LAST 1193   12,3451   00037 0           STORE  T


 1538                          12,3452   71201 1  LOENERGY SETPD  DLOAD          LOW ENERGY TRAJECTORY RESULTED
 1539                          12,3453   00001 0                  0
 1540     REF  14  LAST 1194   12,3454   02766 1                  COGA           IN OVERFLOW OF TIME.
 1541     REF   3  LAST 1192   12,3455   00017 1           STORE  COGAMAX        THIS IS THE NEW BOUND.
 1542                          12,3456   77650 1           GOTO
 1543     REF   1              12,3457   25436 1                  COMMONLM


 1544                          12,3460   51545 1  SUFFCHEK DLOAD  ABS
 1545     REF   2  LAST 1193   12,3461   02760 1                  TERRLAMB
 1546                          12,3462   41325 0           PDDL   DMP                                PL AT 2D
 1547     REF   5  LAST 1193   12,3463   02671 0                  TDESIRED
 1548     REF   1              12,3464   11031 0                  BEE17
 1549                          12,3465   45215 0           DAD    DSU                                PL AT 0D
 1550     REF   1              12,3466   11060 1                  ONEBIT
 1551                          12,3467   43044 0           BPL    SETGO
 1552     REF   2  LAST 1193   12,3470   25516 1                  INITV
 1553     REF   2  LAST 1191   12,3471   02434 0                  SOLNSW
 1554     REF   3  LAST 1194   12,3472   25516 1                  INITV
 1555                          12,3473   43001 1  360LAMB  SETPD  SETGO          LAMBERT CANNOT HANDLE CSTH=1
 1556                          12,3474   00001 0                  0
 1557     REF   3  LAST 1194   12,3475   02434 0                  SOLNSW
 1558     REF   6  LAST 1191   12,3476   02710 0                  RTNLAMB


 1559                          12,3477   71331 0  NOGUESS  SSP    DLOAD
 1560     REF   4  LAST 1192   12,3500   00051 0                  TWEEKIT
 1561                          12,3501   10000 0                  20000
 1562     REF   3  LAST 1194   12,3502   00011 1                  COGAMIN
 1563                          12,3503   65342 1           SR1    PDDL                               PL AT 2
```

```
1564   REF  4  LAST 1194   12,3504   00017 1                    COGAMAX
1565                       12,3505   43342 0            SR1     DAD
1566                       12,3506   77626 0            STADR                                           PL AT 0
1567   REF 15  LAST 1194   12,3507   75011 0            STORE   COGA
1568   REF  4  LAST 1194   12,3510   00015 0            STORE   DCOGA
1569                       12,3511   77650 1            GOTO
1570   REF  3  LAST 1194   12,3512   25330 0                    LAMBLOOP

1574                       12,3513   52145 0   LCLIM    DLOAD   GOTO
1575   REF  1              12,3514   11064 0                    COGLOLIM        COGLOLIM=-.999511597
1576   REF  1              12,3515   25320 1                    MINCOGA

1577                       12,3516   60345 0   INITV    DLOAD   NORM
1578   REF 16  LAST 1191   12,3517   00041 1                    R1
1579   REF 57  LAST 1192   12,3520   00047 1                    X1
1580                       12,3521   70525 1            PDDL    SR1                                     PL AT 2
1581   REF 10  LAST 1193   12,3522   02740 0                    P
1582                       12,3523   77671 1            DDV                                             PL AT 0
1583                       12,3524   75457 0            SL*     SQRT
1584                       12,3525   20175 0                    0 -4,1
1585                       12,3526   72405 0            DMP     SL1
1586   REF  3  LAST 1182   12,3527   00021 1                    ROOTMU
1587                       12,3530   41206 0            PUSH    DMP             OD=VTAN (+7)            PL AT 2
1588   REF 16  LAST 1195   12,3531   02766 1                    COGA
1589                       12,3532   74261 1            SL      VXSC
1590                       12,3533   20206 1                    5
1591   REF  7  LAST 1186   12,3534   02722 1                    UR1
1592                       12,3535   77725 1            PDDL                    XCH WITH OD             PL AT 0,6
1593                       12,3536   76561 1            VXSC    VSL1
1594   REF  7  LAST 1186   12,3537   02674 0                    UN
1595                       12,3540   53235 0            VXV     VAD                                     PL AT 0
1596   REF  8  LAST 1195   12,3541   02722 1                    UR1
1597                       12,3542   77772 0            VSL1
1599   REF 13  LAST 1184   12,3543   02744 1            STORE   VVEC
1600                       12,3544   53135 0            SLOAD   BZE
1601   REF  5  LAST  692   12,3545   02702 0                    VTARGTAG
1602   REF  1              12,3546   25551 1                    TARGETV
1603                       12,3547   77650 1            GOTO
1604   REF  7  LAST 1194   12,3550   02710 0                    RTNLAMB

1605                       12,3551   45145 0   TARGETV  DLOAD   CALL
1606   REF  6  LAST 1191   12,3552   02720 0                    MAGVEC2
1607   REF  1              12,3553   24701 1                    LAMENTER
1608   REF  4  LAST  693   12,3554   02703 1            STORE   VTARGET
1609                       12,3555   77650 1            GOTO
1610   REF  8  LAST 1195   12,3556   02710 0                    RTNLAMB
```

```
1611                      12,3557   40220 0  TIMERAD  STQ     SETPD                                PL AT 0
1612   REF   1            12,3560   02710 0                   RTNTR
1613                      12,3561   00001 0                   0
16135                     12,3562   77600 1           BOV
16136                     12,3563   25564 1                   +1
1614                      12,3564   63375 0           VLOAD   PDVL                                 PL AT 6
1615   REF   9  LAST 1184 12,3565   02655 0                   RVEC
1616   REF  14  LAST 1195 12,3566   02744 1                   VVEC
1617                      12,3567   77624 1           CALL
1618   REF   2  LAST 1184 12,3570   11065 1                   PARAM
1619                      12,3571   71200 0           BOV     DLOAD                                PL AT 0
1620   REF   2  LAST 1184 12,3572   24764 1                   COGAOVFL
1621   REF   5  LAST 1193 12,3573   11044 1                   D1/32
1622                      12,3574   41225 1           DSU     DMP
1623   REF  12  LAST 1193 12,3575   02742 1                   R1A
1624   REF  11  LAST 1195 12,3576   02740 0                   P
1625                      12,3577   41366 1           SQRT    DMP
1626   REF  17  LAST 1195 12,3600   02766 1                   COGA
1627                      12,3601   74212 0           SL4     VXSC
1628   REF   5  LAST 1186 12,3602   02712 1                   U2
1629                      12,3603   45325 1           PDDL    DSU                                  PL AT 6
1630   REF   4  LAST 1188 12,3604   11036 1                   D1/64
1631   REF  13  LAST 1196 12,3605   02742 1                   R1A
1632                      12,3606   52361 1           VXSC    VSU                                  PL AT 0
1633   REF   9  LAST 1195 12,3607   02722 1                   UR1
1634                      12,3610   53512 1           VSL4    UNIT
16345                     12,3611   77600 1           BOV
16346  REF   1            12,3612   25670 1                   CIRCULAR
1635                      12,3613   60325 0           PDDL    NORM           0D=UNIT(ECC) (+3)     PL AT 6
1636   REF   3  LAST  628 12,3614   02756 1                   RDESIRED       36D=ECC (+3)
1637   REF  58  LAST 1195 12,3615   00047 1                   X1
1638                      12,3616   41325 0           PDDL    DMP                                PL AT 8
1639   REF  17  LAST 1195 12,3617   00041 1                   R1
1640   REF  12  LAST 1196 12,3620   02740 0                   P
1641                      12,3621   56257 1           SL*     DDV                                PL AT 6
1642                      12,3622   20201 0                   0,1
1643                      12,3623   56225 1           DSU     DDV
1644   REF   2  LAST 1189 12,3624   11042 1                   D1/16
1645                      12,3625   00045 0                   36D            36D=ECC (+3)
1646   REF   1            12,3626   00031 0           STORE   COSF
1647                      12,3627   63400 0           BOV     DSQ
1648   REF   1            12,3630   25674 0                   BADR2
1649                      12,3631   50021 1           BDSU    BMN
1650   REF   4  LAST 1191 12,3632   11040 0                   D1/4
16505  REF   2  LAST 1196 12,3633   25674 0                   BADR2
1651                      12,3634   75366 0           SQRT    SIGN
1652   REF   2  LAST  130 12,3635   02755 1                   SGNRDOT
16525                     12,3636   77614 1           CLEAR
1653   REF   1            12,3637   04272 1                   APSESW
```

```
 1654                         12,3640  76561 1  TERMNVEC VXSC    VSL1
 1655   REF   8  LAST 1195    12,3641  02674 0                   UN
 1656                         12,3642  63235 0           VXV     PDVL                VXCH WITH OD                       PL AT 0,6
 1657                         12,3643  00001 0                   OD
 1658                         12,3644  53361 0           VXSC    VAD                                                    PL AT 0
 1659   REF   2  LAST 1196    12,3645  00031 0                   COSF
 1660                         12,3646  41572 1           VSL1    PUSH                OD=U2                              PL AT 6

 1661                         12,3647  56241 0           DOT     DDV                 LIMITS RESULT TO POSMAX OR NEGMAX
 1662   REF  10  LAST 1196    12,3650  02722 1                   UR1
 16622  REF   1               12,3651  25766 1                   DP1/4
 16624                        12,3652  40142 1           SR1     BOV                 SCALE BACK DOWN TO NORMAL
 16625                        12,3653  25654 1                   +1                  CLEAR OVFIND IF SET
 1663   REF   9  LAST 1192    12,3654  26732 0           STOVL   CSTH                CSTH (+1)
 1664   REF  11  LAST 1197    12,3655  02722 1                   UR1
 1665                         12,3656  76435 1           VXV     VSL1
 1666                         12,3657  72441 0           DOT     SL1
 1667   REF   9  LAST 1197    12,3660  02674 0                   UN
 1668   REF  14  LAST 1192    12,3661  16730 1           STODL   SNTH                SNTH (+1)
 1669   REF  13  LAST 1196    12,3662  02740 0                   P
 1670                         12,3663  77624 1           CALL
 1671   REF   3  LAST 1193    12,3664  24767 1                   GETX
 1672                         12,3665  77614 1           CLRGO
 16725  REF   4  LAST 1194    12,3666  02634 1                   SOLNSW
 1673   REF   1               12,3667  24747 0                   COMMNOUT


 16734                        12,3670  43001 1  CIRCULAR SETPD   SETGO
 16735                        12,3671  00001 0                   0
 16736  REF   5  LAST 1197    12,3672  02434 0                   SOLNSW
 16737  REF   3  LAST 1184    12,3673  25752 0                   ABTCONIC

 1674                         12,3674  75345 1  BADR2    DLOAD   SIGN
 16741  REF   3  LAST  335    12,3675  24005 1                   LODPHALF
 16742  REF   3  LAST 1197    12,3676  00031 0                   COSF
 16743  REF   4  LAST 1197    12,3677  14031 0           STODL   COSF
 1675   REF   3  LAST 1173    12,3700  24007 0                   KEPZERO
 16755                        12,3701  77614 1           SETGO
 1676   REF   2  LAST 1196    12,3702  04032 1                   APSESW
 1677   REF   1               12,3703  25640 1                   TERMNVEC
 1678                          12,3704   40220 0  APSIDES  STQ     SETPD                                        PL AT  0
 1679   REF   1                12,3705   02710 0                   RTNAPSE
 1680                          12,3706   00001 0                   0D
 16805                         12,3707   77600 1           BOV
 16806                         12,3710   25711 1                   +1
 1681                          12,3711   63375 0           VLOAD   PDVL                                         PL AT  6
 1682   REF  10  LAST 1196     12,3712   02655 0                   RVEC
 1683   REF  15  LAST 1196     12,3713   02744 1                   VVEC
 1684                          12,3714   77624 1           CALL
 1685   REF   3  LAST 1196     12,3715   11065 1                   PARAM
 1686                          12,3716   77600 1           BOV                                                  PL AT  0
 1687   REF   1                12,3717   25720 0                   GETECC
 1688                          12,3720   42405 0  GETECC   DMP     SL4
 1689   REF  14  LAST 1196     12,3721   02742 1                   R1A
 1690                          12,3722   75421 1           BDSU    SQRT
 1691   REF   5  LAST 1196     12,3723   11036 1                   D1/64
 1692   REF   3  LAST  641     12,3724   02752 0           STORE   ECC
 1693                          12,3725   65215 1           DAD     PDDL                                         PL AT  2
 1694   REF   1                12,3726   11032 0                   D1/8
 1695   REF  18  LAST 1196     12,3727   00041 1                   R1
 1696                          12,3730   72405 0           DMP     SL1
 1697   REF  14  LAST 1197     12,3731   02740 0                   P
 1698                          12,3732   77671 1           DDV                                                  PL AT  0
 1699                          12,3733   60325 0           PDDL    NORM             0D=RP (+29 OR +27)          PL AT  2
 1700   REF  15  LAST 1198     12,3734   02742 1                   R1A
 1701   REF  59  LAST 1196     12,3735   00047 1                   X1
 1702                          12,3736   53725 1           PDDL    SL*                                          PL AT  4
 1703   REF  19  LAST 1198     12,3737   00041 1                   R1
 1704                          12,3740   20174 1                   0 -5,1
 1705                          12,3741   45271 1           DDV     DSU                                          PL AT 2,0
 1706                          12,3742   50000 1           BOV     BMN
 1707   REF   1                12,3743   25747 1                   INFINAPO
 1708   REF   2  LAST 1198     12,3744   25747 1                   INFINAPO
 1709                          12,3745   77650 1           GOTO
 1710   REF   2  LAST 1198     12,3746   02710 0                   RTNAPSE
 1711                          12,3747   52145 0  INFINAPO DLOAD   GOTO             RETURNS WITH APOAPSIS IN MPAC,PERIAPSIS
 1712   REF   1                12,3750   24020 0                   LDPOSMAX
 1713   REF   3  LAST 1198     12,3751   02710 0                   RTNAPSE          THAT PL IS AT 0.
 17136                          12,3752   77776 1  ABTCONIC EXIT
 17137  REF    3  LAST   828    12,3753  0 5644 1           TC       POODOO
 17138                          12,3754   20607 1           OCT      20607

 1725   REF    3  LAST   705    12,2017            LDPOSMAX EQUALS LODPMAX          DPPOSMAX IN LOW MEMORY.

R1727   ERASABLE ASSIGNMENTS


R1728   KEPLER SUBROUTINE

R1729      INPUT -
R1730   RRECT     ERASE   +5
R1731   VRECT     ERASE   +5
R1732   TAU.      ERASE   +1
R1733   XKEP      ERASE   +1
R1734   TC        ERASE   +1
R1735   XPREV     ERASE   +1
 1736                              0016            1/MU     EQUALS 14D
 1737                              0020            ROOTMU   EQUALS 16D
 1738                              0022            1/ROOTMU EQUALS 18D
R1739      OUTPUT -
R1740   RCV       ERASE   +5
R1741   VCV       ERASE   +5
R1742   RC        ERASE   +1
R1743   XPREV     ERASE   +1

R1744   DEBRIS -
 1745                              0010            ALPHA    EQUALS 8D
 1746                              0012            XMAX     EQUALS 10D
 1747                              0014            XMIN     EQUALS 12D
 1748                              0024            X        EQUALS 20D
 1749                              0030            XI       EQUALS 24D
 1750                              0032            S(XI)    EQUALS 26D
 1751                              0034            XSQC(XI) EQUALS 28D
 1752                              0036            T        EQUALS 30D
 1753                              0040            R1       EQUALS 32D
 1754                              0042            KEPC1    EQUALS 34D
 1755                              0044            KEPC2    EQUALS 36D
R1756   DELX      ERASE   +1
R1757   DELT      ERASE   +1
R1758   URRECT    ERASE   +5
R1759   RCNORM    ERASE   +1
R1760   XPREV     EQUALS XKEP


R1761   LAMBERT SUBROUTINE

R1762      INPUT-
R1763   R1VEC     ERASE   +5
```

```
R1764   R2VEC    ERASE  +5
R1765   TDESIRED ERASE  +1
R1766   GEOMSGN  ERASE  +0
R1767   GUESSW                          0 IF COGA GUESS AVAILABLE, 1 IF NOT
R1768   COGA     ERASE  +1              INPUT ONLY IF GUESSW IS ZERO.
R1769   NORMSW                          0 IF UN TO BE COMPUTED, 1 IF UN INPUT
R1770   UN       ERASE  +5              ONLY USED IF NORMSW IS 1
R1771   VTARGTAG ERASE  +0
R1772   TWEEKIT  EQUALS 40D             ONLY USED IF GUESSW IS 0

R1773      OUTPUT -
R1774   VTARGET  ERASE  +5              AVAILABLE ONLY IF VTARGTAG IS ZERO.
R1775   V1VEC    EQUALS MPAC

R1776      DEBRIS -
R1777   RTNLAMB  ERASE  +0
R1778   U2       ERASE  +5
R1779   MAGVEC2  ERASE  +1
R1780   UR1      ERASE  +5
R1781   R1       EQUALS 31D
R1782   UN       ERASE  +5
R1783   SNTH     ERASE  +1
R1784   CSTH     ERASE  +1
R1785   1-CSTH   ERASE  +1
R1786   CSTH-RHO ERASE  +1
 1787                           0016            COGAMAX  EQUALS 14D             CLOBBERS 1/MU
 1788                           0010            COGAMIN  EQUALS 8D
 1789                           0014            DCOGA    EQUALS 12D
R1790   TWEEKIT  EQUALS 40D
R1791   P        ERASE  +1
R1792   COGA     ERASE  +1
R1793   R1A      ERASE  +1
R1794   X        EQUALS 20D
R1795   XSQ      EQUALS 22D
R1796   XI       EQUALS 24D
R1797   S(XI)    EQUALS 26D
R1798   XSQC(XI) EQUALS 28D
R1799   T        EQUALS 30D
R1800   KEPC1    EQUALS 34D
R1801   KEPC2    EQUALS 36D
R1802   SLOPESW
R1803   SOLNSW
R1804   OTHERS -

R1805   RVEC     EQUALS R1VEC
R1806   VVEC     ERASE  +5
R1807   COGAFLAG
R1808   RVSW
R1809   INFINFLG
R1810   APSESW
```

```
R1811      360SW
R1812      RTNTT    EQUALS RTNLAMB
R1813      ECC      ERASE  +1
R1814      RTNTR    EQUALS RTNLAMB
R1815      RTNAPSE  EQUALS RTNLAMB
R1816      R2       EQUALS MAGVEC2
 1817                               0030             COSF      EQUALS 24D
R1818      RTNPRM   ERASE  +0
R1819      SGNRDOT  ERASE  +0
R1820      RDESIRED ERASE  +1


R1821      ITERATOR SUBROUTINE

R1822      ORDERSW
 1823                               0016             MAX       EQUALS 14D                CLOBBERS 1/MU
 1824                               0010             MIN       EQUALS 8D
R1825      INDEP    ERASE  +1
 1826                               0014             DELINDEP  EQUALS 12D
 1827                               0026             ITERCTR   EQUALS 22D
 1828                               0036             DEP       EQUALS 30D
R1829      DELDEP   ERASE  +1
R1830      DEPREV   ERASE  +1
 1831                               0050             TWEEKIT   EQUALS 40D


R1832      MORE KEPLER

R1833      EPSILONT ERASE  +1


R1834      MORE LAMBERT

R1835      TERRLAMB EQUALS DELDEP
R1836      TPREV    EQUALS DEPREV


R1837      EPSILONL EQUALS EPSILONT +2     DOUBLE PRECISION WORD
```

```
R0006    1.0 INTRODUCTION
R0007    ----------------
R0008
R0009    FROM A USERS POINT OF VIEW, ORBITAL INTEGRATION IS ESSENTIALLY THE SAME AS THE 278 INTEGRATION
R0011    PROGRAM. THE SAME ENTRANCES TO THE PROGRAM WILL BE MAINTAINED, THE SAME STALLING ROUTINE WILL BE USED AND
R0013    OUTPUT WILL STILL BE VIA THE PUSHLIST. THE PRIMARY DIFFERENCES TO A USER INVOLVE THE ADDED CAPABILITY OF
R0015    TERMINATING INTEGRATION AT A SPECIFIC FINAL RADIUS AND THE DIFFERENCE IN STATE VECTOR SCALING INSIDE AND OUT-
R0017    SIDE THE LUNAR SPHERE OF INFLUENCE.
R0018
R0019    IN ORDER TO MAKE THE CSM(LEM)PREC AND CSM(LEM)CONIC ENTRANCES SIMILAR TO FLIGHT 278, THE INTEGRATION PROGRAM
R0021    WILL ITSELF SET THE FINAL RADIUS (RFINAL) TO 0 SO THAT REACHING THE DESIRED TIME ONLY WILL TERMINATE
R0023    INTEGRATION. THE DP REGISTER RFINAL MUST BE SET BY USERS OF INTEGRVS AND INTEGRV, AND MUST BE DONE AFTER THE
R0025    CALL TO INTSTALL.
R0026
R0027    WHEN THE LM IS ON THE LUNAR SURFACE (INDICATED BY LUNAR SURFACE FLAG SET) CALLS TO LEMCONIC, LEMPREC, AND
R0029    INTEGRV WITH VINFLAG = 0 WILL RESULT IN THE USE OF THE PLANETARY INERTIAL ORIENTATION SUBROUTINES TO PROVIDE
R0031    BOTH THE LMS POSITION AND VELOCITY IN THE REFERENCE COORDINATE  SYSTEM.
R0032    THE PROGRAM WILL PROVIDE OUTPUT AS IF INTEGRATION WAS USED. THAT IS, THE PUSHLIST WILL BE SET AS NOTED BELOW AND
R0034    THE PERMANENT STATE VECTOR UPDATED WHEN SPECIFIED BY AN INTEGRV CALL.
R0035
R0036    USERS OF INTEGRVS DESIRING INTEGRATION (INTYPFLG = 0) SHOULD NOTE THAT THE OBLATENESS PERTURBATION COMPUTATION
R0038    IN LUNAR ORBIT IS TIME DEPENDENT. THEREFORE, THE USER SHOULD SUPPLY AN INITIAL STATE VECTOR VALID AT SOME REAL
R0040    TIME AND THE DESIRED TIME (TDEC1) ALSO AT SOME REAL TIME. FOR CONIC ,,INTEGRATION,, THE USER MAY STILL USE ZERO
R0042    AS THE INITIAL TIME AND DELTA TIME AS THE DESIRED TIME.
R0043
R0044    2.0 GENERAL DESCRIPTION
R0045    -----------------------
R0046
R0047    THE INTEGRATION PROGRAM OPERATES AS A CLOSED INTERPRETIVE SUBROUTINE AND PERFORMS THESE FUNCTIONS---
R0049       1) INTEGRATES (PRECISION OR CONIC) EITHER CSM OR LM STATE VECTOR
R0050       2) INTEGRATES THE W-MATRIX
R0051       3) PERMANENT OR TEMPORARY UPDATE OF THE STATE VECTOR
R0052
R0053    THERE ARE SIX ENTRANCES TO THE INTEGRATION PROGRAM. FOUR OF THESE (CSMPREC, LEMPREC, CSMCONIC, LEMCONIC) SET
R0055    ALL THE FLAGS REQUIRED IN THE INTEGRATION PROGRAM ITSELF TO CAUSE THE PRECISION OR CONIC INTEGRATION (KEPLER) OF
R0057    THE LM OR CSM STATE VECTOR, AS THE NAMES SUGGEST. ONE ENTRANCE (INTEGRVS) PERMITS THE CALLING PROGRAM TO
R0059    PROVIDE A STATE VECTOR TO BE INTEGRATED. THE CALLING PROGRAM MUST SET THE FLAGS INDICATING (1) PRECISION OR
R0061    CONIC INTEGRATION, (2) IN OR OUT OF LUNAR SPHERE, (3) MIDCOURSE OR NOT, AND THE INTEGRATION PROGRAM COMPLETES
R0063    THE FLAG SETTING TO BYPASS W-MATRIX INTEGRATION. THE LAST ENTRANCE (INTEGRV, USED IN GENERAL BY THE
R0065    NAVIGATION PROGRAMS) PERMITS THE CALLER TO SET FIVE FLAGS (NOT MOONFLAG OR MIDFLAG) BUT NOT TO INPUT A STATE
R0067    VECTOR. ANY PROGRAM WHICH CALLS INTEGRVS OR INTEGRV MUST CALL INTSTALL BEFORE IT SETS THE INTEGRATION FLAGS
R0069    AND/OR STATE VECTOR.
R0070
R0071    THREE SETS OF 42 REGISTERS AND 2 FLAGS ARE USED FOR THE STATE VECTORS. TWO SETS, WHICH MAY NOT BE OVERLAYED, ARE
R0073    USED FOR THE PERMANENT STATE VECTORS FOR THE CSM AND LM. THE THIRD SET, WHICH MAY BE OVERLAYED WHEN INTEGRATION
R0075    IS NOT BEING DONE, IS USED IN THE COMPUTATIONS.
R0076
R0077    THE PERMANENT STATE VECTORS WILL BE PERIODICALLY UPDATED SO THAT THE VECTORS WILL NOT BE OLDER THAN 4 TIMESTEPS.
R0079    THE PERMANENT STATE VECTORS WILL ALSO BE UPDATED WHENEVER THE W-MATRIX IS INTEGRATED OR WHEN A CALLER OF INTEGRV
R0081    SETS STATEFLG (THE NAVIGATION PROGRAMS P20, P22.)
```

```
R0082   APPENDIX B OF THE USERS GUIDE LISTS THE STATE VECTOR QUANTITIES.
R0083
R0084   2.1 RESTARTS
R0085
R0086   PHASE CHANGES WILL BE MADE IN THE INTEGRATION PROGRAM ONLY FOR THE INTEGRV ENTRANCE (I.E., WHEN THE W-MATRIX IS
R0088   INTEGRATED OR PERMANENT STATE VECTOR IS UPDATED.) THE GROUP NUMBER USED WILL BE THAT FOR THE P20-25 PROGRAMS
R0090   (I.E., GROUP2) SINCE THE INTEGRV ENTRANCE WILL ONLY BE USED BY THESE PROGRAMS. IF A RESTART OCCURS DURING AN
R0092   INTEGRATION OF THE STATE VECTOR ONLY, THE RECOVERY WILL BE TO THE LAST PHASE IN THE CALLING PROGRAM. CALLING
R0094   PROGRAMS WHICH USE THE INTEGRV OR INTEGRVS ENTRANCE OF INTEGRATION SHOULD ENSURE THAT IF PHASE CHANGING IS DONE
R0096   THAT IT IS PRIOR TO SETTING THE INTEGRATION INPUTS IN THE PUSHLIST.
R0097   THIS IS BECAUSE THE PUSHLIST IS LOST DURING A RESTART.
R0098
R0099   2.2 SCALING
R0100
R0101   THE INTEGRATION ROUTINE WILL MAINTAIN THE PERMANENT MEMORY STATE VECTORS IN THE SCALING AND UNITS DEFINED IN
R0103   APPENDIX B OF THE USERS GUIDE. THE SCALING OF THE OUTPUT POSITION VECTORDEPENDS ON THE ORIGIN OF THE COORDINATE
R0105    SYSTEM AT THE DESIRED INTEGRATION TIME. THE COORDINATE SYSTEM TRANSFORMATION WILL BE DONE AUTOMATICALLY ON
R0107   MULTIPLE TIMESTEP ENCKE INTEGRATION ONLY. THUS IT IS POSSIBLE TO HAVE OUTPUT FROM SUCCESSIVE INTEGRATIONS IN
R0109   DIFFERENT SCALING.
R0110   HOWEVER, RATT, VATT WILL ALWAYS BE SCALED THE SAME.
R0111
R0112   3.0 INPUT/OUTPUT
R0113   ----------------
R0114
R0115   PROGRAM INPUTS ARE THE FLAGS DESCRIBED IN APPENDIX A AND THE PERMANENT STATE VECTOR QUANTITIES DESCRIBED IN AP-
R0117   PENDIX B OF THE USERS GUIDE, PLUS THE DESIRED TIME TO INTEGRATE TO IN TDEC1 (A PUSH LIST LOCATION).
R0119   FOR INTEGRVS, THE RCV,VCV, TET OF THE TEMPORARY STATE VECTOR MUST BE SET, PLUS MOONFLAG AND MIDFLAG
R0121
R0122   FOR SIMULATION THE FOLLOWING QUANTITIES MUST BE PRESET ---
R0123
R0124                                                            EARTH  MOON
R0125                                                             29     27
R0126      RRECTCSM(LEM)  - RECTIFIED POSITION VECTOR      METERS  2      2
R0127
R0128                                                             7      5
R0129      VRECTCSM(LEM)  - RECTIFIED VELOCITY VECTOR      M/CSEC  2    2
R0130
R0131                                                             28     28
R0132      TETCSM(LEM)    - TIME STATE VECTOR IS VALID     CSEC    2      2
R0133                       CUSTOMARILY 0, BUT NOTE LUNAR
R0134                       ORBIT DEPENDENCE ON REAL TIME.
R0135
R0136                                                             22     18
R0137      DELTAVCSM(LEM) - POSITION DEVIATION             METERS  2      2
R0138                       0 IF TCCSM(LEM) = 0
R0139
R0140                                                             3      -1
R0141      NUVCSM(LEM)    - VELOCITY DEVIATION             M/CSEC  2      2
R0142                       0 IF TCCSM(LEM) = 0
R0143
```

```
R0144                                                               29     27
R0145      RCVCSM(LEM)    - CONIC POSITICN                 METERS  2      2
R0146                       EQUALS RRECTCSM(LEM) IF
R0147                       TCCSM(LEM) = 0
R0148
R0149                                                               7      5
R0150      VCVCSM(LEM)    - CONIC VELOCITY                 M/CSEC  2      2
R0151                       EQUALS VRECTCSM(LEM) IF
R0152                       TCCSM(LEM) = 0
R0153
R0154                                                               28     28
R0155      TCCSM(LEM)     - TIME SINCE RECTIFICATION       CSECS   2      2
R0156                       CUSTOMARILY 0
R0157
R0158                                                       1/2     17     16
R0159      XKEPCSM(LEM)   - ROOT OF KEPLERS EQUATION       M       2      2
R0160                       0 IF TCCSM(LEM) = 0
R0161
R0162      CMCCNFLG       - PERMANENT FLAGS CORRESPONDING          0      0
R0163      CMIDFLAG         TO MOONFLAG AND MIDFLAG                0,1    0,1
R0164      LMCCNFLG         C = CSM, L = LM                        0      0
R0165      LMIDFLG                                                 0,1    0,1
R0166
R0167      SURFFLAG       - LUNAR SURFACE FLAG                     0,1    0,1
R0168
R0169   IN ADDITION, IF (L)CMIDFLAG IS SET, THE INITIAL INPUT VALUES FOR LUNAR
R0170   SOLAR EPHEMERIDES SUBROUTINE AND PLANETARY INERTIAL ORIENTATION SUB-
R0171   ROUTINE MUST BE PRESET.
R0172
R0173   OUTPUT
R0174   AFTER EVERY CALL TO INTEGRATION
R0175                                                              EARTH  MOON
R0176                                                               29     29
R0177       0D  RATT   POSITION                            METERS  2      2
R0178                                                               7      7
R0179       6D  VATT   VELOCITY                            M/CSEC  2      2
R0180                                                               28     28
R0181      12D  TAT    TIME                                        2      2
R0182                                                               29     27
R0183      14D  RATT1  POSITION                            METFRS  2      2
R0184                                                               7      5
R0185      20D  VATT1  VELOCITY                            M/CSEC  2      2
R0186                                                       3   2   36     30
R0187      26D  MU(P)  MU                                  M /CS   2      2
R0188
R0189      X1          MUTABLE ENTRY                               -2     -10D
R0190
R0191      X2          COORDINT
R0192      X2          COORDINATE SYSTEM ORIGEN                    0      2
R0193                  (THIS, NOT MOONFLAG, SHOULD BE
                 USED TO DETERMINE ORIGIN.)

IN ADDITION TO THE ABOVE, THE PERMANENT STATE VECTOR IS UPDATED WHENEVER
STATEFLG WAS SET AND WHENEVER A W-MATRIX IS TO BE INTFGRATED. THE PUSH
COUNTER IS SET TO O AND CVERFLOW IS CLEARED BEFORE RETURNING TO THE
CALLING PROGRAM.

4.C CALLING SEQUENCES AND SAMPLF CODE
------------------------------------

   A) PRECISION ORBITAL INTEGRATION. CSMPREC,LEMPREC ENTRANCES
         L-X     STORE TIME TO 95T5791T5 T  95 PUS  L9ST (T4531)
         L       CALL
         L+1              CSMPREC (OR LEMPREC)
         L+2     RETURN
      INPUT                                                        28
         TDEC1 (PD 32D) TIME TO INTEGRATE TO...CENTISECONDS SCALED 2
      CUTPUT
         THE DATA LISTED IN SECTICN 3.0 PLUS
         RQVV    POSITION VECTOR CF VEHICLE WITH RESPECT TO SECONDARY
         BODY... METERS B-29 ONLY IF M1DFLAG = DIMOFLAG = 1
   B) CONIC INTEGRATION. CSMCCNIC, LEMCCN1C ENTRANCES
         L-X     STORE TIME IN PUSH LIST (TDEC1)
         L       CALL
         L+I              CSMCONIC (OR LEMCONIC)
      INPUT/OUTPUT
         SAMF AS PRECISION INTEGRATION, EXCEPT RQVV NOT SET
   C) INTEGRATE GIVEN STATE VECTCR. INTEGRVS ENTRANCE
                 CALL
                          INTSTALL
                 VLOAD
                          POSITION VECTOR
                 STCVL    RCV
                          VELOCITY VECTOR
                 STCDL    VCV
                          TIME STATE VECTOR VALID
                 STODL    TET
                          FINAL RADIUS
                 STORE    RFINAL
                 SET(CLEAR)  SET(CLEAR)
                             INTYPFLAG
                             MOONFLAG
                 SET(CLEAR)  DLOAD
                             DESIRED TIME
                 STCALL      TDEC1
                             INTEGRVS
      INPUT
         RCV     POSITION VECTOR                     METERS
         VCV     VELOCITY VECTOR                     M/CSEC
         TET     TIME OF STATE VECTOR(MAY = 0)       CSEC B-28
```

```
R0244             TDEC1  TIME TO INTEGRATE TO             CSEC B-28 (PD 32D)
R0245                    (MAY BE INCREMENT IF TET=0)
R0246          OUTPUT
R0247             SAME AS FOR PRECISION OR CONIC INTEGRATION,
R0248             DEPENDING ON INTYPFLG.
R0249        D) INTEGRATE STATE VECTOR.INTGRV ENTRANCE
R0250             L-X    STORE TIME IN PUSH LIST (TDEC1)(MAY BE DONE AFTER CALL TO INTSTALL)
R0252             L-8    CALL
R0253             L-7
R0254             L-6    SET(CLEAR) SET(CLEAR)
R0255             L-5               VINTFLAG   1=CSM, 0=LM
R0256             L-4               INTYPFLAG  1=CONIC, 0=PRECISION
R0257             L-3    SET(CLEAR) SET(CLEAR)
R0258             L-2               DIMOFLAG   1=W-MATRIX, 0=NO W-MATRIX
R0259             L-1               D6OR9FLG   1=9X9, 0=6X6
R0260             L      SET        DLCAD
R0261             L+1               STATEFLG   DESIRE PERMANENT UPDATE
R0262             L+2               FINAL RAD. OF STATE VECTOR
R0263             L+3    STCALL     RFINAL
R0264             L+4               INTEGRV
R0265             L      CALL                  NORMAL USE-- WILL UPDATE STATE
R0266             L+1               INTEGRV    VECTOR IF DIMOFLAG=1.(STATEFLG IS
R0267             L+2    RETURN                ALWAYS RESET IN INTEGRATION AFTER
R0268                                          IT IS USED.)
R0269          INPUT
R0270             TDEC1 (PD 32D) TIME TO INTEGRATE TO    CSEC B-28
R0271          OUTPUT
R0272             SAME AS FOR PRECISION OR CONIC INTEGRATION
R0273          THE PROGRAM WILL SET MOONFLAG, MIDFLAG DEPENDING ON
R0274          THE PERMANENT STATE VECTOR REPRESENTATION.

 02741                          11,2403                          BANK    11
 02742  REF   3  LAST  247      13,2000                          SETLOC  INTINIT
 02743                          13,2641                          BANK
 02744  REF   7  LAST  981      E3,1554                          EBANK=  RRECTCSM
 02745  REF   3 LAST  247 TU    250:      34    36*              COUNT*  $$/INTIN
 0275   REF 108  LAST 1151      13,2641  0 5355 1  STATEINT TC      PHASCHNG
 0276                           13,2642   00052 0               OCT     00052
 0277   REF  10  LAST  777      13,2643  3 5010 0               CAF     PRIO5
 0278   REF  40  LAST  964      13,2644  0 5076 0               TC      FINDVAC
 0279   REF   8  LAST 1206      E3,1554                          FBANK=  RRECTCSM
 0280   REF   2  LAST  251      13,2645   02650 0               2CADR   STATINT1
 0280                           13,2646   26063 0
 0281   REF  67  LAST 1130      13,2647  0 5263 0               TC      TASKOVER
 0282   REF 223  LAST 1188      13,2650  0 6060 1  STATINT1 TC      INTPRET
 0283                           13,2651   47014 1               BON     RTB
 02831  REF   2  LAST  310      13,2652   04712 1                       QUITFLAG          KILL INTEGRATION UNTIL NEXT P00.
 02832  REF   1                 13,2653   26711 1                       NOINT
 0284   REF  34  LAST  977      13,2654   21603 1                       LOADTIME
 0286   REF  50  LAST  974      13,2655   00041 1               STORE   TDEC1
 0323                          13,2656   77624 1              CALL
 0324   REF  28  LAST 1151     13,2657   27447 0                       INTSTALL
 0325                          13,2660   45014 0              SET      CALL
 03251  REF   4  LAST  713     13,2661   01076 1                       NODOFLAG
 0326   REF   7  LAST  603     13,2662   26702 0                       SETIFLGS
 0327                          13,2663   52014 0              SET      GOTO
 0328   REF   2  LAST  240     13,2664   01460 1                       POOHFLAG
 03282  REF   1                13,2665   26026 1                       STATEUP
 0356                          13,2666   00003 1  600SECS     2DEC     60000
 0356                          13,2667   25140 0
 0404                          13,2670   77414 0  ENDINT      CLEAR    EXIT
 0405   REF   4  LAST  603     13,2671   01672 0                       STATEFLG
 0408   REF 109  LAST 1206     13,2672  0 5355 1              TC       PHASCHNG
 0409                          13,2673   20032 1              OCT      20032
 0411                          13,2674  0 0006 1              EXTEND
 0412   REF   2  LAST  250     13,2675  3 2667 1              DCA      600SECS
 0413   REF   4  LAST  729     13,2676  0 5301 0              TC       LONGCALL
 0414   REF   4  LAST  309     E3,1626                        EBANK=   RRECTHIS
 0415   REF   3  LAST  251     13,2677   02641 0              2CADR    STATEINT
 0415                          13,2700   26063 0
 0416   REF 136  LAST  973     13,2701  0 5146 1              TC       ENDOFJOB
 0426                          13,2702   43014 0  SETIFLGS    SET      CLEAR
 0427   REF   5  LAST 1207     13,2703   01472 1                       STATEFLG
 0428   REF  16  LAST  783     13,2704   01673 1                       INTYPFLG
 0429                          13,2705   43014 0              CLEAR    CLEAR
 0430   REF  14  LAST  659     13,2706   01676 1                       DIMOFLAG
 04301  REF   8  LAST  603     13,2707   01675 1                       D6OR9FLG
 04302                         13,2710   77616 0              RVQ
 04303                         13,2711   77776 1  NOINT       EXIT
 04304  REF 110  LAST 1207     13,2712  0 5355 1              TC       PHASCHNG
 04305                         13,2713   00002 0              OCT      00002

 04306  REF  54  LAST  978     13,2714  0 5520 0              TC       DOWNFLAG
 04307  REF   3  LAST 1206     13,2715   00221 0              ADRES    QUITFLAG
 04308  REF 137  LAST 1207     13,2716  0 5146 1              TC       ENDOFJOB

R0431   ATOPCSM TRANSFERS RRECT TO RRECT +41 TO RRECTCSM TO RRECTCSM +41

R0432   CALLING SEQUENCE
R0433      L    CALL
R0434      L+1         ATOPCSM

R0435   NORMAL EXIT AT L+2

 0436                          13,2717   47020 0  ATOPCSM     STQ      RTB
 0437   REF  28  LAST 1187     13,2720   00051 0                       S2
 0438   REF   2  LAST 1155     13,2721   26732 0                       MOVEACSM
 0439                          13,2722   45014 0              SET      CALL
 0440   REF   7  LAST  713     13,2723   04063 0                       CMOONFLG
 0441   REF   3  LAST 1155     13,2724   26114 1                       SVDWN1
 0442                         13,2725   43014 0            BON     CLRGO
 0443   REF  14  LAST  783    13,2726   00303 1                    MOONFLAG
 0444   REF  29  LAST 1207    13,2727   00051 0                    S2
 0445   REF   8  LAST 1207    13,2730   04223 0                    CMOONFLG
 0446   REF  30  LAST 1208    13,2731   00051 0                    S2
 0447   REF   1               13,2732   0 3074 1  MOVEACSM TC      SETBANK
 0448   REF   2  LAST  115    13,2733   55'500 1           TS      DIFEQCNT         INITIALIZE INDEX
 0449   REF   3  LAST 1208    13,2734   51'500 0           INDEX   DIFEQCNT
 0450   REF   6  LAST 1172    13,2735   3 1502 1           CA      RRECT
 0451   REF   4  LAST 1208    13,2736   51'500 0           INDEX   DIFEQCNT
 0452   REF   9  LAST 1206    13,2737   55'554 0           TS      RRECTCSM
 0453   REF   5  LAST 1208    13,2740   11'500 1           CCS     DIFEQCNT         IS TRANSFER COMPLETE
 0454   REF   3  LAST 1207    13,2741   1 2733 0           TCF     MOVEACSM +1      NO-LOOP
 0455   REF  57  LAST 1181    13,2742   0 6102 1           TC      DANZIG           COMPLETE- RETURN

R0456   PTOACSM TRANSFERS RRECTCSM TO RRECTCSM +41 TO RRECT TO RRECT +41

R0457   CALLING SEQUENCE
R0458      L    CALL
R0459                PTOACSM

R0460   NORMAL EXIT AT L+2
 0461                         13,2743   43034 1  PTOACSM   RTB     BON
 0462   REF   2  LAST 1155    13,2744   26761 0                    MOVEPCSM
 0463   REF   9  LAST 1208    13,2745   04303 0                    CMOONFLG
 0464   REF   1               13,2746   26754 0                    SETMOON
 0465                         13,2747   66214 0  CLRMOON   CLEAR   SSP
 0466   REF  15  LAST 1208    13,2750   00263 0                    MOONFLAG
 0467   REF   4  LAST 1154    13,2751   02031 1                    PBODY
 0468                         13,2752   00000 1                    0
 0469                         13,2753   77616 0            RVQ
 0470                         13,2754   66214 0  SETMOON   SET     SSP
 0471   REF  16  LAST 1208    13,2755   00063 1                    MOONFLAG
 0472   REF   5  LAST 1208    13,2756   02031 1                    PBODY
 0473                         13,2757   00002 0                    2
 0474                         13,2760   77616 0            RVQ
 0475   REF   2  LAST 1208    13,2761   0 3074 1  MOVEPCSM TC      SETBANK
 0476   REF   6  LAST 1208    13,2762   55'500 1           TS      DIFEQCNT
 0477   REF   7  LAST 1208    13,2763   51'500 0           INDEX   DIFEQCNT
 0478   REF  10  LAST 1208    13,2764   3 1554 1           CA      RRECTCSM
 0479   REF   8  LAST 1208    13,2765   51'500 0           INDEX   DIFEQCNT
 0480   REF   7  LAST 1208    13,2766   55'502 0           TS      RRECT
 0481   REF   9  LAST 1208    13,2767   11'500 1           CCS     DIFEQCNT
 0482   REF   3  LAST 1208    13,2770   1 2762 1           TCF     MOVEPCSM +1
 0483   REF  58  LAST 1208    13,2771   0 6102 1           TC      DANZIG

R0484   ATOPLEM  TRANSFERS RRECT TO RRECT +41 TO RRECTLEM TO RRECTLEM +41
```

```
 0485                               13,2772   47020 0  ATOPLEM  STQ     RTB
 0486   REF  31  LAST 1208          13,2773   00051 0                   S2
 0487   REF   3  LAST 1154          13,2774   27005 1                   MOVEALEM
 0488                               13,2775   45014 0           SET     CALL
 0489   REF   3  LAST  596          13,2776   04064 1                   LMOONFLG
 0490   REF   2  LAST 1154          13,2777   26070 1                   SVDWN2
 0491                               13,3000   43014 0           BON     CLRGO
 0492   REF  17  LAST 1208          13,3001   00303 1                   MOONFLAG
 0493   REF  32  LAST 1209          13,3002   00051 0                   S2
 0494   REF   4  LAST 1209          13,3003   04224 1                   LMOONFLG
 0495   REF  33  LAST 1209          13,3004   00051 0                   S2
 0496   REF   3  LAST 1208          13,3005   0 3074 1  MOVEALEM TC      SETBANK
 0497   REF  10  LAST 1208          13,3006   55'500 1           TS      DIFEQCNT
 0498   REF  11  LAST 1209          13,3007   51'500 0           INDEX   DIFEQCNT
 0499   REF   8  LAST 1208          13,3010   3 1502 1           CA      RRECT
 0500   REF  12  LAST 1209          13,3011   51'500 0           INDEX   DIFEQCNT
 0501   REF   2  LAST  116          13,3012   55'626 0           TS      RRECTLEM
 0502   REF  13  LAST 1209          13,3013   11'500 1           CCS     DIFEQCNT
 0503   REF   4  LAST 1209          13,3014   1 3006 0           TCF     MOVEALEM +1
 0504   REF  59  LAST 1208          13,3015   0 6102 1           TC      DANZIG

R0505   PTCALEM  TRANSFERS RRECTLEM TO RRECTLEM +41 TO RRECT TO RRECT +41

 0506                               13,3016   47014 1  PTOALEM  BON     RTB
 0507   REF  17  LAST  844          13,3017   04307 1                   SURFFLAG
 0508   REF   1                     13,3020   27037 0                   USEPIOS
 0509   REF   2  LAST 1154          13,3021   27026 0                   MOVEPLEM
 0510                               13,3022   52014 0           BON     GOTO
 0511   REF   5  LAST 1209          13,3023   04304 1                   LMOONFLG
 0512   REF   2  LAST 1208          13,3024   26754 0                   SETMOON
 0513   REF   1                     13,3025   26747 1                   CLRMOON
 0514   REF   4  LAST 1209          13,3026   0 3074 1  MOVEPLEM TC      SETBANK
 0515   REF  14  LAST 1209          13,3027   55'500 1           TS      DIFEQCNT
 0516   REF  15  LAST 1209          13,3030   51'500 0           INDEX   DIFEQCNT
 0517   REF   3  LAST 1209          13,3031   3 1626 1           CA      RRECTLEM
 0518   REF  16  LAST 1209          13,3032   51'500 0           INDEX   DIFEQCNT
 0519   REF   9  LAST 1209          13,3033   55'502 0           TS      RRECT
 0520   REF  17  LAST 1209          13,3034   11'500 1           CCS     DIFEQCNT
 0521   REF   3  LAST 1209          13,3035   1 3027 0           TCF     MOVEPLEM +1
 0522   REF  60  LAST 1209          13,3036   0 6102 1           TC      DANZIG

 0523                               13,3037   77201 1  USEPIOS  SETPD   VLOAD
 0524                               13,3040   00001 0                   0
 0525   REF  16  LAST 1137          13,3041   02021 0                   RLS
 0526                               13,3042   41525 0           PDDL    PUSH
 0527   REF  51  LAST 1206          13,3043   00041 1                   TDEC1
 0528   REF  16  LAST  784          13,3044   15517 0           STODL   TET
 0529   REF   1                     13,3045   27762 1                   5/8
```

```
0530                         13,3046   77624 1           CALL
0531    REF   7  LAST 1133   13,3047   55716 1                   RP-TO-R
0532    REF  16  LAST 1176   13,3050   25535 0           STOVL   RCV
0533    REF   2  LAST   38   13,3051   24001 0                   ZUNIT
0534                         13,3052   14001 0           STODL   0D
0535    REF  17  LAST 1209   13,3053   01517 0                   TET
0536                         13,3054   14007 0           STODL   6D
0537    REF   2  LAST 1209   13,3055   27762 1                   5/8
0538                         13,3056   45014 0           SET     CALL               NEEDED FOR SETTING X1 ON EXIT
05381   REF  18  LAST 1209   13,3057   00063 1                   MOONFLAG
0539    REF   8  LAST 1210   13,3060   55716 1                   RP-TO-R
0540                         13,3061   74235 0           VXV     VXSC
0541    REF  17  LAST 1210   13,3062   01535 0                   RCV
0542    REF   1              13,3063   26001 1                   OMEGMOON
0543    REF  14  LAST 1177   13,3064   25543 1           STOVL   VCV
0544    REF   8  LAST 1133   13,3065   24007 0                   ZEROVEC
0545    REF   6  LAST 1154   13,3066   01521 0           STORE   TDELTAV
0546                         13,3067   67174 1           AXT,2   SXA,2
0547                         13,3070   00002 0                   2
0548    REF   6  LAST 1208   13,3071   02030 0                   PBODY
0549    REF   6  LAST 1154   13,3072   35527 1           STCALL  TNUV
0550    REF   1              13,3073   27215 1                   A-PCHK
0552    REF   1              13,3074  3 3100 0  SETBANK  CAF     INTBANK
0553    REF  40  LAST 1127   13,3075  54 006 0           TS      BBANK
0554    REF   1              13,3076  3 3505 1           CAF     FORTYONE
0555    REF 321  LAST 1129   13,3077  0 0002 0           TC      Q
0556    REF  11  LAST 1208   E3,1554                     EBANK=  RRECTCSM
0557    REF  10  LAST  658   13,3100   26063 0  INTBANK  BBCON   INTEGRV

R0558   SPECIAL PURPOSE ENTRIES TO ORBITAL INTEGRATION. THESE ROUTINES PROVIDE ENTRANCES TO INTEGRATION WITH
R0560   APPROPRIATE SWITCHES SET OR CLEARED FOR THE DESIRED INTEGRATION.

R0561   CSMPREC AND LEMPREC PERFORM ORBIT INTEGRATION BY THE ENCKE METHOD TO THE TIME INDICATED IN TDEC1
R0563   ACCELERATIONS DUE TO OBLATENESS ARE INCLUDED. NO W-MATRIX INT. IS DONE.
R0564   THE PERMANENT STATE VECTOR IS NOT UPDATED.
R0565   CSMCONIC AND LEMCONIC PERFORM ORBIT INTEG. BY KEPLERS METHOD TO THE TIME INDICATED IN TDEC1
R0567   NO DISTURBING ACCELERATIONS ARE INCLUDED. IN THE PROGRAM FLOW THE GIVEN
R0568   STATE VECTOR IS RECTIFIED BEFORE SOLUTION OF KEPLERS EQUATION

R0569   THE ROUTINES ASSUME THAT THE CSM (LEM) STATE VECTOR IN P-MEM IS VALID.
R0570   SWITCHES SET PRIOR TO ENTRY TO THE MAIN INTEG. PROG ARE AS FOLLOWS
R0571                      CSMPREC   CSMCONIC    LEMPREC   LEMCONIC
R0572   VINTFLAG            SET        SET        CLEAR     CLEAR
R0573   INTYPFLG            CLEAR      SET        CLEAR     SET
R0574   DIMOFLAG            CLEAR      CLEAR      CLEAR     CLEAR


R0575   CALLING SEQUENCE
R0576      L-X  STORE TDEC1
```

```
R0577      L     CALL        (STCALL TDEC1)
R0578      L+1          CSMPREC (CSMCONIC, LEMPREC, LEMCONIC)

R0579     NORMAL EXIT TO L+2


R0580    SUBROUTINES CALLED
R0581      INTEGRV1
R0582      PRECOUT FOR CSMPREC AND LEMPREC
R0583      CONICOUT  FOR CSMCONIC AND LEMCONIC


R0584    OUTPUT - SEE PAGE 2 OF THIS LOG SECTION
R0585    INPUT
R0586     TDEC1    TIME TO INTEGRATE TO . CSECS B-28
0587                             13,3101   45020 1  CSMPREC  STQ      CALL
0588    REF  60  LAST 1198       13,3102   00046 0                    X1
0589    REF  29  LAST 1207       13,3103   27447 0                    INTSTALL
0590                             13,3104   43130 1           SXA,1    SET
0591    REF   2  LAST  119       13,3105   02101 0                    IRETURN
0592    REF  19  LAST  658       13,3106   01474 1                    VINTFLAG

0593                             13,3107   43014 0  IFLAGP   SET      CLEAR
0594    REF   3  LAST  248       13,3110   01467 0                    PRECIFLG
0595    REF  15  LAST 1207       13,3111   01676 1                    DIMOFLAG
0596                             13,3112   77614 1           CLRGO
05961   REF  17  LAST 1207       13,3113   01633 0                    INTYPFLG
05962   REF   1                  13,3114   27174 0                    INTEGRV1
0597                             13,3115   45020 1  LEMPREC  STQ      CALL
0598    REF  61  LAST 1211       13,3116   00046 0                    X1
0599    REF  30  LAST 1211       13,3117   27447 0                    INTSTALL
0600                             13,3120   43130 1           SXA,1    CLRGO
0601    REF   3  LAST 1211       13,3121   02101 0                    IRETURN
0602    REF  20  LAST 1211       13,3122   01634 1                    VINTFLAG
0603    REF   1                  13,3123   27107 1                    IFLAGP

0604                             13,3124   45020 1  CSMCONIC STQ      CALL
0605    REF  62  LAST 1211       13,3125   00046 0                    X1
0606    REF  31  LAST 1211       13,3126   27447 0                    INTSTALL
0607                             13,3127   43130 1           SXA,1    SET
0608    REF   4  LAST 1211       13,3130   02101 0                    IRETURN
0609    REF  21  LAST 1211       13,3131   01474 1                    VINTFLAG
0610                             13,3132   43014 0  IFLAGC   CLEAR    SETGO
0611    REF  16  LAST 1211       13,3133   01676 1                    DIMOFLAG
0612    REF  18  LAST 1211       13,3134   01433 1                    INTYPFLG
0613    REF   2  LAST 1211       13,3135   27174 0                    INTEGRV1
0614                             13,3136   45020 1  LEMCONIC STQ      CALL
0615    REF  63  LAST 1211       13,3137   00046 0                    X1
0616    REF  32  LAST 1211       13,3140   27447 0                    INTSTALL
0617                             13,3141   43130 1           SXA,1    CLRGO
```

```
 0618    REF   5  LAST 1211   13,3142   02101 0                       IRETURN
 0619    REF  22  LAST 1211   13,3143   01634 1                       VINTFLAG
 0620    REF   1              13,3144   27132 1                       IFLAGC

 0621                         13,3145   66214 0  INTEGRVS SET         SSP
 0622    REF   4  LAST 1211   13,3146   01467 0                       PRECIFLG
 0623    REF   7  LAST 1210   13,3147   02031 1                       PBODY
 0624                         13,3150   00000 1                       0
 0625                         13,3151   66214 0           BOF         SSP
 0626    REF  19  LAST 1210   13,3152   00343 0                       MOONFLAG
 0627                         13,3153   27156 0                       +3
 0628    REF   8  LAST 1212   13,3154   02031 1                       PBODY
 06281                        13,3155   00002 0                       2
 0629                         13,3156   77220 1           STQ         VLOAD
 0630    REF   6  LAST 1212   13,3157   02101 0                       IRETURN
 0631    REF   9  LAST 1210   13,3160   24007 0                       ZEROVEC
 0632    REF   7  LAST 1210   13,3161   01521 0           STORE       TDELTAV
 0633    REF   7  LAST 1210   13,3162   35527 1           STCALL      TNUV
 0634    REF   2  LAST 1154   13,3163   27720 1                       RECTIFY
 0635                         13,3164   43014 0           CLEAR       SET
 0636    REF  17  LAST 1211   13,3165   01676 1                       DIMOFLAG
 0637    REF   1              13,3166   04062 1                       NEWIFLG
 06371                        13,3167   77614 1           SETGO
 06372   REF   1              13,3170   04020 1                       RPQFLAG
 0638    REF   1              13,3171   27206 0                       ALOADED
R0639    INTEGRV IS AN ENTRY TO ORBIT INTEGRATION WHICH PERMITS THE CALLER ,
R0640    NORMALLY THE NAVIGATION PROGRAM ,TO SET THE INTEG. FLAGS. THE ROUTINE
R0641    IS ENTERED AT INTEGRV1 BY CSMPREC ET.AL. AND AT ALOADED BY INTEGRVS.
R0642    THE ROUTINE SETS UP A-MEMORY IF ENTERED AT INTEGRV,1 AND SETS THE INTEG.
R0643    PROGRAM FOR PRECISION OR CONIC

R0644    THE CALLER MUST FIRST CALL INTSTALL TO CHECK IF INTEG. IS IN USE BEFORE
R0645    SETTING ANY FLAGS.
R0646    THE FLAGS WHICH SHOULD BE SET OR CLEARED ARE
R0647      VINTFLAG     (IGNORED WHEN ENTERED FROM INTEGRVS)
R0648      INTYPFLG
R0649      DIMOFLAG
R0650      D6OR9FLG
R0651    CALLING SEQUENCE
R0652      L-X      CALL
R0653      L-Y               INTSTALL
R0654      L-1      SET OR CLEAR ALL FOUR FLAGS. ALSO CAN SET STATEFLG IF DESIRED
R0655               AND DIMOFLAG IS CLEAR.
R0656      L        CALL
R0657      L+1               INTEGRV
R0658    INITIALIZATION
R0659      FLAGS AS ABOVE
R0660      STORE TIME TO INTEGRATE TO IN TDEC1
R0661    OUTPUT
R0662      RATT     AS
```

```
R0663      VATT       DEFINED
R0664      TAT                  BEFORE


 0665                           13,3172   77620 0  INTEGRV   STQ
 0666   REF    7  LAST 1212     13,3173   02101 0                    IRETURN
 0667                           13,3174   43014 0  INTEGRV1  SET     SET
 0668   REF    2  LAST 1212     13,3175   04060 0                    RPQFLAG
 0669   REF    2  LAST 1212     13,3176   04062 1                    NEWIFLG
 0670                           13,3177   77731 1  INTEGRV2  SSP
 0671   REF   10  LAST 1155     13,3200   00053 1                    QPRET
 0672   REF    2  LAST 1212     13,3201   27206 0                    ALOADED
 0673                           13,3202   52014 0            BON     GOTO
 0674   REF   23  LAST 1212     13,3203   01714 1                    VINTFLAG
 0675   REF    1                13,3204   26743 0                    PTOACSM
 0676   REF    2  LAST  309     13,3205   27016 0                    PTOALEM
 0677                           13,3206   77745 1  ALOADED   DLOAD
 0678   REF   52  LAST 1209     13,3207   00041 1                    TDEC1
 0679   REF    2  LAST  107     13,3210   01115 0            STORE   TDEC
 0680                           13,3211   52014 0            BOFF    GOTO
 0681   REF   19  LAST 1211     13,3212   01753 1                    INTYPFLG
 0682   REF    1                13,3213   27315 0                    TESTLOOP
 0683   REF    1                13,3214   27301 0                    RVCON
 0684                           13,3215   77414 0  A-PCHK    BOF     EXIT
 0685   REF    6  LAST 1207     13,3216   01752 0                    STATEFLG
 0636   REF    1                13,3217   27236 0                    RECTOUT
 0687   REF  111  LAST 1207     13,3220  0 5355 1            TC      PHASCHNG
 0688                           13,3221   04022 0            OCT     04022
 0689   REF   72  LAST 1152     13,3222  0 5506 1            TC      UPFLAG             PHASE CHANGE HAS OCCURRED BETWEEN
 0690   REF    3  LAST 1152     13,3223   00236 0            ADRES   REINTFLG           INTSTALL AND INTWAKE
 0692   REF  224  LAST 1206     13,3224  0 6060 1            TC      INTPRET
 0693                           13,3225   77731 1            SSP
 0694   REF   11  LAST 1213     13,3226   00053 1                    QPRET
 0695   REF    1                13,3227   27234 1                    PHEXIT
 0696                           13,3230   52014 0            BON     GOTO
 0697   REF   24  LAST 1213     13,3231   01714 1                    VINTFLAG
 0698   REF    3  LAST  510     13,3232   26717 1                    ATOPCSM
 0699   REF    2  LAST   38     13,3233   26772 1                    ATOPLEM
 0700                           13,3234   77624 1  PHEXIT    CALL
 0701   REF   20  LAST 1155     13,3235   51770 0                    GRP2PC
 0702                           13,3236   45001 1  RECTOUT   SETPD   CALL
 0703                           13,3237   00001 0                    0
 0704   REF    3  LAST 1212     13,3240   27720 1                    RECTIFY
 0705                           13,3241   53775 1            VLOAD   VSL*
 0706   REF   10  LAST 1209     13,3242   01503 0                    RRECT
 0707                           13,3243   57576 1                    0,2
 0708                           13,3244   53715 1            PDVL    VSL*               RATT TO PD0
 0709   REF    7  LAST 1177     13,3245   01511 0                    VRECT
 0710                           13,3246   57576 1                    0,2
 0711                           13,3247   63325 0            PDDL    PDVL               VATT TO PD6    TAT TO PD12
 0712   REF  18  LAST 1210   13,3250   01517 0                    TET
 0713   REF  11  LAST 1213   13,3251   01503 0                    RRECT
 0714                        13,3252   64715 0           PDVL     PDDL*
 0715   REF   8  LAST 1213   13,3253   01511 0                    VRECT
 0716   REF   2  LAST  690   13,3254   51770 0                    MUEARTH,2
 0717                        13,3255   76006 0           PUSH     AXT,1
 0718                        13,3256   77765 0           DEC      -10
 0719                        13,3257   76014 0           BON      AXT,1
 0720   REF  20  LAST 1212   13,3260   00303 1                    MOONFLAG
 0721                        13,3261   27263 0                    +2
 0722                        13,3262   77775 1           DEC      -2
 0723                        13,3263   40001 1  INTEXIT  SETPD    BOV
 0724                        13,3264   00001 0                    0
 0725                        13,3265   27266 0                    +1
 07251                       13,3266   43014 0           CLEAR    CLEAR
 07252  REF   2  LAST  332   13,3267   04676 1                    AVEMIDSW          ALLOW UPDATE OF DOWNLINK STATE VECTOR
 07253  REF   5  LAST 1212   13,3270   01667 1                    PRECIFLG
 07254                       13,3271   77614 1           CLEAR
 07255  REF   7  LAST 1213   13,3272   01672 0                    STATEFLG
 0726                        13,3273   77535 1           SLOAD    EXIT
 0727   REF   8  LAST 1213   13,3274   02102 0                    IRETURN
 0728   REF 729  LAST 1193   13,3275   3 0154 1          CA       MPAC
 0729   REF  63  LAST 1181   13,3276   50 120 1          INDEX    FIXLOC
 0730   REF  12  LAST 1213   13,3277   54 052 1          TS       QPRET
 0731   REF   4  LAST 1155   13,3300   0 3460 0          TC       INTWAKE
R0732   RVCON SETS UP ORBIT INTEGRATION TO DO A CONIC SOLUTION FOR POSITION AND
R0733   VELOCITY FOR THE INTERVAL (TET-TDEC)

 0734                        13,3301   45345 1  RVCON    DLOAD    DSU
 0735   REF   3  LAST 1213   13,3302   01115 0                    TDEC
 0736   REF  19  LAST 1214   13,3303   01517 0                    TET
 0737   REF  10  LAST 1175   13,3304   36074 1           STCALL   TAU.
 0738   REF   4  LAST 1213   13,3305   27720 1                    RECTIFY
 0739                        13,3306   77624 1           CALL
 0740   REF   1              13,3307   22403 0                    KEPPREP
 0741                        13,3310   43345 1           DLOAD    DAD
 0742   REF   6  LAST 1177   13,3311   01551 1                    TC
 0743   REF  20  LAST 1214   13,3312   01517 0                    TET
 0744   REF  21  LAST 1214   13,3313   35517 1           STCALL   TET
 0745   REF   2  LAST 1213   13,3314   27236 0                    RECTOUT
```

```
P07455          TESTLOOP

 0746                          13,3315   43014 0  TESTLOOP BOF      CLRGO
 07462  REF    4  LAST 1207    13,3316   04752 0                    QUITFLAG
 07463                         13,3317   27322 1                    +3
 07464  REF    8  LAST 1214    13,3320   01632 1                    STATEFLG
 07465  REF    1               13,3321   27263 0                    INTEXIT           STOP INTEGRATION
 07466                         13,3322   73001 1   +3      SETPD    LXA,2
 0747                          13,3323   00013 0                    10D
 0748   REF    9  LAST 1212    13,3324   02030 0                    PBODY
 0749                          13,3325   51575 1           VLOAD    ABVAL
 0750   REF   1B  LAST 1210    13,3326   01535 0                    RCV
 0751                          13,3327   43006 0           PUSH     CLEAR             RC TO 10D
 0752   REF    1               13,3330   00262 1                    MIDFLAG
 0753                          13,3331   50023 0           DSU*     BMN               MIDFLAG=0 IF R G.T. RMP
 0754   REF    1               13,3332   53755 0                    RME,2
 0755                          13,3333   27336 1                    +3
 0756                          13,3334   77614 1           SET
 0757   REF    2  LAST 1215    13,3335   00062 0                    MIDFLAG
 0758                          13,3336   41345 0  NORFINAL DLOAD    DMP
 0759                          13,3337   00013 0                    10D
 0760                          13,3340   00043 0                    34D
 0761                          13,3341   55762 1           SR1R     DDV*
 0762   REF    3  LAST 1214    13,3342   51770 0                    MUEARTH,2
 0763                          13,3343   41366 1           SQRT     DMP
 0764   REF    1               13,3344   25762 0                    .3D
 0765                          13,3345   40442 1           SR3      SR4               DT    IS TRUNCATED TO A MULTIPLE
 0766                          13,3346   54345 1           DLOAD    SL
 0767   REF 73C   LAST 1214    13,3347   00155 0                    MPAC
 0768                          13,3350   20220 0                    15D                     OF 12B CSECS.
 0769                          13,3351   40006 0           PUSH     BOV
 0770   REF    1               13,3352   27377 1                    MAXDT
 0771                          13,3353   50021 1           BDSU     BMN
 0772   REF    1               13,3354   27446 1                    DT/2MAX
 0773   REF    2  LAST 1215    13,3355   27377 1                    MAXDT
 0774                          13,3356   45345 1  DT/2COMP DLOAD    DSU
 0775   REF    4  LAST 1214    13,3357   01115 0                    TDEC
 0776   REF   22  LAST 1214    13,3360   01517 0                    TET
 0777                          13,3361   54234 0           RTB      SL
 0778   REF    4  LAST  943    13,3362   21622 1                    SGNAGREE
 0779                          13,3363   20211 1                    8D
 0780   REF    2  LAST  119    13,3364   02076 1           STORE    DT/2              8-19
 0781                          13,3365   51400 1           BOV      ABS
 0782   REF    1               13,3366   27403 0                    GETMAXDT
 0783                          13,3367   50025 0           DSU      BMN               IS TIME TO INTEG. TO GR THAN MAXTIME
 0784                          13,3370   00015 0                    12D
 0785   REF    1               13,3371   27407 1                    POOHCHK
 0786                          13,3372   75345 1  USEMAXDT DLOAD    SIGN
 0787                          13,3373   00015 0                    12D
 0788   REF    3  LAST 1215    13,3374   02076 1                    DT/2
 0789   REF   4  LAST 1215   13,3375   36076 0            STCALL DT/2
 0790   REF   2  LAST 1215   13,3376   27407 1                   POOHCHK
 0791                        13,3377   65345 0  MAXDT     DLOAD  PDDL               EXCHANGE DT/2MAX WITH COMPUTED MAX.
 0792   REF   2  LAST 1215   13,3400   27446 1                   DT/2MAX
 0793                        13,3401   77650 1            GOTO
 0794   REF   1              13,3402   27356 1                   DT/2COMP
 0795                        13,3403   77634 0  GETMAXDT  RTB
 0796   REF  14  LAST  886   13,3404   31765 1                   SIGNMPAC
 0797   REF   5  LAST 1216   13,3405   36076 0            STCALL DT/2
 0798   REF   1              13,3406   27372 1                   USEMAXDT
 0799                        13,3407   51545 1  POOHCHK   DLOAD  ABS
 0800   REF   6  LAST 1216   13,3410   02076 1                   DT/2
 0801                        13,3411   50025 0            DSU    BMN
 0802   REF   1              13,3412   27444 0                   DT/2MIN
 0803   REF   2  LAST 1210   13,3413   27215 1                   A-PCHK
 0804                        13,3414   43014 0            BOFF   BON                NO BACKWARDS INTEGRATION
 0805   REF   3  LAST 1207   13,3415   01740 0                   POOHFLAG           WHEN IN POO
 0806   REF   1              13,3416   23307 1                   TIMESTEP
 0807   REF   6  LAST 1214   13,3417   01707 0                   PRECIFLG
 0808   REF   2  LAST 1216   13,3420   23307 1                   TIMESTEP
 0809                        13,3421   45345 1            DLOAD  DSU
 0810   REF   7  LAST 1216   13,3422   02076 1                   DT/2
 0811                        13,3423   00015 0                   12D
 0812                        13,3424   43040 1            BMN    BOFCLR
 0813   REF   3  LAST 1216   13,3425   27215 1                   A-PCHK
 0814   REF   3  LAST 1213   13,3426   04242 1                   NEWIFLG
 0815   REF   3  LAST 1216   13,3427   23307 1                   TIMESTEP
 0816                        13,3430   45345 1            DLOAD  DSU
 0817   REF   5  LAST 1215   13,3431   01115 0                   TDEC
 0818   REF  23  LAST 1215   13,3432   01517 0                   TET
 08181                       13,3433   77640 0            BMN                       NO BACKWARD INTEGRATION
 08182  REF   2  LAST 1215   13,3434   27263 0                   INTEXIT
 0819                        13,3435   40525 1            PDDL   SR4
 0820   REF   8  LAST 1216   13,3436   02076 1                   DT/2               IS 4(DT) LS(TDEC - TET)
 0821                        13,3437   44322 1            SR2R   BDSU               NO
 0822                        13,3440   52040 1            BMN    GOTO
 0823   REF   3  LAST 1216   13,3441   27263 0                   INTEXIT
 0824   REF   4  LAST 1216   13,3442   23307 1                   TIMESTEP
 0825                        13,3443   00000 1  DT/2MIN   2DEC   3 B-20
 0825                        13,3444   01400 1
 0826                        13,3445   14152 1  DT/2MAX   2DEC   4000 E2 B-20
 0826                        13,3446   00000 1
 0828                        13,3447   77776 1  INTSTALL  EXIT
 0831   REF   1              13,3450  3 0106 0            CA     RASFLAG
 0833   REF   1              13,3451  7 3521 0            MASK   INTBITAB           IS THIS STALL AREA FREE
 0834                        13,3452  0 0006 1            EXTEND
 0835   REF   1              13,3453  1 3513 1            BZF    OKTOGRAB           YES
 0837   REF   1              13,3454  3 3520 0            CAF    WAKESTAL
 0838   REF   4  LAST  479   13,3455  0 5124 0            TC     JOBSLEEP
 0839                        13,3456   77776 1  INTWAKE0  EXIT
 08395 REF    1                13,3457  1 3500 0            TCF     INTWAKE1

 0840  REF    2  LAST 1216     13,3460  4 0106 1  INTWAKE   CS      RASFLAG         IS THIS INTSTALLED ROUTINE TO BE
 0841  REF    1                13,3461  7 4736 0            MASK    REINTBIT             RESTARTED
 0842  REF  365  LAST 1129     13,3462  10 000 0            CCS     A
 0843  REF    2  LAST 1217     13,3463  0 3500 1            TC      INTWAKE1        NO

 0844  REF   64  LAST 1214     13,3464  50 120 1            INDEX   FIXLOC
 0845  REF   13  LAST 1214     13,3465  3 0052 0            CA      QPRET
 0848  REF    6  LAST  895     13,3466  55 054 0            TS      TBASE2          YES, DONT RESTART WITH SOMEONE ELSES Q

 0849  REF  112  LAST 1213     13,3467  0 5355 1            TC      PHASCHNG
 0850                          13,3470   04022 0            OCT     04022

 0851  REF    7  LAST 1217     13,3471  3 1054 1            CA      TBASE2
 0852  REF   65  LAST 1217     13,3472  50 120 1            INDEX   FIXLOC
 0853  REF   14  LAST 1217     13,3473  54 052 1            TS      QPRET

 0854  REF    2  LAST 1217     13,3474  3 4736 1            CAF     REINTBIT
 0855  REF    3  LAST 1217     13,3475  7 0106 1            MASK    RASFLAG
 0856                          13,3476  0 0006 1            EXTEND
 0857  REF    1                13,3477  1 3516 1            BZF     GOBAC           DONT INTWAKE IF WE CAME HERE VIA RESTART

 0861  REF    2  LAST 1216     13,3500  3 3520 0  INTWAKE1  CAF     WAKESTAL
 0862                          13,3501  0 0004 0            INHINT
 0863  REF    5  LAST  480     13,3502  0 5130 0            TC      JOBWAKE
 0864  REF   22  LAST 1109     13,3503  10 064 1            CCS     LOCCTR
 0865  REF    3  LAST 1217     13,3504  1 3500 0            TCF     INTWAKE1
 0866                          13,3505   00051 0  FORTYONE  DEC     41
 0868  REF    2  LAST 1216     13,3506  4 3521 0            CS      INTBITAB
 0869  REF    4  LAST 1217     13,3507  7 0106 1            MASK    RASFLAG
 0870  REF    5  LAST 1217     13,3510  54 106 1            TS      RASFLAG         RELEASE STALL AREA
 0871                          13,3511  0 0003 1            RELINT
 0872  REF    2  LAST 1217     13,3512  1 3516 1            TCF     GOBAC
 0874  REF    3  LAST  227     13,3513  3 4727 1  OKTOGRAB  CAF     INTFLBIT
 08745                         13,3514  0 0004 0            INHINT
 0875  REF    6  LAST 1217     13,3515  26 106 1            ADS     RASFLAG
 0876  REF  225  LAST 1213     13,3516  0 6060 1  GOBAC     TC      INTPRET
 0877                          13,3517   77616 0            RVQ
 0888  REF   33  LAST 1211     13,3520   27450 0  WAKESTAL  CADR    INTSTALL +1
 0892                          13,3521   20100 1  INTBITAB  OCT     20100
```

```
P0895   AVETCMID

R0896   THIS ROUTINE PERFORMS THE TRANSITION FROM A THRUSTING PHASE TO THE COAST
R0897   PHASE BY INITIALIZING THIS VEHICLES PERMANENT STATE VECTOR WITH THE
R0898   VALUES LEFT BY THE AVERAGEG ROUTINE IN RN,VN,PIPTIME.

R0899   BEFORE THIS IS DONE THE W-MATRIX, IF ITS  VALID (ORWFLAG OR RENDWFLG IS
R0900   SET) IS INTEGRATED FORWARD TO PIPTIME WITH THE PRE-THRUST STATE VECTOR.

R0901   IN ADDITION, THE OTHER VEHICLE IS INTEGRATED (PERMANENT) TO PIPTIME.

R0902   FINALLY TRKMKCNT IS ZEROED


 0903   REF   4  LAST 1206    13,2000                            SETLOC INTINIT
 0904                         13,3522                            BANK

 0905   REF   4 LAST 1206 TO 1218:   433   469*                  COUNT* $$/INTIN
 0906                         13,3522   43020 1  AVETOMID STQ     BON
 0907   REF   5  LAST 1155    13,3523   02767 0                   EGRESS
 0908   REF  11  LAST  844    13,3524   02716 0                   RENDWFLG
 0909   REF   1               13,3525   27571 1                   INT/W           W-MATRIX VALID ,GO INTEGRATE IT
 0910                         13,3526   77614 1           BON
 0911   REF   1               13,3527   01711 1                   ORBWFLAG
 0912   REF   2  LAST 1218    13,3530   27571 1                   INT/W           W-MATRIX VALID ,GO INTEGRATE IT

 0913                         13,3531   45145 0  OTHERS   DLOAD   CALL            GET SET FOR OTHER VEHICLE INTEGRATION
 0914   REF  25  LAST  971    13,3532   01234 0                   PIPTIME         DESIRED TIME
 0915   REF  34  LAST 1217    13,3533   27447 0                   INTSTALL
 0916                         13,3534   45014 0           SET     CALL
 0917   REF  25  LAST 1213    13,3535   01474 1                   VINTFLAG        CM
 0918   REF   8  LAST 1207    13,3536   26702 0                   SETIFLGS        SETS UP NONE W-MAT. PERMANENT INTEG.
 0923   REF  53  LAST 1213    13,3537   34041 0           STCALL  TDEC1
 0924   REF  11  LAST 1210    13,3540   27172 0                   INTEGRV

 0925                         13,3541   45174 1           AXT,2   CALL            NOW MOVE PROPERLY SCALE RN,UN AS WELL AS
 0926                         13,3542   00002 0                   2               PIPTIME TO INTEGRATION ERASABLES.
 0927   REF  35  LAST 1218    13,3543   27447 0                   INTSTALL
 0928                         13,3544   77014 1           BON     AXT,2
 0929   REF   6  LAST 1154    13,3545   04304 1                   MOONTHIS
 0930                         13,3546   27550 1                   +2
 0931                         13,3547   00000 1                   0
 0932                         13,3550   53775 1           VLOAD   VSR*
 0933   REF  17  LAST  971    13,3551   01220 0                   RN
 0934                         13,3552   57176 0                   0,2
 0935   REF  12  LAST 1214    13,3553   01503 0           STORE   RRECT
 0936   REF  19  LAST 1215    13,3554   15535 0           STODL   RCV
 0937   REF  26  LAST 1218    13,3555   01234 0                   PIPTIME
 0938   REF  24  LAST 1216    13,3556   25517 0           STOVL   TET
 0939   REF  10  LAST  883    13,3557   01226 0                   VN
```

```
0940                           13,3560   45057 1              VSR*    CALL
0941                           13,3561   57176 0                      0,2
0942   REF    3  LAST  713     13,3562   27734 1                      MINIRECT          FINISH SETTING UP STATE VECTOR
0943                           13,3563   66234 1              RTB     SSP
0944   REF    1                13,3564   27C05 1                      MOVATHIS          PUT TEMP STATE VECTOR INTO PERMANENT
0945   REF   12  LAST  755     13,3565   03463 0                      TRKMKCNT
0946                           13,3566   00000 1                      0
0947                           13,3567   77650 1              GOTO
0948   REF    2  LAST 1155     13,3570   47211 0                      FAZAB5

0949                           13,3571   45145 0  INT/W       DLOAD   CALL
0950   REF   27  LAST 1218     13,3572   01234 0                      PIPTIME           INTEGRATE W THRU BURN
0951   REF   36  LAST 1218     13,3573   27447 0                      INTSTALL
0952                           13,3574   43014 0              SET     SET
0953   REF   18  LAST 1212     13,3575   01476 0                      DIMOFLAG          DO W-MATRIX
0954   REF    3  LAST 1214     13,3576   04476 0                      AVEMIDSW          SO WONT CLOBBER RN,VN,PIPTIME
0955                           13,3577   43014 0              SET     CLEAR
0956   REF    9  LAST 1207     13,3600   01475 0                      D6OR9FLG          9X9 FOR LM
0957   REF   26  LAST 1218     13,3601   01674 0                      VINTFLAG          LM
0964   REF   54  LAST 1218     13,3602   34C41 0              STCALL  TDEC1
0965   REF   12  LAST 1218     13,3603   27172 0                      INTEGRV
0966                           13,3604   77650 1              GOTO
0967   REF    1                13,3605   27531 0                      OTHERS            NOW GO DO THE OTHER VEHICLE
```

```
P0968    MIDTOAV1

R0969    THIS ROUTINE INTEGRATES (PRECISION) TO THE TIME SPECIFIED IN TDEC1.
R0970    IF, AT THE END OF AN INTEGRATION TIME STEP, CURRENT TIME PLUS A DELTA
R0971    TIME (SEE TIMEDELT.....BASED ON THE COMPUTATION TIME FOR ONE TIME STEP)
R0972    IS GREATER THAN THE DESIRED TIME, ALARM 1703 IS SET AND THE INTEGRATION
R0973    IS DONE TO THE CURRENT TIME.
R0974    RETURN IS IN BASIC TO THE RETURN ADDRESS PLUS ONE.

R0975    IF THE INTEGRATION IS FINISHED TO THE DESIRED TIME, RETURN IS IN BASIC
R0976    TO THE RETURN ADDRESS

R0977    IN EITHER CASE , BEFORE RETURNING, THE EXTRAPOLATED STATE VECTOR IS TRAN
R0978    FERRED FROM R,VATT TO R,VN1-PIPTIME1 IS SET TO THE FINISHING INTEGRA-
R0979    TION TIME AND MPAC IS SET TO THE DELTA TIME---
R0980                                    TAT MINUS CURRENT TIME.


R0981    MIDTOAV2

R0982    THIS ROUTINE INTEGRATES THIS VEHICLES STATE VECTOR TO THE CURRENT TIME.
R0983    NO INPUTS ARE REQUIRED OF THE CALLER. RETURN IS IN BASIC TO THE RETURN
R0984    ADDRESS WITH THE ABOVE TRANSFERS TO R,VN1-PIPTIME1-AND MPAC DONE

 09841   REF    1               21,2000                           SETLOC ORBITAL5
 09842                          21,2760                           BANK
 09843   REF    1                                                 COUNT* $$/INTIN

 0985    REF    1               E7,1744                           EBANK= IRETURN1
 0986                           21,2760   43020 1  MIDTOAV2 STQ     CLRGO            INTEGRATE TO PRESENT TIME PLUS TIMEDELT
 0987    REF    2  LAST 1220    21,2761   03744 0                   IRETURN1
 0988    REF    1               21,2762   04634 1                   MID1FLAG
 0989    REF    1               21,2763   27621 1                   ENTMID2

 09891   REF    5  LAST 1218    13,2000                           SETLOC INTINIT
 09892                          13,3606                           BANK
 09893   REF    5 LAST 1218 TO 1220:    52    521*                COUNT* $$/INTIN

 0990                           13,3606   43020 1  MIDTOAV1 STQ     SET               INTEGRATE TO TDEC1
 0991    REF    3  LAST 1220    13,3607   03744 0                   IRETURN1
 0992    REF    2  LAST 1220    13,3610   04474 1                   MID1FLAG
 0993                           13,3611   43234 0           RTB     DAD              INITIAL CHECK, IS TDEC1 IN THE FUTURE
 0994    REF   35  LAST 1206    13,3612   21603 1                   LOADTIME
 0995    REF    1               13,3613   11171 0                   TIMEDELT
 0996                           13,3614   51021 0           BDSU    BPL
 0997    REF   55  LAST 1219    13,3615   00041 1                   TDEC1
 0998    REF    1               13,3616   27625 0                   ENTMID1           Y5S
 0999                           13,3617   77624 1           CALL
 1000    REF    1               13,3620   27711 0                   NOTIME           NO, SET ALARM, SWITCH TO MIDTOAV2
 1001                         13,3621  43234 0  ENTMID2  RTB     DAD
 1002   REF  36  LAST 1220    13,3622  21603 1                   LOADTIME
 1003   REF   2  LAST 1220    13,3623  11171 0                   TIMEDELT
 1004   REF  56  LAST 1220    13,3624  00041 1           STORE   TDEC1

 1005                         13,3625  77624 1  ENTMID1  CALL
 1006   REF  37  LAST 1219    13,3626  27447 0                   INTSTALL
 1007                         13,3627  45014 0           CLEAR   CALL
 1008   REF  19  LAST 1219    13,3630  01676 1                   DIMOFLAG        NO W-MATRIX
 1009   REF   1               13,3631  26066 0                   THISVINT
 1010                         13,3632  43014 0           CLEAR   SET
 1011   REF  20  LAST 1213    13,3633  01673 1                   INTYPFLG
 1012   REF   1               13,3634  04475 0                   MIDAVFLG        LET INTEG. KNOW THE CALL IS FOR MIDTOAV.
 1013                         13,3635  77624 1           CALL
 1014   REF  13  LAST 1219    13,3636  27172 0                   INTEGRV          GO INTEGRATE
 1015                         13,3637  77214 0           CLEAR   VLOAD
 1016   REF   2  LAST 1221    13,3640  04675 1                   MIDAVFLG
 1017   REF  33  LAST  974    13,3641  00001 0                   RATT
 1018   REF   7  LAST  883    13,3642  27545 0           STOVL   RN1
 1019   REF  23  LAST  951    13,3643  00007 0                   VATT
 1020   REF   7  LAST  883    13,3644  17553 1           STODL   VN1
 1021   REF  15  LAST  782    13,3645  00015 0                   TAT
 1022   REF  11  LAST  874    13,3646  03561 0           STORE   PIPTIME1
10221                         13,3647  66134 1           SXA,2   SXA,1
10222   REF  17  LAST  882    13,3650  02777 1                   RTX2
10223   REF  13  LAST  762    13,3651  02776 0                   RTX1
 1023                         13,3652  77776 1           EXIT

 1024                         13,3653  0 0004 0          INHINT
 1025                         13,3654  0 0006 1          EXTEND
 1026   REF  30  LAST  990    13,3655  4 0025 1          DCS     TIME2
 1027   REF 731  LAST 1215    13,3656  20 155 1          DAS     MPAC
 1028   REF  14  LAST 1055    13,3657  0 7300 0          TC      TPAGREE

 1029   REF   4  LAST 1220    13,3660  3 1744 1          CA      IRETURN1
 1030   REF  14  LAST  743    13,3661  0 4631 1          TC      BANKJUMP
 1031                         13,3662  47014 1  CKMID2   BOF     RTB
 1032   REF   3  LAST 1220    13,3663  04754 0                   MID1FLAG
 1033   REF   1               13,3664  27701 1                   MID2
 1034   REF  37  LAST 1221    13,3665  21603 1                   LOADTIME
 1035                         13,3666  44215 1           DAD     BDSU
 1036   REF   3  LAST 1221    13,3667  11171 0                   TIMEDELT
 1037   REF   6  LAST 1216    13,3670  01115 0                   TDEC
 1038                         13,3671  45044 0           BPL     CALL
 1039   REF   2  LAST 1213    13,3672  27315 0                   TESTLOOP         YES
 1040   REF   2  LAST 1220    13,3673  27711 0                   NOTIME

 1041                         13,3674  43234 0  TIMEINC  RTB     DAD
 1042   REF  38  LAST 1221    13,3675  21603 1                   LOADTIME
 1043   REF   4  LAST 1221    13,3676  11171 0                   TIMEDELT
 1044    REF   7  LAST 1221    13,3677   35115 1            STCALL TDEC
 1045    REF   3  LAST 1221    13,3700   27315 0                   TESTLOOP

 1046                          13,3701   45345 1  MID2      DLOAD  DSU
 1047    REF   8  LAST 1222    13,3702   01115 0                   TDEC
 1048    REF  25  LAST 1218    13,3703   01517 0                   TET
 1049                          13,3704   45246 0            ABS    DSU
 1050    REF   1               13,3705   11167 1                   3CSECS
 1051                          13,3706   52040 1            BMN    GOTO
 1052    REF   4  LAST 1216    13,3707   27215 1                   A-PCHK
 1053    REF   1               13,3710   27674 1                   TIMEINC

 1054                          13,3711   77414 0  NOTIME    CLEAR  EXIT                 TOO LATE
 1055    REF   4  LAST 1221    13,3712   04674 0                   MID1FLAG
 1056    REF   5  LAST 1221    13,3713  25'744 1            INCR   IRETURN1             SET ERROR EXIT  (CALLOC +2)
 1057    REF  40  LAST  981    13,3714  0 5571 1            TC     ALARM                INSUFFICIENT TIME FOR INTEGRATION --
 1058                          13,3715   01703 1            OCT    1703                    TIG WILL BE SLIPPED...
 1059    REF 226  LAST 1217    13,3716  0 6060 1            TC     INTPRET
 1060                          13,3717   77616 0            RVQ

 10601   REF   1               04,2000                      SETLOC UPDATE2
 10602                         04,3166                      BANK
 10603   REF   1                                            COUNT* $$/INTIN

 1061                          04,3166   00000 1  3CSECS    2DEC   3
 1061                          04,3167   00003 1
 1062                          04,3170   00000 1  TIMEDELT  2DEC   2000
 1062                          04,3171   03720 1
 1066    REF   4  LAST  983    E3,1706                      EBANK= TEPHEM
 1067    REF   2 LAST 1222 TO 1222:    4      4*            COUNT* $$/INTIN

 1072    REF 227  LAST 1222    04,3172  0 6060 1  INTWAKEU  TC     INTPRET

 1073                          04,3173   53135 0            SLOAD  BZE                  IS THIS A CSM/LEM STATE VECTOR UPDATE
 1074    REF   4  LAST  223    04,3174   01502 1                   UPSVFLAG             REQUEST. IF NOT GO TO INTWAKUP.
 1075    REF   1               04,3175   11241 0                   INTWAKUP

 1076                          04,3176   77775 1            VLOAD                       MOVE RRECT(6) AND VRECT(6) INTO
 1077    REF  13  LAST 1218    04,3177   01503 0                   RRECT                     RCV(6)   AND VCV(6)   RESPECTIVELY.
 1078    REF  20  LAST 1218    04,3200   25535 0            STOVL  RCV
 1079    REF   9  LAST 1214    04,3201   01511 0                   VRECT                NOW GO TO 'RECTIFY +13D' TO
 1080                          04,3202   77624 1            CALL                        STORE VRECT INTO VCV  AND ZERO OUT
 1081    REF   5  LAST 1214    04,3203   27735 0                   RECTIFY +13D         TDELTAV(6),TNUV(6),TC(2) AND XKEP(2)
 1082                          04,3204   51535 0            SLOAD  ABS                  COMPARE ABSOLUTE VALUE OF 'UPSVFLAG'
 1083    REF   5  LAST 1222    04,3205   01502 1                   UPSVFLAG             TO 'UPDATE MOON STATE VECTOR CODE'
 1084                          04,3206   53025 0            DSU    BZE                  TO DETERMINE WHETHER THE STATE VECTOR TO
 1085    REF   1               04,3207   11250 0                   UPMNSVCD             BE UPDATED IS IN THE EARTH OR LUNAR
 1086    REF   1               04,3210   11215 1                   INTWAKEM             SPHERE OF INFLUENCE.........
 1087                          04,3211   43174 1            AXT,2  CLRGO                EARTH SPHERE OF INFLUENCE.
 1088                          04,3212   00000 1            DEC    0
 1089   REF  21  LAST 1214   04,3213   00223 1                    MOONFLAG
 1090   REF   1              04,3214   11220 1                    INTWAKEC
 1091                        04,3215   43174 1  INTWAKEM AXT,2    SET              LUNAR SPHERE OF INFLUENCE.
 1092                        04,3216   00002 0           DEC      2
 1093   REF  22  LAST 1223   04,3217   00063 1                    MOONFLAG
 1094                        04,3220   50135 0  INTWAKEC SLOAD    BMN              COMMON CODING AFTER X2 INITIALIZED AND
A1095                                                                              MOONFLAG SET(OR CLEARED).
 1096   REF   6  LAST 1222   04,3221   01502 1                    UPSVFLAG         IS THIS A REQUEST FOR A LEM OR CSM
 1097   REF   1              04,3222   11230 0                    INTWAKLM          STATE VECTOR UPDATE......
 1098                        04,3223   77624 1           CALL                      UPDATE CSM STATE VECTOR
 1099   REF   4  LAST 1213   04,3224   26717 1                    ATOPCSM

 1100                        04,3225   52014 0           CLEAR    GOTO
 1101   REF   2  LAST 1218   04,3226   01671 0                    ORBWFLAG
 1102   REF   1              04,3227   11232 1                    INTWAKEX

 1103                        04,3230   77624 1  INTWAKLM CALL                      UPDATE  LM STATE VECTOR
 1104   REF   3  LAST 1213   04,3231   26772 1                    ATOPLEM

 1105                        04,3232   77414 0  INTWAKEX CLEAR    EXIT
 1106   REF  12  LAST 1218   04,3233   02676 1                    RENDWFLG

 11061  REF 233  LAST 1151   04,3234  3 4746 0           CAF      ZERO
 11062                       04,3235  0 0006 1           EXTEND
 11063  REF   2  LAST  222   04,3236  01 C77 0           WRITE    CHAN77           ZERO CHANNEL 77
 11068  REF   7  LAST 1223   E3,1501                     EBANK=   UPSVFLAG
 1107   REF   8  LAST 1223   04,3237  55'501 0           TS       UPSVFLAG

 1108   REF 228  LAST 1222   04,3240  0 6060 1           TC       INTPRET
 1109                        04,3241   77624 1  INTWAKUP CALL
 1110   REF   3  LAST  713   04,3242   27456 0                    INTWAKEO         RELEASE :GRAB: OF ORBIT INTEG
 1111                        04,3243   77776 1           EXIT

 1112   REF 113  LAST 1217   04,3244  0 5355 1           TC       PHASCHNG
 1113                        04,3245   04026 1           OCT      04026
 1114   REF   1              04,3246  0 3714 0           TC       UPOUT +1

 1115                        04,3247   00002 0  UPMNSVCD OCT      2
 1116                        04,3250   00000 1           OCT      0


 11165  REF   1              24,2000                     SETLOC   ORBITAL4
 11166                       24,3770                     BANK
 11167  REF   1                                          COUNT*   $$/INTIN

 1117                        24,3770   77420 1  GRP2PC   STQ      EXIT
 1118   REF   2  LAST  131   24,3771   02711 1                    GRP2SVQ
 1119   REF 114  LAST 1223   24,3772  0 5355 1           TC       PHASCHNG
 1120                        24,3773   04022 0           OCT      04022
 1121   REF 229  LAST 1223   24,3774  0 6060 1           TC       INTPRET
 1122                          24,3775   77650 1            GOTO
 1123    REF   3  LAST 1223    24,3776   02711 1                    GRP2SVQ
```

```
L      ORBITAL INTEGRATION                                                              USER'S PAGE NO.   1      E0 S3

R0001                DELETE
 0002                          13,3720                          BANK    13
 0003   REF    1               11,2000                          SETLOC  ORBITAL
 0004                          11,2403                          BANK
 0005   REF    1                                                COUNT*  $$/ORBIT
R0006                DELETE
 0007                          11,2403   40354 1   KEPPREP      LXA,2   SETPD
 0008   REF   10   LAST 1215   11,2404   02030 0                        PBODY
 0009                          11,2405   00001 0                        0
 0010                          11,2406   75543 1                DLOAD*  SQRT         SQRT(MU) (+18 OR +15)  0D       PL  2D
 0011   REF    4   LAST 1215   11,2407   51770 0                        MUEARTH,2
 0012                          11,2410   53515 0                PDVL    UNIT                                         PL  8D
 0013   REF   21   LAST 1222   11,2411   01535 0                        RCV
 0014                          11,2412   60325 0                PDDL    NORM         NORM R (+29 OR +27 - N1) 2D     PL  4D
 0015                          11,2413   00045 0                        36D
 0016   REF   64   LAST 1211   11,2414   00047 1                        X1
 0017                          11,2415   77715 1                PDVL
 0018                          11,2416   65241 0                DOT     PDDL         E*SQRT(MU)(+7 OR+5) 4D        PL  6D
 0019   REF   15   LAST 1210   11,2417   01543 1                        VCV
 0020   REF   11   LAST 1214   11,2420   02074 0                        TAU.         (+28)
 0021                          11,2421   60225 1                DSU     NORM
 0022   REF    7   LAST 1214   11,2422   01551 1                        TC
 0023   REF   19   LAST 1153   11,2423   00051 0                        S1
 0024                          11,2424   77742 0                SR1
 0025                          11,2425   65271 0                DDV     PDDL
 0026                          11,2426   00003 1                        2D
 0027                          11,2427   41405 0                DMP     PUSH         ES(+6 +N1-N2) 6D              PL  8D
 0028                          11,2430   00005 1                        4D
 0029                          11,2431   65316 0                DSQ     PDDL         (ES)SQ(+12 +2(N1-N2)) 8D      PL 10D
 0030                          11,2432   00005 1                        4D
 0031                          11,2433   64716 0                DSQ     PDDL*        SSQ/MU(-2OR +2(N1-N2)) 10D      PL 12D
 0032   REF    5   LAST 1225   11,2434   51770 0                        MUEARTH,2
 0033                          11,2435   40442 1                SR3     SR4
 0034                          11,2436   47515 0                PDVL    VSQ          PREALIGN MU (+43 OR +37) 12D  PL 14D
 0035   REF   16   LAST 1225   11,2437   01543 1                        VCV
 0036                          11,2440   44205 0                DMP     BDSU                                       PL 12D
 0037                          11,2441   00045 0                        36D
 0038                          11,2442   41271 0                DDV     DMP                                        PL 10D
 0039                          11,2443   00003 1                        2D           -(1/R-ALPHA)(+12 +3N1-2N2)
 0040                          11,2444   53605 1                DMP     SL*
 0041   REF    1                11,2445   11254 1                        DP2/3
 0042                          11,2446   20176 0                        0 -3,1       10L(1/R-ALPHA)(+13 +2(N1-N2))
 0043                          11,2447   43260 1                XSU,1   DAD          2(ES)SQ - ETCETRA          PL  8D
 0044   REF   20   LAST 1225   11,2450   00050 1                        S1           X1 = N2-N1
 0045                          11,2451   45257 0                SL*     DSU          -ES+2(ES)SQ ETC (+6 +N1-N2)   PL  6D
 0046                          11,2452   20211 1                        8D,1
 0047                          11,2453   41205 0                DMP     DMP
 0048                          11,2454   00001 0                        0D
 0049                          11,2455   00005 1                        4D
 0050                          11,2456   53657 0                SL*     SL*
```

```
0051                         11,2457   20211 1                   8D,1
0052                         11,2460   20201 0                   0,1             S(-FS(1-2FS)-1/6...)(+17 OR +16)
0053                         11,2461   65215 1           DAD     PDDL                                             PL   6D
0054   REF    2  LAST   115  11,2462   01553 0                   XKEP
0055                         11,2463   53605 1           DMP     SL*             S(+17 OR +16)
0056                         11,2464   00001 0                   0D
0057                         11,2465   20202 0                   1,1
0058                         11,2466   43204 0           BOVB    DAD
0059   REF    3  LAST  1154  11,2467   57756 1                   TCDANZIG
0060                         11,2470   77626 0           STADR
0061   REF    3  LAST  1173  11,2471   75656 0           STORE   XKEPNEW
0062                         11,2472   74020 0           STQ     AXC,1
0063   REF    3  LAST  1177  11,2473   02111 1                   KEPRTN
0064                         11,2474   00012 1           DEC     10
0065                         11,2475   74014 1           BON     AXC,1
0066   REF   23  LAST  1223  11,2476   00303 1                   MOONFLAG
0067   REF    1              11,2477   24023 0                   KEPLERN
0068                         11,2500   00002 0           DEC     2
0069                         11,2501   77650 1           GOTO
0070   REF    2  LAST  1226  11,2502   24023 0                   KEPLERN
```

```
0071                      11,2503   66350 1  FBR3     LXA,1  SSP
0072   REF  18  LAST 1209  11,2504   01500 0                  DIFEQCNT
0073   REF  21  LAST 1225  11,2505   00051 0                  S1
0074                      11,2506   77762 1           DEC    -13
0075                      11,2507   54345 1           DLOAD  SR
0076   REF   9  LAST 1216  11,2510   02076 1                  DT/2
0077                      11,2511   20612 0                  9D
0078                      11,2512   61500 0           TIX,1  ROUND
0079                      11,2513   22514 1                  +1
0080                      11,2514   43206 1           PUSH   DAD
0081   REF   8  LAST 1225  11,2515   01551 1                  TC
0082   REF  12  LAST 1225  11,2516   16074 0           STODL  TAU.
0083                      11,2517   77615 0           DAD
0084   REF  26  LAST 1222  11,2520   01517 0                  TET
0085   REF  27  LAST 1227  11,2521   35517 1           STCALL TET
0086   REF   2  LAST 1214  11,2522   22403 0                  KEPPREP
```

```
P0087   AGC ROUTINE TO COMPUTE ACCELERATION COMPONENTS.


 0088                              11,2523   73150 1  ACCOMP    LXA,1   LXA,2
 0089   REF  11  LAST 1225         11,2524   02030 0                    PBODY
 0090   REF  12  LAST 1228         11,2525   02030 0                    PBODY
 0091                              11,2526   77775 1            VLOAD
 0092   REF  10  LAST 1212         11,2527   24007 0                    ZEROVEC
 0093   REF   2  LAST  118         11,2530   26062 1            STOVL   FV
 0094   REF  20  LAST 1134         11,2531   02032 1                    ALPHAV
 0095                              11,2532   53257 1            VSL*    VAD
 0096                              11,2533   57605 0                    0 -7,2
 0097   REF  22  LAST 1225         11,2534   01535 0                    RCV
 0098   REF   2  LAST  118         11,2535   02040 1            STORE   BETAV
 0099                              11,2536   65014 1            BOF     XCHX,2
 0100   REF  20  LAST 1221         11,2537   01756 1                    DIMOFLAG
 0101                              11,2540   22545 0                    +5
 0102   REF  19  LAST 1227         11,2541   01500 0                    DIFEQCNT
 0103   REF   6  LAST  120         11,2542   12123 1            STORE   VECTAB,2
 0104                              11,2543   77724 0            XCHX,2
 0105   REF  20  LAST 1228         11,2544   01500 0                    DIFEQCNT
 0106                              11,2545   53575 0            VLOAD   UNIT
 0107   REF  21  LAST 1228         11,2546   02032 1                    ALPHAV
 0108   REF  22  LAST 1228         11,2547   16032 1            STODL   ALPHAV
 0109                              11,2550   00045 0                    36D
 0110   REF   4  LAST 1132         11,2551   36070 0            STCALL  ALPHAM
 0111   REF   1                    11,2552   22653 1                    GAMCOMP
 0112                              11,2553   66175 1            VLOAD   SXA,1
 0113   REF   3  LAST 1228         11,2554   02040 1                    BETAV
 0114   REF  34  LAST 1209         11,2555   00051 0                    S2
 0115   REF  23  LAST 1228         11,2556   16032 1            STODL   ALPHAV
 0116   REF   2  LAST  118         11,2557   02072 0                    BETAM
 0117   REF   5  LAST 1228         11,2560   02070 1            STORE   ALPHAM
 0118                              11,2561   71214 0            BOF     DLOAD
 0119   REF   3  LAST 1215         11,2562   00342 1                    MIDFLAG
 0120   REF   1                    11,2563   23024 0                    OBLATE
 0121   REF  28  LAST 1227         11,2564   01517 0                    TET
 0122                              11,2565   77624 1            CALL
 0123   REF   3  LAST  983         11,2566   33646 0                    LSPOS
 0124                              11,2567   72174 0            AXT,2   LXA,1
 0125                              11,2570   00002 0                    2
 0126   REF  35  LAST 1228         11,2571   00051 0                    S2
 0127                              11,2572   77614 1            BOF
 0128   REF  24  LAST 1226         11,2573   00343 0                    MOONFLAG
 0129                              11,2574   22577 1                    +3
 0130                              11,2575   77076 0            VCOMP   AXT,2
 0131                              11,2576   00000 1                    0
 0132   REF   4  LAST 1228         11,2577   02040 1            STORE   BETAV
 0133   REF   3  LAST  119         11,2600   26104 0            STOVL   RPQV
 0134                              11,2601   00003 1                    2D
```

```
0135  REF   4  LAST  119   11,2602   02113 0            STORE   RPSV
0136                       11,2603   45335 0            SLOAD   DSU
0137  REF  19  LAST  891   11,2604   01011 0                    MODREG
0138  REF   1              11,2605   11256 0                    OCT27
0139                       11,2606   43030 0            BHIZ    BOF
0140                       11,2607   22612 1                    +3
0141  REF  21  LAST 1228   11,2610   01756 1                    DIMOFLAG
0142  REF   1              11,2611   22625 0                    GETRPSV
0143                       11,2612   74375 0            VLOAD   VXSC
0144  REF  24  LAST 1228   11,2613   02032 1                    ALPHAV
0145  REF   6  LAST 1228   11,2614   02070 1                    ALPHAM
0146                       11,2615   52257 0            VSR*    VSU
0147                       11,2616   57175 0                    1,2
0148  REF   5  LAST 1228   11,2617   02040 1                    BETAV
0149                       11,2620   77724 0            XCHX,2
0150  REF  21  LAST 1228   11,2621   01500 0                    DIFEQCNT
0151  REF   7  LAST 1228   11,2622   12131 1            STORE   VECTAB +6,2
0153                       11,2623   77724 0            XCHX,2
0154  REF  22  LAST 1229   11,2624   01500 0                    DIFEQCNT
0155                       11,2625   62175 0  GETRPSV   VLOAD   INCR,1
0156  REF   4  LAST 1228   11,2626   02104 0                    RPQV
0157                       11,2627   00004 0                    4
0158                       11,2630   43014 0            CLEAR   BOF
0159  REF   3  LAST 1213   11,2631   04260 1                    RPQFLAG
0160  REF  25  LAST 1228   11,2632   00343 0                    MOONFLAG
0161                       11,2633   22640 0                    +5
0162                       11,2634   53261 1            VSR     VAD
0163                       11,2635   20612 0                    9D
0164  REF   5  LAST 1229   11,2636   02113 0                    RPSV
0165  REF   6  LAST 1229   11,2637   02113 0            STORE   RPSV
0166                       11,2640   77624 1            CALL
0167  REF   2  LAST 1228   11,2641   22653 1                    GAMCOMP
0168                       11,2642   62174 1            AXT,2   INCR,1
0169                       11,2643   00004 0                    4
0170                       11,2644   00004 0                    4
0171                       11,2645   77775 1            VLOAD
0172  REF   7  LAST 1229   11,2646   02113 0                    RPSV
0173  REF   6  LAST 1229   11,2647   36040 0            STCALL  BETAV
0174  REF   3  LAST 1229   11,2650   22653 1                    GAMCOMP
0175                       11,2651   77650 1            GOTO
0176  REF   2  LAST 1228   11,2652   23024 0                    OBLATE
0177                       11,2653   74575 0  GAMCOMP   VLOAD   VSR1
0178  REF   7  LAST 1229   11,2654   02040 1                    BETAV
0179                       11,2655   40236 1            VSQ     SETPD
0180                       11,2656   00001 0                    0
0181                       11,2657   61501 1            NORM    ROUND
0182                       11,2660   00040 0                    31D
0183                       11,2661   60325 0            PDDL    NORM               NORMED B SQUARED TO PD LIST
0184  REF   7  LAST 1229   11,2662   02070 1                    ALPHAM             NORMALIZE (LESS ONE) LENGTH OF ALPHA
0185                       11,2663   00041 1                    32D                SAVING NORM SCALE FACTOR IN X1
```

```
0186                          11,2664   63342 1        SR1      PDVL
0187   REF   8   LAST 1229    11,2665   02040 1                 BETAV         C(PDL+2) = ALMOST NORMED ALPHA
0188                          11,2666   77656 1        UNIT
0189   REF   9   LAST 1230    11,2667   16040 1        STODL    BETAV
0190                          11,2670   00045 0                 36D
0191   REF   3   LAST 1228    11,2671   02072 0        STORE    BETAM
0192                          11,2672   55301 0        NORM     BDDV          FORM NORMALIZED QUOTIENT ALPHAM/BETAM
0193                          11,2673   00042 1                 33D
0194                          11,2674   41562 0        SR1R     PUSH          C(PDL+2) = ALMOST NORMALIZED RHO.
0195                          11,2675   77743 1        DLOAD*
0196   REF   1                11,2676   27760 0                 ASCALE,1
0197   REF  22   LAST 1227    11,2677   00051 0        STORE    S1
0198                          11,2700   57124 1        XCHX,2   XAD,2
0199   REF  23   LAST 1230    11,2701   00050 1                 S1
0200                          11,2702   00040 0                 32D
0201                          11,2703   71264 1        XSU,2    DLOAD
0202                          11,2704   00041 1                 33D
0203                          11,2705   00003 1                 2D
0204                          11,2706   65057 0        SR*      XCHX,2
0205                          11,2707   57177 1                 0 -1,2
0206   REF  24   LAST 1230    11,2710   00050 1                 S1
0207                          11,2711   74406 0        PUSH     SR1R          RHO/4 TO 4D
0208                          11,2712   50315 0        PDVL     DOT
0209   REF  25   LAST 1229    11,2713   02032 1                 ALPHAV
0210   REF  10   LAST 1230    11,2714   02040 1                 BETAV
0211                          11,2715   44372 1        SL1R     BDSU          (RHO/4) - 2(ALPHAV/2.BETAV/2)
0212                          11,2716   57206 1        PUSH     DMPR          TO PDL+6
0213                          11,2717   00005 1                 4
0214                          11,2720   77752 1        SL1
0215                          11,2721   43206 1        PUSH     DAD
0216   REF   1                11,2722   25766 1                 DQUARTER
0217                          11,2723   75406 1        PUSH     SQRT
0218                          11,2724   41475 1        DMPR     PUSH
0219                          11,2725   00013 0                 10D
0220                          11,2726   43352 1        SL1      DAD
0221   REF   2   LAST 1230    11,2727   25766 1                 DQUARTER
0222                          11,2730   43325 1        PDDL     DAD           (1/4)+2((Q+1)/4)    TO PD+14D
0223                          11,2731   00013 0                 10D
0224   REF   3   LAST  935    11,2732   24005 1                 HALFDP
0225                          11,2733   72475 1        DMPR     SL1
0226                          11,2734   00011 1                 8D
0227                          11,2735   56215 1        DAD      DDV
0228   REF   1                11,2736   25760 1                 THREE/8
0229                          11,2737   00017 1                 14D
0230                          11,2740   74275 1        DMPR     VXSC
0231                          11,2741   00007 0                 6
0232   REF  11   LAST 1230    11,2742   02040 1                 BETAV                         -
0233                          11,2743   64515 1        PDVL     VSR3          (G/2)(C(PD+4))B/2 TO PD+16D
0234   REF  26   LAST 1230    11,2744   02032 1                 ALPHAV
0235                          11,2745   41455 0        VAD      PUSH          A12 + C(PD+16D) TO PD+16D
```

```
0236                      11,2746   41345 0             DLOAD   DMP
0237                      11,2747   00001 0                     0
0238                      11,2750   00015 0                     12D
0239                      11,2751   61501 1             NORM    ROUND
0240                      11,2752   00037 0                     30D
0241                      11,2753   40665 0             BDDV    DMP*
0242                      11,2754   00003 1                     2
0243  REF   6  LAST 1225  11,2755   51770 0                     MUEARTH,2
0244                      11,2756   74276 1             DCOMP   VXSC
0245                      11,2757   57124 1             XCHX,2  XAD,2
0246  REF  25  LAST 1230  11,2760   00050 1                     S1
0247  REF  36  LAST 1228  11,2761   00051 0                     S2
0248                      11,2762   55064 0             XSU,2   XSU,2
0249                      11,2763   00036 1                     30D
0250                      11,2764   00037 0                     31D
0252                      11,2765   53604 0             BOVB    VSR*
0253  REF   4  LAST 1226  11,2766   57756 1                     TCDANZIG
0254                      11,2767   57177 1                     0 -1,2
0255                      11,2770   53324 1             XCHX,2  VAD
0256  REF  26  LAST 1231  11,2771   00050 1                     S1
0257  REF   3  LAST 1228  11,2772   02062 1                     FV
0258  REF   4  LAST 1231  11,2773   02062 1             STORE   FV
0259                      11,2774   43400 1             BOV     RVQ                 RETURN IF NO OVERFLOW
0260                      11,2775   22776 1                     +1
0261                      11,2776   51575 1   GOBAQUE   VLOAD   ABVAL
0262  REF   8  LAST 1212  11,2777   01521 0                     TDELTAV
0263                      11,3000   77654 0             BZE
0264  REF   1             11,3001   23021 0                     INT-ABRT
0265                      11,3002   54345 1             DLOAD   SR
0266  REF   2  LAST  119  11,3003   02100 1                     H
0267                      11,3004   20612 0                     9D
0268                      11,3005   44206 0             PUSH    BDSU
0269  REF   9  LAST 1227  11,3006   01551 1                     TC
0270  REF  13  LAST 1227  11,3007   16074 0             STODL   TAU.
0271  REF  29  LAST 1228  11,3010   01517 0                     TET
0272                      11,3011   45425 0             DSU     STADR
0273  REF  30  LAST 1231  11,3012   42260 0             STCALL  TET
0274  REF   3  LAST 1227  11,3013   22403 0                     KEPPREP
0275                      11,3014   77624 1             CALL
0276  REF   6  LAST 1222  11,3015   27720 1                     RECTIFY
0277                      11,3016   77614 1             SETGO
0278  REF   4  LAST 1229  11,3017   04020 1                     RPQFLAG
0279  REF   4  LAST 1222  11,3020   27315 0                     TESTLOOP

0280                      11,3021   77776 1   INT-ABRT  EXIT
0281  REF   4  LAST 1199  11,3022   0 5644 1            TC      POODOO
0282                      11,3023   20430 1             OCT     20430
```

```
P0283   THE OBLATE ROUTINE COMPUTES THE ACCELERATION DUE TO OBLATENESS. IT USES THE UNIT OF THE VEHICLE
R0285   POSITION VECTOR FOUND IN ALPHAV AND THE DISTANCE TO THE CENTER IN ALPHAM. THIS IS ADDED TO THE SUM OF THE
R0287   DISTURBING ACCELERATIONS IN FV AND THE PROPER DIFEQ STAGE IS CALLED VIA X1.
 0289                           11,3024   71354 0    OBLATE   LXA,2  DLOAD
 0290   REF  13  LAST 1228      11,3025   02030 0                    PBODY
 0291   REF   8  LAST 1229      11,3026   02070 1                    ALPHAM
 0292                           11,3027   44601 0             SETPD  DSU*
 0293                           11,3030   00001 0                    0
 0294   REF   1                 11,3031   50003 1                    RDE,2
 0295                           11,3032   43044 0             BPL    BOF              GET URPV
 0296   REF   1                 11,3033   23262 0                    NBRANCH
 0297   REF  26  LAST 1229      11,3034   00343 0                    MOONFLAG
 0298   REF   1                 11,3035   23271 1                    COSPHIE
 0299                           11,3036   65375 0             VLOAD  PDDL
 0300   REF  27  LAST 1230      11,3037   02032 1                    ALPHAV
 0301   REF  31  LAST 1231      11,3040   01517 0                    TET
 0302                           11,3041   45125 0             PDDL   CALL
 0303   REF   1                 11,3042   25756 1                    3/5
 0304   REF   6  LAST 1131      11,3043   51644 0                    R-TO-RP
 0305   REF   1                 11,3044   24017 1             STOVL  URPV              RP/R  B-1  IN PLANETARY COORDINATES
 0306   REF   3  LAST 1210      11,3045   24001 0                    ZUNIT
 0307                           11,3046   45006 0             PUSH   CALL              ZUNIT B-1  IN PLANETARY COORDL  AT 00D
 0308   REF   1                 11,3047   23277 1                    MATRIX
 0309                           11,3050   77715 1             PDVL                     UZ    B-2  IN INERT COORD       AT 00D
 0310   REF   9  LAST 1134      11,3051   24005 1                    XUNIT
 0311                           11,3052   45006 0             PUSH   CALL              XUNIT B-1  IN PLANETARY COORD.  AT 06D
 0312   REF   2  LAST 1232      11,3053   23277 1                    MATRIX
 0313                           11,3054   77772 0             VSL1
 0314                           11,3055   24041 1             STOVL  32D               UX    B-1  IN INERT. COORD      AT 32D
 0315                           11,3056   77772 0             VSL1
 0316   REF   1                 11,3057   14025 0    COMTERM  STODL  UZ                UZ  B-1 IN INERTIAL COORD         AT 20D
 0317   REF   1                 11,3060   00023 0                    COSPHI/2           '      Z-COMPONENT OF URPV
 0318                           11,3061   65275 1             DMPR   PDDL              P   B-6    ,  3COSPHI/64          AT 00D
 0319   REF   1                 11,3062   25770 0                    3/32               2
 0320   REF   2  LAST 1232      11,3063   00023 0                    COSPHI/2
 0321                           11,3064   57316 1             DSQ    DMPR
 0322   REF   1                 11,3065   25772 1                    15/16              '                         2
 0323                           11,3066   41425 1             DSU    PUSH              P   B-5    ,(1/2)(15COSPHI -3)     AT 02D
 0324   REF   1                 11,3067   25764 0                    3/64               3
 0325                           11,3070   41275 1             DMPR   DMP
 0326   REF   3  LAST 1232      11,3071   00023 0                    COSPHI/2
 0327   REF   1                 11,3072   23775 0                    7/12
 0328                           11,3073   65372 1             SL1R   PDDL
 0329                           11,3074   00001 0                    0D
 0330                           11,3075   44275 1             DMPR   BDSU
 0331   REF   1                 11,3076   11254 1                    2/3                '                      '    '
 0332                           11,3077   57206 1             PUSH   DMPR              P   B-7,(1/3)(7COSPHI P  -4P )     AT 04D
 0333   REF   4  LAST 1232      11,3100   00023 0                    COSPHI/2           4                      3    2
 0334                           11,3101   65275 1             DMPR   PDDL
 0335   REF   1                 11,3102   25774 1                    9/16
```

```
0336                        11,3103   00003 1                  2D                 '                      '    '
0337                        11,3104   44275 1           DMPR   BDSU             P   B-10,(1/4)(9COSPHI P  -5P )
0338   REF   1              11,3105   11252 1                  5/128             5                      4    3
0339                        11,3106   56203 0           DMP*   DDV                                  '
0340   REF   1              11,3107   51764 0                  J4REQ/J3,2           B-  , (J RP/J R)P
0341   REF   9  LAST 1232   11,3110   02070 1                  ALPHAM                      4    3   5
0342                        11,3111   56615 0           DAD    DMPR*
0343                        11,3112   00005 1                  40                             2     2  '              '
0344   REF   1              11,3113   51760 1                  2J3RE/J2,2           B  ,(2J PP /J2 R )P  +(2J RP/J2R)P
0345                        11,3114   43271 1           DDV    DAD                         4           5     3        4
0346   REF  10  LAST 1233   11,3115   02070 1                  ALPHAM              -        2 '  2         '        ,
0347                        11,3116   00003 1                  20                (R/R)(J RP P /R + 2J RP P /  + J P )
0348                        11,3117   77761 1           VXSC                             4    5       3    4  2   2 3
0349   REF  28  LAST 1232   11,3120   02032 1                  ALPHAV                     4       2  '           -
0350   REF   1              11,3121   14033 1           STODL  TVEC                 B-6,(SUM((J /R )P    (COSPHI))UR)
0351                        11,3122   70403 1           DMP*   SR1                       I=2   I     I+1
0352   REF   2  LAST 1233   11,3123   51764 0                  J4REQ/J3,2                             '
0353                        11,3124   43271 1           DDV    DAD                     (J RP/J R)P
0354   REF  11  LAST 1233   11,3125   02070 1                  ALPHAM                    4    3   4
0355                        11,3126   50473 1           DMPR*  SR3                          2    2  '              '
0356   REF   2  LAST 1233   11,3127   51760 1                  2J3RE/J2,2             (2J RP /J P )P  +(2J RP/J R)P
0357                        11,3130   43271 1           DDV    DAD                       4     2    4     3    2   3
0358   REF  12  LAST 1233   11,3131   02070 1                  ALPHAM
0359                        11,3132   76561 1           VXSC   VSL1                       4   '        -
0360   REF   2  LAST 1232   11,3133   00025 0                  UZ                   B-6  SUM(P(COSPHI))UZ
0361                        11,3134   77645 0           BVSU                             I=2  I
0362   REF   2  LAST 1233   11,3135   00033 1                  TVEC               4              I-2    '          -
0363   REF   3  LAST 1233   11,3136   14033 1           STODL  TVEC              SUM((MU J (RP/R)    )(P   (COSPHI)UR -
0364   REF  13  LAST 1233   11,3137   02070 1                  ALPHAM            I=2      I             I+2
0365                        11,3140   63501 0           NORM   DSQ                           P (COSPHI)UZ))  B-6 AT 20D
0366   REF  65  LAST 1225   11,3141   00047 1                  X1                             I
0367                        11,3142   60316 0           DSQ    NORM
0368   REF  27  LAST 1231   11,3143   00051 0                  S1                            4
0369                        11,3144   54606 0           PUSH   BDDV*            NORMALIZED  R                    AT 000
0370   REF   1              11,3145   51754 0                  J2REQSQ,2
0371                        11,3146   40161 0           VXSC   BOV
0372   REF   4  LAST 1233   11,3147   00033 1                  TVEC
0373                        11,3150   23151 0                  +1                B+38 FOR EARTH , B+42 FOR MOON
0374                        11,3151   56070 0           XAD,1  XAD,1
0375   REF  66  LAST 1233   11,3152   00046 0                  X1
0376   REF  67  LAST 1233   11,3153   00046 0                  X1
0377                        11,3154   53670 0           XAD,1  VSL*
0378   REF  28  LAST 1233   11,3155   00050 1                  S1
0379                        11,3156   20153 1                  0 -22D,1
0380                        11,3157   40055 0           VAD    BOV
0381   REF   5  LAST 1231   11,3160   02062 1                  FV
0382   REF   1              11,3161   22776 1                  GOBAQUE
0383   REF   6  LAST 1233   11,3162   16062 1           STODL  FV                B+16 FOR EARTH , B+20 FOR MOON
0384   REF   2  LAST 1232   11,3163   00017 1                  URPV              B-1  X-COMPONENT OF POSITION  IN
0385                        11,3164   41414 0           BOF    PUSH                        PLANETORY COORD.      AT 020
```

```
0386  REF 27  LAST 1232   11,3165   00343 0                  MOONFLAG
0387  REF  2  LAST 1232   11,3166   23262 0                  NBRANCH                2
0388                      11,3167   65316 0         DSQ      PDDL            B-2   X                       AT 04D
0389  REF  3  LAST 1233   11,3170   00021 1                  URPV +2         B-1  Y-COMPONENT
0390                      11,3171   45316 1         DSQ      DSU
0391                      11,3172   74205 0         DMP      VXSC
0392  REF  3  LAST 1210   11,3173   27762 1                  5/8                     2  2 -
0393  REF 29  LAST 1233   11,3174   02032 1                  ALPHAV          B-6  5(Y -X )UR  2  2 -
0394                      11,3175   65332 0         VSL3     PDDL            B-3           5(Y -X )UR      AT 02D
0395                      11,3176   53361 0         VXSC     VAD
0396                      11,3177   00041 1                  32D                   2  2 -   2         -
0397                      11,3200   47315 0         PDVL     VXV               (5(Y.-X )UR/R ) +(2X/R)UX   AT 02D
0398                      11,3201   00041 1                  32D                B-1   UX
0399  REF  3  LAST 1233   11,3202   00025 0                  UZ                 B-2  -UY =(UX * UZ)
0400                      11,3203   74372 1         VSL1     VXSC               B-3   -(2Y/R)UY
0401  REF  4  LAST 1234   11,3204   00021 1                  URPV +2                    2  2 -   2        -
0402                      11,3205   41455 0         VAD      PUSH               B-3 (5(X -Y )UR/R )+(2X/R)UX -(
0403                      11,3206   77745 1         DLOAD                                    -
0404  REF  5  LAST 1232   11,3207   00023 0                  COSPHI/2               2Y/R)UY                AT 02D
0405                      11,3210   41516 0         DSQ      PUSH               B-2 (Z.COMPONENT)          AT 08D
0406                      11,3211   65205 0         DMP      PDDL                           2
0407  REF  4  LAST 1234   11,3212   27762 1                  5/B                B-5  5COSPHI/2             AT 08D
0408                      11,3213   43302 1         SR2      DAD
0409                      11,3214   00011 1                  08D
0410                      11,3215   41221 0         BDSU     DMP                                 2
0411  REF  6  LAST 1196   11,3216   11044 1                  D1/32              B-5  (1 - 7COSPHI )
0412  REF  5  LAST 1234   11,3217   00017 1                  URPV
0413                      11,3220   74205 0         DMP      VXSC
0414  REF  5  LAST 1234   11,3221   27762 1                  5/8
0415  REF 30  LAST 1234   11,3222   02032 1                  ALPHAV                                 2 -
0416                      11,3223   65272 0         VSL5     PDDL               B-5 (5X/R)(1-7COSPHI )UR   AT 08D
0417                      11,3224   74225 1         DSU      VXSC
0418  REF  7  LAST 1234   11,3225   11044 1                  D1/32
0419                      11,3226   00041 1                  32D
0420                      11,3227   53372 1         VSL1     VAD                                    2 -          -
0421                      11,3230   41325 0         PDDL     DMP                B-5 (5X/R)(1-7COSPHI )UR +(5COSPHI
0422  REF  6  LAST 1234   11,3231   00017 1                  URPV                  -
0423  REF  7  LAST 1234   11,3232   00023 0                  URPV +4            -1)UX                      AT 08D
0424                      11,3233   74205 0         DMP      VXSC
0425  REF  6  LAST 1234   11,3234   27762 1                  5/8                B-5   5X Y
0426  REF  4  LAST 1234   11,3235   00025 0                  UZ                         M M
0427                      11,3236   53352 0         VSL2     VAD                                    2 -           2
0428                      11,3237   60325 0         PDDL     NORM               B-5 (5X/R)(1-7COSPHI )UR +(5COSPHI
0429  REF 14  LAST 1233   11,3240   02070 1                  ALPHAM                -          2 -
0430  REF 28  LAST 1180   11,3241   00050 1                  X2                 -1)UX +(10XZ/R )UZ         AT 08D
0431                      11,3242   67206 1         PUSH     SLOAD
0432  REF  1              11,3243   01351 1                  E32C31RM
0433                      11,3244   74271 0         DDV      VXSC
0434                      11,3245   63257 1         VSL*     PDVL
0435                      11,3246   57601 1                  0 -3,2
```

```
0436                          11,3247    67206 1             PUSH     SLOAD
0437  REF    1                11,3250    01350 0                      E3J22R2M
0438                          11,3251    53361 0             VXSC     VAD
0439                          11,3252    70257 0             VSL*     V/SC
0440                          11,3253    20146 0                      0 -27D,1                      B+16 OR B+20 (J    + C   )
0441                          11,3254    40055 0             VAD      BOV                                         22     31
0442  REF    7  LAST 1233     11,3255    02062 1                      FV
0443  REF    2  LAST 1233     11,3256    22776 1                      GOBAQUE
0444  REF    8  LAST 1235     11,3257    02062 1             STORE    FV
0445                          11,3260    77754 1             LXA,2
0446  REF   14  LAST 1232     11,3261    02030 0                      PBODY
0447                          11,3262    72135 0  NBRANCH    SLOAD    LXA,1
0448  REF   23  LAST 1229     11,3263    01501 1                      DIFEQCNT
0449  REF  732  LAST 1221     11,3264    00154 1                      MPAC
0450                          11,3265    73205 1             DMP      CGOTO
0451  REF    1                11,3266    27764 1                      -1/12
0452  REF  733  LAST 1235     11,3267    00155 0                      MPAC
0453  REF    1                11,3270    23304 1                      DIFEQTAB
0454                          11,3271    77745 1  COSPHIE    DLOAD
0455  REF   31  LAST 1234     11,3272    02036 0                      ALPHAV +4
0456  REF    6  LAST 1234     11,3273    24023 0             STOVL    COSPHI/2
0457  REF    4  LAST 1232     11,3274    24001 0                      ZUNIT
0458                          11,3275    77650 1             GOTO
0459  REF    1                11,3276    23057 1                      COMTERM
0428                          11,3277    57435 1  MATRIX     VXV      VCOMP
0429  REF    3  LAST 1140     11,3300    02013 1                      504LM                   ROUTINE TRANSLATES FROM PLANETARY
0430                          11,3301    77655 1             VAD                              TO INERTIAL COORDINATES
0431                          11,3302    43505 0             VXM      RVQ
0432  REF    8  LAST 1143     11,3303    00025 0                      MMATRIX
0433  REF    1                11,3304    23473 0  DIFEQTAB   CADR     DIFEQ+0
0434  REF    1                11,3305    23477 1             CADR     DIFEQ+1
0435  REF    1                11,3306    23510 1             CADR     DIFEQ+2
0436                          11,3307    77214 0  TIMESTEP   BOF      VLOAD
0437  REF    4  LAST 1228     11,3310    00342 1                      MIDFLAG
0438  REF    1                11,3311    23340 1                      RECTEST
0439  REF   23  LAST 1228     11,3312    01535 0                      RCV
0440                          11,3313    41241 0             DOT      DMP
0441  REF   17  LAST 1225     11,3314    01543 1                      VCV
0442  REF   10  LAST 1227     11,3315    02076 1                      DT/2                    (R.V) X (DELTA T)
0443                          11,3316    77640 0             BMN
0444  REF    2  LAST 1235     11,3317    23340 1                      RECTEST
0445                          11,3320    43014 0             BON      BOF
0446  REF   28  LAST 1234     11,3321    00303 1                      MOONFLAG
0447  REF    1                11,3322    23415 0                      LUNSPH
0448  REF    5  LAST 1231     11,3323    04340 1                      RPQFLAG
0449  REF    1                11,3324    23412 1                      FARSPH
0450                          11,3325    45145 0             DLOAD    CALL
0451  REF   32  LAST 1232     11,3326    01517 0                      TET
0452  REF    4  LAST 1228     11,3327    33646 0                      LSPOS                   RPQV IN MPAC
0453  REF    5  LAST 1229     11,3330    02104 0             STORE    RPQV                    RPQV
```

```
0454                        11,3331   77754 1            LXA,2
0455  REF  15  LAST 1235    11,3332   02030 0                     PBODY
0456                        11,3333   51445 0  INLUNCHK  BVSU     ABVAL
0457  REF  24  LAST 1235    11,3334   01535 0                     RCV
0458                        11,3335   50025 0            DSU      BMN
0459  REF   1               11,3336   27770 1                     RSPHERE
0460  REF   1               11,3337   23432 0                     DOSWITCH
0461                        11,3340   51575 1  RECTEST   VLOAD    ABVAL          RECTIFY IF
0462  REF   9  LAST 1231    11,3341   01521 0                     TDELTAV
0463                        11,3342   77600 1            BOV
0464  REF   1               11,3343   23366 0                     CALLRECT
0465                        11,3344   51025 1            DSU      BPL               1) EITHER TDELTAV OR TNUV EQUALS OR
0466  REF   3  LAST  956    11,3345   23773 0                     3/4                  EXCEEDS 3/4 IN MAGNITUDE
0467  REF   2  LAST 1236    11,3346   23366 0                     CALLRECT
0468                        11,3347   53615 0            DAD      SL*                            OR
0469  REF   4  LAST 1236    11,3350   23773 0                     3/4
0470                        11,3351   57605 0                     0 -7,2            2) ABVAL(TDELTAV) EQUALS OR EXCEEDS
0471                        11,3352   45271 1            DDV      DSU                  .01(ABVAL(RCV))
0472                        11,3353   00013 0                     10D
0473  REF   1               11,3354   27766 0                     RECRATIO
0474                        11,3355   77244 0            BPL      VLOAD
0475  REF   3  LAST 1236    11,3356   23366 0                     CALLRECT
0476  REF   8  LAST 1212    11,3357   01527 0                     TNUV
0477                        11,3360   45246 0            ABVAL    DSU
0478  REF   5  LAST 1236    11,3361   23773 0                     3/4
0479                        11,3362   77600 1            BOV
0480  REF   4  LAST 1236    11,3363   23366 0                     CALLRECT
0481                        11,3364   77640 0            BMN
0482  REF   1               11,3365   23370 1                     INTGRATE
0483                        11,3366   77624 1  CALLRECT  CALL
0484  REF   7  LAST 1231    11,3367   27720 1                     RECTIFY
0485                        11,3370   77775 1  INTGRATE  VLOAD
0486  REF   9  LAST 1236    11,3371   01527 0                     TNUV
0487  REF   1               11,3372   25134 0            STOVL    ZV
0488  REF  10  LAST 1236    11,3373   01521 0                     TDELTAV
0489  REF   2  LAST  107    11,3374   01126 0            STORE    YV
0490                        11,3375   77614 1            CLEAR
0491  REF   1               11,3376   00261 1                     JSWITCH
0492                        11,3377   66375 0  DIFEQ0    VLOAD    SSP
0493  REF   3  LAST 1236    11,3400   01126 0                     YV
0494  REF  24  LAST 1235    11,3401   01501 1                     DIFEQCNT
0495                        11,3402   00000 1                     0
0496  REF  32  LAST 1235    11,3403   16032 1            STODL    ALPHAV
0497  REF   3  LAST 1135    11,3404   24007 0                     DPZERO
0498  REF   3  LAST 1231    11,3405   02100 1            STORE    H              START H AT ZERO. GOES 0(DELT/2)DELT.
0499                        11,3406   52014 0            BON      GOTO
0500  REF   2  LAST 1236    11,3407   00301 0                     JSWITCH
0501  REF   1               11,3410   23712 1                     DOW..
0502  REF   1               11,3411   22523 0                     ACCOMP
0503                        11,3412   52175 0  EARSPH    VLOAD    GOTO
```

```
0504   REF   6  LAST 1235   11,3413   02104 0                    RPQV
0505   REF   1              11,3414   23333 0                    INLUNCHK
0506                        11,3415   60545 0  LUNSPH   DLOAD    SR2
0507                        11,3416   00013 0                    10D
0508                        11,3417   50025 0           DSU      BMN
0509   REF   2  LAST 1236   11,3420   27770 1                    RSPHERE
0510   REF   3  LAST 1235   11,3421   23340 1                    RECTEST
0511                        11,3422   71214 0           BOF      DLOAD
0512   REF   6  LAST 1235   11,3423   04340 1                    RPQFLAG
0513   REF   2  LAST 1236   11,3424   23432 0                    DOSWITCH
0514   REF  33  LAST 1235   11,3425   01517 0                    TET
0515                        11,3426   77624 1           CALL
0516   REF   2  LAST  502   11,3427   33646 0                    LUNPOS
0517                        11,3430   77676 0           VCOMP
0518   REF   7  LAST 1237   11,3431   02104 0           STORE    RPQV
0519                        11,3432   77624 1  DOSWITCH CALL
0520   REF   1              11,3433   23436 1                    ORIGCHNG
0521                        11,3434   77650 1           GOTO
0522   REF   2  LAST 1236   11,3435   23370 1                    INTGRATE
0523                        11,3436   45020 1  ORIGCHNG STQ      CALL
0524   REF   3  LAST  119   11,3437   02111 1                    ORIGEX
0525   REF   8  LAST 1236   11,3440   27720 1                    RECTIFY
0526                        11,3441   53775 1           VLOAD    VSL*
0527   REF  25  LAST 1236   11,3442   01535 0                    RCV
0528                        11,3443   57576 1                    0,2
0529                        11,3444   53651 0           VSU      VSL*
0530   REF   8  LAST 1237   11,3445   02104 0                    RPQV
0531                        11,3446   57574 0                    2,2
0532   REF  14  LAST 1222   11,3447   01503 0           STORE    RRECT
0533   REF  26  LAST 1237   11,3450   01535 0           STORE    RCV
0537                        11,3451   57414 1           BOF      VCOMP
0538   REF  29  LAST 1235   11,3452   00343 0                    MOONFLAG
0539                        11,3453   23454 0                    +1
0540                        11,3454   53715 1           PDVL     VSL*
0541   REF  18  LAST 1235   11,3455   01543 1                    VCV
0542                        11,3456   57576 1                    0,2
0543                        11,3457   77651 0           VSU
0544                        11,3460   77657 0           VSL*
0545                        11,3461   57574 0                    0 +2,2
0546   REF  10  LAST 1222   11,3462   01511 0           STORE    VRECT
0547   REF  19  LAST 1237   11,3463   01543 1           STORE    VCV
0548                        11,3464   67154 0           LXA,2    SXA,2
0549   REF   4  LAST 1237   11,3465   02111 1                    ORIGEX
0550   REF  15  LAST 1217   11,3466   00052 0                    QPRET
0551                        11,3467   52014 0           BON      GOTO
0552   REF  30  LAST 1237   11,3470   00303 1                    MOONFLAG
0553   REF   2  LAST 1209   11,3471   26747 1                    CLRMOON
0554   REF   3  LAST 1209   11,3472   26754 0                    SETMOON
```

```
P0555   THE RECTIFY SUBROUTINE IS CALLED BY THE INTEGRATION PROGRAM AND OCCASIONALLY BY THE MEASUREMENT INCORPORATION
R0557   ROUTINES TO ESTABLISH A NEW CONIC.

 0558                              13,3720                       BANK    13
 0559   REF   2  LAST   48         13,2000                       SETLOC  ORBITAL2
 0560                              13,3720                       BANK

 0561                              13,3720   77354 0  RECTIFY    LXA,2   VLOAD
 0562   REF  16  LAST 1236         13,3721   02030 0                     PBODY
 0563   REF  11  LAST 1236         13,3722   01521 0                     TDELTAV
 0564                              13,3723   53257 1             VSL*    VAD
 0565                              13,3724   57605 0                     0 -7,2
 0566   REF  27  LAST 1237         13,3725   01535 0                     RCV
 0567   REF  15  LAST 1237         13,3726   01503 0             STORE   RRECT
 0568   REF  28  LAST 1238         13,3727   25535 0             STOVL   RCV
 0569   REF  10  LAST 1236         13,3730   01527 0                     TNUV
 0570                              13,3731   53257 1             VSL*    VAD
 0571                              13,3732   57602 1                     0 -4,2
 0572   REF  20  LAST 1237         13,3733   01543 1                     VCV
 0573   REF  11  LAST 1237         13,3734   01511 0  MINIRECT   STORE   VRECT
 0574   REF  21  LAST 1238         13,3735   25543 1             STOVL   VCV
 0575   REF  11  LAST 1228         13,3736   24007 0                     ZEROVEC
 0576   REF  12  LAST 1238         13,3737   01521 0             STORE   TDELTAV
 0577   REF  11  LAST 1238         13,3740   15527 0             STODL   TNUV
 0578   REF  12  LAST 1238         13,3741   24007 0                     ZEROVEC
 0579   REF  10  LAST 1231         13,3742   01551 1             STORE   TC
 0580   REF   3  LAST 1226         13,3743   01553 0             STORE   XKEP
 0581                              13,3744   77616 0             RVQ
 0582                              11,3473                       BANK    11
 0583   REF   2  LAST 1225         11,2000                       SETLOC  ORBITAL
 0584                              11,3473                       BANK
```

```
R0585    THE THREE DIFEQ ROUTINES - DIFEQ+0, DIFEQ+12, AND DIFEQ+24 - ARE ENTEREDTO PROCESS THE CONTRIBUTIONS AT THE
R0587    BEGINNING, MIDDLE, AND END OF THE TIMESTEP, RESPECTIVELY. THE UPDATING IS DONE BY THE NYSTROM METHOD.
 0589                            11,3473   64575 1  DIFEQ+0   VLOAD   VSR3
 0590    REF   9  LAST 1235      11,3474   02062 1                    FV
 0591    REF   2  LAST  118      11,3475   36046 0            STCALL  PHIV
 0592    REF   1                 11,3476   23653 0                    DIFEQCOM
 0593                            11,3477   74575 0  DIFEQ+1   VLOAD   VSR1
 0594    REF  10  LAST 1239      11,3500   02062 1                    FV
 0595                            11,3501   53206 0            PUSH    VAD
 0596    REF   3  LAST 1239      11,3502   02046 1                    PHIV
 0597    REF   2  LAST  118      11,3503   26054 1            STOVL   PSIV
 0598                            11,3504   53362 0            VSR1    VAD
 0599    REF   4  LAST 1239      11,3505   02046 1                    PHIV
 0600    REF   5  LAST 1239      11,3506   36046 0            STCALL  PHIV
 0601    REF   2  LAST 1239      11,3507   23653 0                    DIFEQCOM
 0602                            11,3510   57345 1  DIFEQ+2   DLOAD   DMPR
 0603    REF   4  LAST 1236      11,3511   02100 1                    H
 0604    REF   2  LAST 1225      11,3512   11254 1                    DP2/3
 0605                            11,3513   74206 0            PUSH    VXSC
 0606    REF   6  LAST 1239      11,3514   02046 1                    PHIV
 0607                            11,3515   53372 1            VSL1    VAD
 0608    REF   2  LAST 1236      11,3516   01134 0                    ZV
 0609                            11,3517   53361 0            VXSC    VAD
 0610    REF   5  LAST 1239      11,3520   02100 1                    H
 0611    REF   4  LAST 1236      11,3521   01126 0                    YV
 0612    REF   5  LAST 1239      11,3522   25126 0            STOVL   YV
 0613    REF  11  LAST 1239      11,3523   02062 1                    FV
 0614                            11,3524   53322 1            VSR3    VAD
 0615    REF   3  LAST 1239      11,3525   02054 1                    PSIV
 0616                            11,3526   76561 1            VXSC    VSL1
 0617                            11,3527   77655 1            VAD
 0618    REF   3  LAST 1239      11,3530   01134 0                    ZV
 0619    REF   4  LAST 1239      11,3531   01134 0            STORE   ZV
 0620                            11,3532   45014 0            BOFF    CALL
 0621    REF   3  LAST 1236      11,3533   00341 1                    JSWITCH
 0622    REF   1                 11,3534   23604 1                    ENDSTATE
 0623    REF  21  LAST 1213      11,3535   51770 0                    GRP2PC
 0624                            11,3536   77354 0            LXA,2   VLOAD
 0625    REF   2  LAST  107      11,3537   01116 0                    COLREG
 0626    REF   5  LAST 1239      11,3540   01134 0                    ZV
 0627                            11,3541   77732 1            VSL3                      ADJUST W-POSITION FOR STORAGE
 0628    REF  31  LAST 1153      11,3542   12467 1            STORE   W +54D,2
 0629                            11,3543   77775 1            VLOAD
 0630    REF   6  LAST 1239      11,3544   01126 0                    YV
 0631                            11,3545   40132 0            VSL3    BOV
 0632    REF   1                 11,3546   23676 1                    WMATEND
 0633    REF  32  LAST 1239      11,3547   12401 1            STORE   W,2

 0634                            11,3550   77624 1            CALL
 0635    REF  22  LAST 1239      11,3551   51770 0                    GRP2PC
```

```
0636                          11,3552   66354 0             LXA,2   SSP
0637   REF   3   LAST 1239    11,3553   01116 0                     COLREG
0638   REF  37   LAST 1231    11,3554   00052 0                     S2
0639                          11,3555   00000 1                     0
0640                          11,3556   67114 1             INCR,2  SXA,2
0641                          11,3557   00006 1                     6
0642   REF   7   LAST 1239    11,3560   01125 0                     YV
0643                          11,3561   45104 0             TIX,2   CALL
0644   REF   1                11,3562   23647 0                     RELOADSV
0645   REF  23   LAST 1239    11,3563   51770 0                     GRP2PC
0646                          11,3564   67154 0             LXA,2   SXA,2
0647   REF   8   LAST 1240    11,3565   01125 0                     YV
0648   REF   4   LAST 1240    11,3566   01116 0                     COLREG

0649                          11,3567   77624 1   NEXTCOL   CALL
0650   REF  24   LAST 1240    11,3570   51770 0                     GRP2PC
0651                          11,3571   76754 0             LXA,2   VLOAD*
0652   REF   5   LAST 1240    11,3572   01116 0                     COLREG
0653   REF  33   LAST 1239    11,3573   75376 1                     W,2
0654                          11,3574   77722 0             VSR3                    ADJUST W-POSITION FOR INTEGRATION
0655   REF   9   LAST 1240    11,3575   01126 0             STORE   YV
0656                          11,3576   76173 0             VLOAD*  AXT,1
0657   REF  34   LAST 1240    11,3577   75310 1                     W +54D,2
0658                          11,3600   00000 1                     0
0659                          11,3601   77722 0             VSR3                    ADJUST W-VELOCITY FOR INTEGRATION
0660   REF   6   LAST 1239    11,3602   35134 1             STCALL  ZV
0661   REF   1                11,3603   23377 0                     DIFEQ0

0662                          11,3604   77200 0   ENDSTATE  BOV     VLOAD
0663   REF   3   LAST 1235    11,3605   22776 1                     GOBAQUE
0664   REF   7   LAST 1240    11,3606   01134 0                     ZV
0665   REF  12   LAST 1238    11,3607   25527 0             STOVL   TNUV
0666   REF  10   LAST 1240    11,3610   01126 0                     YV
0667   REF  13   LAST 1238    11,3611   01521 0             STORE   TDELTAV
0668                          11,3612   43014 0             BON     BOFF
0669   REF   3   LAST 1221    11,3613   04715 0                     MIDAVFLG
0670   REF   1                11,3614   27662 0                     CKMID2          CHECK FOR MID2 BEFORE GOING TO TIMEINC
0671   REF  22   LAST 1229    11,3615   01756 1                     DIMOFLAG
0672   REF   5   LAST 1231    11,3616   27315 0                     TESTLOOP
0673                          11,3617   77776 1             EXIT
0674   REF 115   LAST 1223    11,3620   0 5355 1            TC      PHASCHNG
0675                          11,3621   04022 0             OCT     04022           PHASE 1
0676   REF  73   LAST 1213    11,3622   0 5506 1            TC      UPFLAG          PHASE CHANGE HAS OCCURRED BETWEEN
0677   REF   4   LAST 1213    11,3623   00236 0             ADRES   REINTFLG        INTSTALL AND INTWAKE
0678   REF 230   LAST 1223    11,3624   0 6060 1            TC      INTPRET
0679                          11,3625   77731 1             SSP
0680   REF  16   LAST 1237    11,3626   00053 1                     QPRET
0681   REF   1                11,3627   23634 1                     AMOVED
0682                          11,3630   52014 0             BON     GOTO
0683   REF  27   LAST 1219    11,3631   01714 1                     VINTFLAG
```

```
0684    REF   5  LAST 1223   11,3632   26717 1                     ATOPCSM
0685    REF   4  LAST 1223   11,3633   26772 1                     ATOPLEM
0686                         11,3634   66214 0  AMOVED   SET       SSP
0687    REF   4  LAST 1239   11,3635   00061 0                     JSWITCH
0688    REF   6  LAST 1240   11,3636   01117 1                     COLREG
0689                         11,3637   77741 0           DEC       -30
0690                         11,3640   66214 0           BOFF      SSP
0691    REF  10  LAST 1219   11,3641   01755 1                     D6OR9FLG
0692    REF   1              11,3642   23567 1                     NEXTCOL
0693    REF   7  LAST 1241   11,3643   01117 1                     COLREG
0694                         11,3644   77717 0           DEC       -48
0695                         11,3645   77650 1           GOTO
0696    REF   2  LAST 1241   11,3646   23567 1                     NEXTCOL


0697                         11,3647   77745 1  RELOADSV DLOAD                         RELOAD TEMPORARY STATE VECTOR
0698    REF   9  LAST 1222   11,3650   01115 0                     TDEC                FROM PERMANENT IN CASE OF
0699    REF  57  LAST 1221   11,3651   34041 0           STCALL    TDEC1
0700    REF   1              11,3652   27177 0                     INTEGRV2            BY STARTING AT INTEGRV2.
0701                         11,3653   43345 1  DIFEQCOM DLOAD     DAD                 INCREMENT H AND DIFEQCNT.
0702    REF  11  LAST 1235   11,3654   02076 1                     DT/2
0703    REF   6  LAST 1239   11,3655   02100 1                     H
0704                         11,3656   66110 1           INCR,1    SXA,1
0705                         11,3657   77763 0           DEC       -12
0706    REF  25  LAST 1236   11,3660   01500 0                     DIFEQCNT            DIFEQCNT SET FOR NEXT ENTRY.
0707    REF   7  LAST 1241   11,3661   02100 1           STORE     H
0708                         11,3662   74561 0           VXSC      VSR1
0709    REF  12  LAST 1239   11,3663   02062 1                     FV
0710                         11,3664   74255 0           VAD       VXSC
0711    REF   8  LAST 1240   11,3665   01134 0                     ZV
0712    REF   8  LAST 1241   11,3666   02100 1                     H
0713                         11,3667   77655 1           VAD
0714    REF  11  LAST 1240   11,3670   01126 0                     YV
0715    REF  33  LAST 1236   11,3671   02032 1           STORE     ALPHAV
0716                         11,3672   52014 0           BON       GOTO
0717    REF   5  LAST 1241   11,3673   00301 0                     JSWITCH
0718    REF   2  LAST 1236   11,3674   23712 1                     DOW..
0719    REF   1              11,3675   22503 1                     FBR3


0720                         11,3676   43014 0  WMATEND  CLEAR     CLEAR
0721    REF  23  LAST 1240   11,3677   01676 1                     DIMOFLAG            DONT INTEGRATE W THIS TIME
0722    REF   3  LAST 1223   11,3700   01671 0                     ORBWFLAG            INVALIDATE W
0723                         11,3701   77614 1           CLEAR
0724    REF  13  LAST 1223   11,3702   02676 1                     RENDWFLG
0725                         11,3703   77414 0           SET       EXIT
0726    REF   9  LAST 1215   11,3704   01472 1                     STATEFLG            PICK UP STATE VECTOR UPDATE
0727    REF  41  LAST 1222   11,3705   0 5571 1          TC        ALARM
0728                         11,3706   00421 0           OCT       421
0729    REF 231  LAST 1240   11,3707   0 6060 1          TC        INTPRET
```

```
 0730                          11,3710   77650 1          GOTO
 0731   REF   6  LAST 1240     11,3711   27315 0                    TESTLOOP        FINISH INTEGRATING STATE VECTOR
```

```
P0732   ORBITAL ROUTINE FOR EXTRAPOLATICN OF THE W MATRIX. IT COMPUTES THE SECOND DERIVATIVE OF EACH COLUMN POSITION
R0734   VECTOR OF THE MATRIX AND CALLS THE NYSTROM INTEGRATION ROUTINES TO SOLVETHE DIFFERENTIAL EQUATIONS. THE PROGRAM
R0736   USES A TABLE OF VEHICLE POSITION VECTORS COMPUTED DURING THE INTEGRATION OF THE VEHICLES POSITION AND VELOCITY.
 0738                          11,3712   7C754 0  DOW..     LXA,2  DLOAD*
 0739   REF  17  LAST 1238     11,3713   02030 0                   PBODY
 0740   REF   7  LAST 1231     11,3714   51770 0                   MUEARTH,2
 0741   REF   4  LAST 1230     11,3715   36072 1            STCALL BETAM
 0742   REF   1                11,3716   23740 0                   DOW..1
 0743   REF  13  LAST 1241     11,3717   02062 1            STORE  FV
 0744                          11,3720   62014 0            BOF    INCR,1
 0745   REF   5  LAST 1235     11,3721   0C342 1                   MIDFLAG
 0746   REF   3  LAST 1234     11,3722   23262 0                   NBRANCH
 0747                          11,3723   77771 0            DEC    -6
 0748                          11,3724   7C744 1            LXC,2  DLOAD*
 0749   REF  18  LAST 1243     11,3725   02030 0                   PBODY
 0750   REF   8  LAST 1243     11,3726   51772 1                   MUEARTH -2,2
 0751   REF   5  LAST 1243     11,3727   36C72 1            STCALL BETAM
 0752   REF   2  LAST 1243     11,3730   23740 0                   DOW..1
 0753                          11,3731   50414 0            BON    VSR6
 0754   REF  31  LAST 1237     11,3732   0C303 1                   MOONFLAG
 0755                          11,3733   23734 0                   +1
 0756                          11,3734   77655 1            VAD
 0757   REF  14  LAST 1243     11,3735   02C62 1                   FV
 0758   REF  15  LAST 1243     11,3736   36062 0            STCALL FV
 0759   REF   4  LAST 1243     11,3737   23262 0                   NBRANCH
 0760                          11,3740   6C575 0  DOW..1    VLOAD  VSR4
 0761   REF  34  LAST 1241     11,3741   02032 1                   ALPHAV
 0762                          11,3742   53513 0            PDVL*  UNIT
 0763   REF   8  LAST 1229     11,3743   C2123 0                   VECTAB,1
 0764                          11,3744   46315 1            PDVL   VPROJ
 0765   REF  35  LAST 1243     11,3745   02032 1                   ALPHAV
 0766                          11,3746   52361 1            VXSC   VSU
 0767   REF   6  LAST 1236     11,3747   23773 0                   3/4
 0768                          11,3750   60325 0            PDDL   NORM
 0769                          11,3751   00045 0                   36D
 0770   REF  38  LAST 1240     11,3752   00052 0                   S2
 0771                          11,3753   63406 0            PUSH   DSQ
 0772                          11,3754   77605 1            DMP
 0773                          11,3755   65301 0            NORM   PDDL
 0774                          11,3756   00043 0                   34D
 0775   REF   6  LAST 1243     11,3757   02C72 0                   BETAM
 0776                          11,3760   56342 1            SR1    DDV
 0777                          11,3761   77761 1            VXSC
 0778                          11,3762   57154 0            LXA,2  XAD,2
 0779   REF  39  LAST 1243     11,3763   00051 0                   S2
 0780   REF  40  LAST 1243     11,3764   00051 0                   S2
 0781                          11,3765   57074 0            XAD,2  XAD,2
 0782   REF  41  LAST 1243     11,3766   00051 0                   S2
 0783                          11,3767   00042 1                   34D
 0784                          11,3770   43457 0            VSL*   RVQ
```

```
0785                          11,3771   57606 0                     0 -8D,2          ************************************
0787   REF  1                 12,2000                       SETLOC  ORBITAL1
0788                          12,3755                       BANK

0789                          12,3755   04631 1   3/5       2DEC    .6 B-2
0789                          12,3756   23146 0
0790                          12,3757   14000 1   THREE/8   2DEC    .375
0790                          12,3760   00000 1
0791                          12,3761   02314 0    .3D       2DEC     .3 B-2
0791                          12,3762   31463 1
0792                          12,3763   01400 1   3/64      2DEC    3 B-6
0792                          12,3764   00000 1
0793                          12,3765   10000 0   DP1/4     2DEC    .25
0793                          12,3766   00000 1
0794   REF  2  LAST 1197      12,3765             DQUARTER  EQUALS  DP1/4
0795   REF  3  LAST 1244      12,3765             POS1/4    EQUALS  DP1/4
0796                          12,3767   03000 1   3/32      2DEC    3 B-5
0796                          12,3770   00000 1
0797                          12,3771   36000 1   15/16     2DEC    15. B -4
0797                          12,3772   00000 1
07982                         05,3776                       BANK    05
07983  REF  3  LAST 1238      11,2000                       SETLOC  ORBITAL
07984                         11,3772                       BANK

07986                         11,3772   30000 1   3/4       2DEC    3.0 B -2
07986                         11,3773   00000 1
0799                          11,3774   22525 0   7/12      2DEC    .5833333333
0799                          11,3775   12525 0
07992  REF  2  LAST 1244      12,2000                       SETLOC  ORBITAL1
07994                         12,3773                       BANK

0800                          12,3773   22000 1   9/16      2DEC    9 B -4
0800                          12,3774   00000 1
08002  REF  1                 04,2000                       SETLOC  ORBITAL3
08004                         04,3251                       BANK

0801                          04,3251   01200 1   5/128     2DEC    5 B-7
0801                          04,3252   00000 1
0802   REF 13  LAST 1238      12,2006             DPZERO    EQUALS  ZEROVEC
0803                          04,3253   25252 0   DP2/3     2DEC    .6666666667
0803                          04,3254   25253 1
0804   REF  3  LAST 1239      04,3253             2/3       EQUALS  DP2/3
0805                          04,3255   00027 1   OCT27     OCT     27
0806                          13,3745                       BANK    13
0807   REF  3  LAST 1238      13,2000                       SETLOC  ORBITAL2
0808                          13,3745                       BANK
R0809  IT IS VITAL THAT THE FOLLOWING CONSTANTS NOT BE SHUFFLED
0810                          13,3745   77764 1             DEC     -11
0811                          13,3746   77775 1             DEC     -2
0812                          13,3747   77766 0             DEC     -9
```

```
0813                             13,3750   77771 0              DEC      -6
0814                             13,3751   77775 1              DEC      -2
0815                             13,3752   77775 1              DEC      -2
0816                             13,3753   00000 1              DEC      0
0817                             13,3754   77763 0              DEC      -12
0818                             13,3755   77766 0              DEC      -9
0819                             13,3756   77773 1              DEC      -4
0820                             13,3757   77770 1  ASCALE      DEC      -7
0821                             13,3760   77771 0              DEC      -6
0822                             13,3761   24000 1  5/8         2DEC     5 B-3
0822                             13,3762   00000 1
0823                             13,3763   74631 0  -1/12       2DEC     -.1
0823                             13,3764   63145 1
0824                             13,3765   00243 1  RECRATIO 2DEC       .01
0824                             13,3766   32703 1
0825                             13,3767   03654 0  RSPHERE     2DEC     64373.76 E3 B-29
0825                             13,3770   21000 1
0826                             13,3771   03654 0  RDM         2DEC     16093.44 E3 B-27
0826                             13,3772   21000 1
0827                             13,3773   04627 0  RDE         2DEC     80467.20 E3 B-29
0827                             13,3774   25200 1
0828                                0000            RATT        EQUALS 0D
0829                                0006            VATT        EQUALS 6D
0830                                0014            TAT         EQUALS 12D
0831                                0016            RATT1       EQUALS 14D
0832                                0024            VATT1       EQUALS 20D
0833                                0032            MU(P)       EQUALS 26D
0834                                0040            TDEC1       EQUALS 32D
0835                                0016            URPV        EQUALS 14D
0836   REF   8  LAST 1234           0022            COSPHI/2 EQUALS URPV +4
0837                                0024            UZ          EQUALS 20D
0838                                0032            TVEC        EQUALS 26D
```

```
 0001                          22,3774                     BANK    22
 0002    REF    2  LAST  336   23,2000                     SETLOC  INFLIGHT
 0003                          23,3232                     BANK

 0004    REF   23  LAST  972   E5,1642                     EBANK=  XSM


R0005    CALCGTA COMPUTES THE GYRO TORQUE ANGLES REQUIRED TO BRING THE STABLE MEMBER INTO THE DESIRED ORIENTATION.

R0007    THE INPUT IS THE DESIRED STABLE MEMBER COORDINATES REFERRED TO PRESENT STABLE MEMBER COORDINATES. THE THREE
R0009    HALF-UNIT VECTORS ARE STORED AT XDC, YDC, AND ZDC.

R0010    THE OUTPUTS ARE THE THREE GYRO TORQUING ANGLES TO BE APPLIED TO THE Y, Z, AND X GYROS AND ARE STORED DP AT IGC,
R0012    MGC, AND OGC RESPECTIVELY.

 0013    REF    1                                          COUNT*  $$/INFLT
 0014                          23,3232    71220 1  CALCGTA  ITA     DLOAD           PUSHDOWN  00-03,16D-27D,34D-37D
 0015    REF   42  LAST 1243   23,3233    00051 0                   S2              XDC = (XD1 XD2 XD3)
 0016    REF    6  LAST  972   23,3234    02665 0                   XDC             YDC = (YD1 YD2 YD3)
 0017                          23,3235    65325 0           PDDL    PDDL            ZDC = (ZD1 ZD2 ZD3)
 0018    REF   16  LAST 1144   23,3236    06505 1                   HI6ZEROS
 0019    REF    7  LAST 1246   23,3237    02671 0                   XDC +4
 0020                          23,3240    55476 1           DCOMP   VDEF
 0021                          23,3241    77656 1           UNIT
 0022    REF    1              23,3242    14027 1           STODL   ZPRIME          ZP = UNIT(-XD3 0 XD1) = (ZP1 ZP2 ZP3)
 0023    REF    2  LAST 1246   23,3243    00027 1                   ZPRIME

 0024                          23,3244    77742 0           SR1
 0025    REF   12  LAST 1135   23,3245    14023 0           STODL   SINTH           SIN(IGC) = ZP1
 0026    REF    3  LAST 1246   23,3246    00033 1                   ZPRIME +4
 0027                          23,3247    77742 0           SR1
 0028    REF   11  LAST 1135   23,3250    34021 0           STCALL  COSTH           COS(IGC) = ZP3
 0029    REF    4  LAST  334   23,3251    47303 1                   ARCTRIG

 0030    REF    4  LAST  209   23,3252    16742 1           STODL   IGC             Y GYRO TORQUING ANGLE   FRACTION OF REV.
 0031    REF    8  LAST 1246   23,3253    02667 1                   XDC +2
 0032                          23,3254    77742 0           SR1
 0033    REF   13  LAST 1246   23,3255    14023 0           STODL   SINTH           SIN(MGC) = XD2
 0034    REF    4  LAST 1246   23,3256    00027 1                   ZPRIME

 0035                          23,3257    65205 0           DMP     PDDL
 0036    REF    9  LAST 1246   23,3260    02671 0                   XDC +4          PD00 = (ZP1)(XD3)
 0037    REF    5  LAST 1246   23,3261    00033 1                   ZPRIME +4

 0038                          23,3262    45205 1           DMP     DSU
 0039    REF   10  LAST 1246   23,3263    02665 0                   XDC             MPAC = (ZP3)(XD1)
 0040                          23,3264    77626 0           STADR
 0041    REF   12  LAST 1246   23,3265    43756 1           STCALL  COSTH           COS(MGC) = MPAC - PD00
 0042    REF    5  LAST 1246   23,3266    47303 1                   ARCTRIG
 0043    REF   3  LAST  209   23,3267   26744 1          STOVL  MGC             Z GYRO TORQUING ANGLE   FRACTION OF REV.
 0044    REF   6  LAST 1246   23,3270   00027 1                 ZPRIME
 0045                         23,3271   77641 1          DOT
 0046    REF   4  LAST  928   23,3272   02701 0                 ZDC
 0047    REF  13  LAST 1246   23,3273   24021 1          STOVL  COSTH           COS(OGC) = ZP . ZDC
 0048    REF   7  LAST 1247   23,3274   00027 1                 ZPRIME
 0049                         23,3275   77641 1          DOT
 0050    REF   4  LAST  928   23,3276   02673 1                 YDC
 0051    REF  14  LAST 1246   23,3277   34023 1          STCALL SINTH           SIN(OGC) = ZP . YDC
 0052    REF   6  LAST 1246   23,3300   47303 1                 ARCTRIG

 0053    REF  15  LAST  969   23,3301   36740 1          STCALL OGC             X GYRO TORQUING ANGLE   FRACTION OF REV.
 0054    REF  43  LAST 1246   23,3302   00051 0                 S2
```

```
R0055   ARCTRIG COMPUTES AN ANGLE GIVEN THE SINE AND COSINE OF THIS ANGLE.

R0056   THE INPUTS ARE SIN/4 AND COS/4 STORED DP AT SINTH AND COSTH.

R0057   THE OUTPUT IS THE CALCULATED ANGLE BETWEEN +.5 AND -.5 REVOLUTIONS AND STORED AT THETA. THE OUTPUT IS ALSO
R0059   AVAILABLE AT MPAC.


 0060                      23,3303   51545 1  ARCTRIG  DLOAD  ABS            PUSHDOWN  16D-21D
 0061   REF  15  LAST 1247 23,3304   00023 0                  SINTH
 0062                      23,3305   50025 0           DSU    BMN
 0063   REF   1            23,3306   07517 0                  QTSN45         ABS(SIN/4) - SIN(45)/4
 0064   REF   1            23,3307   47316 0                  TRIG1          IF (-45,45) OR (135,-135)

 0065                      23,3310   72545 0           DLOAD  SL1            (45,135) OR (-135,-45)
 0066   REF  14  LAST 1247 23,3311   00021 1                  COSTH
 0067                      23,3312   75326 1           ACOS   SIGN
 0068   REF  16  LAST 1248 23,3313   00023 0                  SINTH
 0069   REF   6  LAST 1135 23,3314   00025 0           STORE  THETA          X = ARCCOS(COS) WITH SIGN(SIN)
 0070                      23,3315   77616 0           RVQ

 0071                      23,3316   72545 0  TRIG1    DLOAD  SL1            (-45,45) OR (135,-135)
 0072   REF  17  LAST 1248 23,3317   00023 0                  SINTH
 0073                      23,3320   77736 0           ASIN
 0074   REF   7  LAST 1248 23,3321   14025 0           STODL  THETA          X = ARCSIN(SIN) WITH SIGN(SIN)
 0075   REF  15  LAST 1248 23,3322   00021 1                  COSTH
 0076                      23,3323   77640 0           BMN
 0077   REF   1            23,3324   47327 1                  TRIG2          IF (135,-135)

 0078                      23,3325   43545 1           DLOAD  RVQ
 0079   REF   8  LAST 1248 23,3326   00025 0                  THETA          X = ARCSIN(SIN)    (-45,45)

 0080                      23,3327   75345 1  TRIG2    DLOAD  SIGN           (135,-135)
 0081   REF   6  LAST 1144 23,3330   06503 1                  HIDPHALF
 0082   REF  18  LAST 1248 23,3331   00023 0                  SINTH
 0083                      23,3332   77625 0           DSU
 0084   REF   9  LAST 1248 23,3333   00025 0                  THETA
 0085   REF  10  LAST 1248 23,3334   00025 0           STORE  THETA          X = .5 WITH SIGN(SIN) - ARCSIN(SIN)
 0086                      23,3335   77616 0           RVQ                                       (+) - (+) OR (-) - (-)
```

```
R0087       SMNB, NBSM, AND AXISROT, WHICH USED TO APPEAR HERE, HAVE BEEN
R0088   COMBINED IN A ROUTINE CALLED AX*SR*T, WHICH APPEARS AMONG THE POWERED
R0089   FLIGHT SUBROUTINES.
```

```
R0090    CALCGA COMPUTES THE CDU DRIVING ANGLES REQUIRED TO BRING THE STABLE MEMBER INTO THE DESIRED ORIENTATION.

R0092    THE INPUTS ARE  1) THE NAVIGATION BASE COORDINATES REFERRED TO ANY COORDINATE SYSTEM. THE THREE HALF-UNIT
R0094    VECTORS ARE STORED AT XNB,YNB, AND ZNB.  2) THE DESIRED STABLE MEMBER COORDINATES REFERRED TO THE SAME
R0096    COORDINATE SYSTEM ARE STORED AT XSM, YSM, AND ZSM.

R0097    THE OUTPUTS ARE THE THREE CDU DRIVING ANGLES AND ARE STORED SP AT THETAD, THETAD +1, AND THETAD +2.


 0099                         23,3336   77601 0  CALCGA   SETPD                  PUSHDOWN  00-05, 16D-21D, 34D-37D
 0100                         23,3337   00001 0                   0
 0101                         23,3340   47375 0           VLOAD   VXV
 0102    REF   8  LAST  966   23,3341   02665 0                   XNB            XNB = OGA (OUTER GIMBAL AXIS)
 0103    REF   2  LAST  127   23,3342   02651 1                   YSM            YSM = IGA (INNER GIMBAL AXIS)
 0104                         23,3343   41456 0           UNIT    PUSH           PDO = UNIT(OGA X IGA) = MGA

 0105                         23,3344   44041 1           DOT     ITA
 0106    REF   6  LAST  979   23,3345   02701 0                   ZNB
 0107    REF  44  LAST 1247   23,3346   00051 0                   S2
 0108    REF  16  LAST 1248   23,3347   24021 1           STOVL   COSTH          COS(OG) = MGA . ZNB
 0109                         23,3350   00001 0                   0
 0110                         23,3351   77641 1           DOT
 0111    REF   6  LAST  979   23,3352   02673 1                   YNB
 0112    REF  19  LAST 1248   23,3353   34023 1           STCALL  SINTH          SIN(OG) = MGA . YNB
 0113    REF   7  LAST 1247   23,3354   47303 1                   ARCTRIG
 0114    REF  16  LAST 1247   23,3355   26740 0           STOVL   OGC
 0115                         23,3356   00001 0                   0

 0116                         23,3357   50235 0           VXV     DOT            PROVISION FOR MG ANGLE OF 90 DEGREES
 0117    REF   9  LAST 1250   23,3360   02665 0                   XNB
 0118    REF   3  LAST 1250   23,3361   02651 1                   YSM
 0119                         23,3362   77752 1           SL1
 0120    REF  17  LAST 1250   23,3363   24021 1           STOVL   COSTH          COS(MG) = IGA . (MGA X OGA)
 0121    REF   4  LAST 1250   23,3364   02651 1                   YSM
 0122                         23,3365   77641 1           DOT
 0123    REF  10  LAST 1250   23,3366   02665 0                   XNB
 0124    REF  20  LAST 1250   23,3367   34023 1           STCALL  SINTH          SIN(MG) = IGA . OGA
 0125    REF   8  LAST 1250   23,3370   47303 1                   ARCTRIG
 0126    REF   4  LAST 1247   23,3371   02744 1           STORE   MGC

 0127                         23,3372   45246 0           ABS     DSU
 0128    REF   1              23,3373   07521 0                   .166...
 0129                         23,3374   77644 1           BPL
 0130    REF   1              23,3375   47414 0                   GIMLOCK1       IF ANGLE GREATER THAN 60 DEGREES

 0131                         23,3376   50375 0  CALCGA1  VLOAD   DOT
 0132    REF   2  LAST  127   23,3377   02657 1                   ZSM
 0133                         23,3400   00001 0                   0
 0134    REF  18  LAST 1250   23,3401   24021 1           STOVL   COSTH          COS(IG) = ZSM . MGA
 0135    REF  24  LAST 1246   23,3402   02643 1                   XSM
 0136                              23,3403    45441 1                  DOT     STADR
 0137     REF   21  LAST 1250      23,3404    43754 0                  STCALL  SINTH            SIN(IG) = XSM . MGA
 0138     REF    9  LAST 1250      23,3405    47303 1                          ARCTRIG

 0139     REF    5  LAST 1246      23,3406    26742 1                  STOVL   IGC
 0140     REF   17  LAST 1250      23,3407    02740 0                          OGC
 0141                              23,3410    77634 0                  RTB
 01415    REF    4  LAST  498      23,3411    21630 1                          V1STO2S
 0143     REF   24  LAST  966      23,3412    34322 0                  STCALL  THETAD
 0144     REF   45  LAST 1250      23,3413    00051 0                          S2

 0145                              23,3414    77776 1       GIMLOCK1   EXIT
 0146     REF   42  LAST 1241      23,3415  0 5571 1                   TC      ALARM
 0147                              23,3416    00401 1                  OCT     00401
 0148     REF   74  LAST 1240      23,3417  0 5506 1                   TC      UPFLAG           GIMBAL LOCK HAS OCCURED
 0149     REF    3  LAST  386      23,3420    00056 1                  ADRES   GLOKFAIL

 0150     REF  232  LAST 1241      23,3421  0 6060 1                   TC      INTPRET
 0151                              23,3422    77650 1                  GOTO
 0152     REF    1                 23,3423    47376 0                          CALCGA1
```

```
R0153    AXISGEN COMPUTES THE COORDINATES OF ONE COORDINATE SYSTEM REFERRED TO ANOTHER COORDINATE SYSTEM.

R0155    THE INPUTS ARE  1) THE STAR1 VECTOR REFERRED TO COORDINATE SYSTEM A STORED AT STARAD.  2) THE STAR2 VECTOR
R0157    REFERRED TO COORDINATE SYSTEM A STORED AT STARAD +6.   3) THE STAR1 VECTOR REFERRED TO COORDINATE SYSTEM B STORED
R0159    AT LOCATION 6 OF THE VAC AREA.  4) THE STAR2 VECTOR REFERRED TO COORDINATE SYSTEM B STORED AT LOCATION 12D OF
R0161    THE VAC AREA.

R0162    THE OUTPUT DEFINES COORDINATE SYSTEM A REFERRED TO COORDINATE SYSTEM B. THE THREE HALF-UNIT VECTORS ARE STORED
R0164    AT LOCATIONS XDC, XDC +6, XDC +12D, AND STARAD, STARAD +6, STARAD +12D.


 0165                          23,3424   66370 0  AXISGEN   AXT,1  SSP               PUSHDOWN  00-30D,34D-37D
 0166    REF  26  LAST  969    23,3425   02714 1                   STARAD +6
 0167    REF  29  LAST 1233    23,3426   00051 0                   S1
 0168    REF  27  LAST 1252    23,3427   02700 1                   STARAD -6

 0169                          23,3430   77601 0            SETPD
 0170                          23,3431   00001 0                   0
 0171                          23,3432   46773 0  AXISGEN1  VLOAD* VXV*              06D   UA = S1
 0172    REF  28  LAST 1252    23,3433   02723 0                   STARAD +12D,1              STARAD +00D   UB = S1
 0173    REF  29  LAST 1252    23,3434   02731 0                   STARAD +18D,1
 0174                          23,3435   77656 1            UNIT                      12D   VA = UNIT(S1 X S2)
 0175    REF  30  LAST 1252    23,3436   06731 1            STORE  STARAD +18D,1              STARAD +06D   VB = UNIT(S1 X S2)
 0176                          23,3437   77773 1            VLOAD*
 0177    REF  31  LAST 1252    23,3440   02723 0                   STARAD +12D,1

 0178                          23,3441   76433 1            VXV*   VSL1
 0179    REF  32  LAST 1252    23,3442   02731 0                   STARAD +18D,1     18D   WA = UA X VA
 0180    REF  33  LAST 1252    23,3443   06737 1            STORE  STARAD +24D,1              STARAD +12D   WB = UB X VB

 0181                          23,3444   77700 0            TIX,1
 0182    REF   1               23,3445   47432 1                   AXISGEN1

 0183                          23,3446   66160 0            AXC,1  SXA,1
 0184                          23,3447   00006 1                   6
 0185                          23,3450   00036 1                   30D

 0186                          23,3451   66370 0            AXT,1  SSP
 0187                          23,3452   00022 1                   18D
 0188    REF  30  LAST 1252    23,3453   00051 0                   S1
 0189                          23,3454   00006 1                   6

 0190                          23,3455   66374 1            AXT,2  SSP
 0191                          23,3456   00006 1                   6
 0192    REF  46  LAST 1251    23,3457   00052 0                   S2
 0193                          23,3460   00002 0                   2

 0194                          23,3461   76720 0  AXISGEN2  XCHX,1 VLOAD*
 0195                          23,3462   00036 1                   30D               X1=-6  X2=+6    X1=-6  X2=+4    X1=-6  X2=+2
 0196                          23,3463   00001 0                   0,1
 0197                              23,3464   62757 0              VXSC*   PDVL*              J=(UA)(UB1)    J=(UA)(UB2)    J=(UA)(UB3)
 0198     REF  34   LAST 1252      23,3465   75062 1                      STARAD +6,2
 0199                              23,3466   00007 0                      6,1
 0200                              23,3467   77757 1              VXSC*
 0201     REF  35   LAST 1253      23,3470   75054 1                      STARAD +12D,2
 0202                              23,3471   30031 0              STOVL*  24D                K=(VA)(VB1)    J=(VA)(VB2)    J=(VA)(VB3)
 0203                              23,3472   00015 0                      12D,1

 0204                              23,3473   53357 0              VXSC*   VAD
 0205     REF  36   LAST 1253      23,3474   75046 1                      STARAD +18D,2      L=(WA)(WB1)    J=(WA)(WB2)    J=(WA)(WB3)
 0206                              23,3475   76455 1              VAD     VSL1
 0207                              23,3476   00031 0                      24D
 0208                              23,3477   53520 0              XCHX,1  UNIT
 0209                              23,3500   00036 1                      30D
 0210     REF  11   LAST 1246      23,3501   06707 1              STORE   XDC +18D,1         XDC = L+J+K    YDC = L+J+K    ZDC = L+J+K

 0211                              23,3502   77700 0              TIX,1
 0212     REF   1                  23,3503   47504 0                      AXISGEN3

 0213                              23,3504   77704 1    AXISGEN3  TIX,2
 0214     REF   1                  23,3505   47461 1                      AXISGEN2

 0215                              23,3506   77775 1              VLOAD
 0216     REF  12   LAST 1253      23,3507   02665 0                      XDC
 0217     REF  37   LAST 1253      23,3510   26707 0              STOVL   STARAD
 0218     REF   5   LAST 1247      23,3511   02673 1                      YDC
 0219     REF  38   LAST 1253      23,3512   26715 0              STOVL   STARAD +6
 0220     REF   5   LAST 1247      23,3513   02701 0                      ZDC
 0221     REF  39   LAST 1253      23,3514   02723 0              STORE   STARAD +12D

 0222                              23,3515   77616 0              RVQ
 0281                          23,3516   05520 0  QTSN45    2DEC    .1768
 0281                          23,3517   26075 1
 0282                          23,3520   05252 1  .166...   2DEC    .1666666667
 0282                          23,3521   25253 1
```

```
 0001                         14,3754                  BANK    14              SAME FBANK AS THE FINDCDUD SUB-PROGRAM
 0002    REF    1             23,2000                  SETLOC POWFLITE
 0003                         23,3522                  BANK

 0004    REF    1                0142                  EBANK= DEXDEX
 0005    REF    1                                      COUNT* $$/POWFL

R0006        CDUTRIG, CDUTRIG1, CDUTRIG2, AND CD*TR*GS ALL COMPUTE THE SINES AND
R0007    COSINES OF THREE 2'S COMPLEMENT ANGLES AND PLACE THE RESULT, DOUBLE
R0008    PRECISION, IN THE SAME ORDER AS THE INPUTS, AT SINCDU AND COSCDU.   AN
R0009    ADDITIONAL OUTPUT IS THE 1'S COMPLEMENT ANGLES AT CDUSPOT.   THESE
R0010    ROUTINES GO OUT OF THEIR WAY TO LEAVE THE MPAC AREA AS THEY FIND IT,
R0011    EXCEPT FOR THE GENERALLY UNIMPORTANT MPAC +2.   THEY DIFFER ONLY IN
R0012    WHERE THEY GET THE ANGLES, AND IN METHOD OF CALLING.

R0013        CDUTRIG (AND CDUTRIG1, WHICH CAN BE CALLED IN BASIC) COMPUTE THE
R0014    SINES AND COSINES FROM THE CURRENT CONTENTS OF THE CDU REGISTERS.
R0015    THE CONTENTS OF CDUTEMP, ETC., ARE NOT TOUCHED SO THAT THEY MAY
R0016    CONTINUE TO FORM A CONSISTENT SET WITH THE LATEST PIPA READINGS.

R0017        CDUTRIG1 IS LIKE CDUTRIG EXCEPT THAT IT CAN BE CALLED IN BASIC.

R0018        CD*TR*GS FINDS CDU VALUES IN CDUSPOT RATHER THAN IN CDUTEMP.   THIS
R0019    ALLOWS USERS TO MAKE TRANSFORMATIONS USING ARBITRARY ANGLES, OR REAL
R0020    ANGLES IN AN ORDER OTHER THAN X Y Z.   A CALL TO THIS ROUTINE IS
R0021    NECESSARY IN PREPARATION FOR A CALL TO AX*SR*T IN EITHER OF ITS TWO
R0022    MODES (SMNB OR NBSM).   SINCE AX*SR*T EXPECTS TO FIND THE SINES AND
R0023    COSINES IN THE ORDER Y Z X THE ANGLES MUST HAVE BEEN PLACED IN CDUSPOT
R0024    IN THIS ORDER.   CD*TR*GS NEED NOT BE REPEATED WHEN AX*SR*T IS CALLED
R0025    MORE THAN ONCE, PROVIDED THE ANGLES HAVE NOT CHANGED.   NOTE THAT SINCE
R0026    IT CLOBBERS BUF2 (IN THE SINE AND COSINE ROUTINES) CD*TR*GS CANNOT BE
R0027    CALLED USING BANKCALL.   SORRY.

R0028        CD*TR*G IS LIKE CD*TR*GS EXCEPT THAT IT CAN BE CALLED IN
R0029    INTERPRETIVE.

 0030                         23,3522    77776 1  CDUTRIG  EXIT
 0031    REF    1             23,3523   0 3532 0           TC      CDUTRIGS
 0032    REF 233   LAST 1251  23,3524   0 6060 1           TC      INTPRET
 0033                         23,3525    77616 0           RVQ

 0034                         23,3526    77776 1  CD*TR*G  EXIT
 0035    REF    1             23,3527   0 3540 0           TC      CD*TR*GS
 0036    REF 234   LAST 1256  23,3530   0 6060 1           TC      INTPRET
 0037                         23,3531    77616 0           RVQ

 0038    REF  16   LAST  945  23,3532   3 0032 0  CDUTRIGS CA      CDUX
 0039    REF  18   LAST  966  23,3533  54  771 1           TS      CDUSPOT  +4
 0040    REF  10   LAST  945  23,3534   3 0033 1           CA      CDUY
 0041    REF  19   LAST 1256  23,3535  54  765 1           TS      CDUSPOT
 0042   REF  13  LAST  945   23,3536  3 0034 0              CA      CDUZ
 0043   REF  20  LAST 1256   23,3537  54 767 0              TS      CDUSPOT +2

 0044                        23,3540  0 0006 1  CD*TR*GS EXTEND
 0045   REF  28  LAST  919   23,3541  22 142 0              QXCH    TEM2
 0046   REF  25  LAST 1075   23,3542  3 4742 1              CAF     FOUR
 0047   REF  18  LAST 1045   23,3543  7 6263 1  TR*GL**P MASK    SIX                 MAKE IT EVEN AND SMALLER
 0048   REF  13  LAST  919   23,3544  54 143 0              TS      TEM3
 0049   REF  14  LAST 1257   23,3545  50 143 1              INDEX   TEM3
 0050   REF  21  LAST 1257   23,3546  3 0765 0              CA      CDUSPOT
 0051   REF 734  LAST 1235   23,3547  52 155 1              DXCH    MPAC                STORING 2'S COMP ANGLE, LOADING MPAC
 0052   REF  56  LAST 1071   23,3550  52 127 1              DXCH    VBUF +4             STORING MPAC FOR LATER RESTORATION
 0053   REF   4  LAST  826   23,3551  0 4704 0              TC      USPRCADR
 0054   REF  15  LAST  590   23,3552   21606 1              CADR    CDULOGIC
 0055                        23,3553  0 0006 1              EXTEND
 0056   REF 735  LAST 1257   23,3554  3 0155 0              DCA     MPAC
 0057   REF  15  LAST 1257   23,3555  50 143 1              INDEX   TEM3
 0058   REF  22  LAST 1257   23,3556  52 766 1              DXCH    CDUSPOT             STORING 1'S COMPLEMENT ANGLE
 0059   REF   5  LAST 1257   23,3557  0 4704 0              TC      USPRCADR
 0060   REF   2  LAST 1011   23,3560   01517 0              CADR    COSINE
 0061   REF 736  LAST 1257   23,3561  52 155 1              DXCH    MPAC
 0062   REF  16  LAST 1257   23,3562  50 143 1              INDEX   TEM3
 0063   REF   4  LAST  103   23,3563  52 744 1              DXCH    COSCDU              STORING COSINE
 0064                        23,3564  0 0006 1              EXTEND
 0065   REF  17  LAST 1257   23,3565  5 0143 1              INDEX   TEM3
 0066   REF  23  LAST 1257   23,3566  3 0766 0              DCA     CDUSPOT             LOADING 1'S COMPLEMENT ANGLE
 0067   REF   6  LAST 1257   23,3567  0 4704 0              TC      USPRCADR
 0068   REF   2  LAST 1011   23,3570   01531 1              CADR    SINE +1             SINE +1 EXPECTS ARGUMENT IN A AND L
 0069   REF  57  LAST 1257   23,3571  52 127 1              DXCH    VBUF +4             BRINGING UP PRIOR MPAC TO BE RESTORED
 0070   REF 737  LAST 1257   23,3572  52 155 1              DXCH    MPAC
 0071   REF  18  LAST 1257   23,3573  50 143 1              INDEX   TEM3
 0072   REF   4  LAST  103   23,3574  52 736 1              DXCH    SINCDU
 0073   REF  19  LAST 1257   23,3575  10 143 0              CCS     TEM3
 0074   REF   1              23,3576  1 3543 1              TCF     TR*GL**P
 0075   REF  29  LAST 1257   23,3577  0 0142 0              TC      TEM2
```

```
L       POWERED FLIGHT SUBROUTINES                                                  USER'S PAGE NO.   3       EO S3

P0076   ****************************************************************************************************

R0078       QUICTRIG, INTENDED FOR GUIDANCE CYCLE USE WHERE TIME IS CRITICAL, IS A MUCH FASTER VERSION OF CD*TR*GS.
R0080   QUICTRIG COMPUTES AND STORES THE SINES AND COSINES OF THE 2'S COMPLEMENT ANGLES AT CDUSPOT, CDUSPOT +2,
R0082   AND CDUSPOT +4.   UNLIKE CD*TR*GS, QUICTRIG DOES NOT LEAVE THE 1'S COMPLEMENT VERSIONS OF THE ANGLES IN
R0084   CDUSPOT.   QUICTRIG'S EXECUTION TIME IS 4.1 MS;   THIS IS 10 TIMES AS FAST AS CD*TR*GS.   QUICTRIG MAY BE
R0086   CALLED FROM INTERPRETIVE AS AN RTB OP-CODE, OR FROM BASIC VIA BANKCALL OR IBNKCALL.

 00891                        23,3600  0 0004 0  QTPROLOG INHINT
 00892  REF  17  LAST 1256    23,3601  3 0032 0           CA     CDUX
 00893  REF   4  LAST  908    23,3602  54 771 1           TS     CDUSPOTX
 00894  REF  11  LAST 1256    23,3603  3 0033 1           CA     CDUY
 00895  REF   4  LAST  908    23,3604  54 765 1           TS     CDUSPOTY
 00896  REF  14  LAST 1257    23,3605  3 0034 0           CA     CDUZ
 00897  REF   4  LAST  908    23,3606  54 767 0           TS     CDUSPOTZ

 0090                         23,3607  0 0004 0  QUICTRIG INHINT                       INHINT SINCE DAP USES THE SAME TEMPS
 00901                        23,3610  0 0006 1           EXTEND
 00902  REF  36  LAST  904    23,3611  22 061 0           QXCH   ITEMP1
 0091   REF  26  LAST 1257    23,3612  3 4742 1           CAF    FOUR
 0092   REF  19  LAST 1257    23,3613  7 6263 1     +4    MASK   SIX
 0093   REF  18  LAST  902    23,3614  54 062 1           TS     ITEMP2
 0094   REF  19  LAST 1258    23,3615  50 062 0           INDEX  ITEMP2
 0095   REF  24  LAST 1257    23,3616  3 0765 0           CA     CDUSPOT
 0096   REF   3  LAST  199    23,3617  0 5024 1           TC     SPSIN
 0097                         23,3620  0 0006 1           EXTEND
 0098   REF  68  LAST 1130    23,3621  7 4727 0           MP     BIT14                 SCALE DOWN TO MATCH INTERPRETER OUTPUTS
 0099   REF  20  LAST 1258    23,3622  50 062 0           INDEX  ITEMP2
 0100   REF   5  LAST 1257    23,3623  52 736 1           DXCH   SINCDU
 0101   REF  21  LAST 1258    23,3624  50 062 0           INDEX  ITEMP2
 0102   REF  25  LAST 1258    23,3625  3 0765 0           CA     CDUSPOT
 0103   REF   3  LAST  200    23,3626  0 5023 0           TC     SPCOS
 0104                         23,3627  0 0006 1           EXTEND
 0105   REF  69  LAST 1258    23,3630  7 4727 0           MP     BIT14
 0106   REF  22  LAST 1258    23,3631  50 062 0           INDEX  ITEMP2
 0107   REF   5  LAST 1257    23,3632  52 744 1           DXCH   COSCDU
 0108   REF  23  LAST 1258    23,3633  10 062 1           CCS    ITEMP2
 0109   REF   3  LAST  909    23,3634  1 3613 1           TCF    QUICTRIG +4
 01091  REF  37  LAST 1258    23,3635  3 0061 0           CA     ITEMP1
 0110                         23,3636  0 0003 1           RELINT
 01101  REF 366  LAST 1217    23,3637  0 0000 1           TC     A
```

```
R0111   ***************************************************************************************************************

R0113       THESE INTERFACE ROUTINES MAKE IT POSSIBLE TO CALL AX*SR*T, ETC., IN
R0114   INTERPRETIVE.   LATER, WHERE POSSIBLE, THEY WILL BE ELIMINATED.

R0127       THESE INTERFACE ROUTINES ARE PERMANENT.   ALL RESTORE USER'S EBANK
R0128   SETTING.   ALL ARE STRICT INTERPRETIVE SUBROUTINES, CALLED USING "CALL",
R0129   RETURNING VIA QPRET.   ALL EXPECT AND RETURN THE VECTOR TO BE TRANSFOR-
R0130   MED INTERPRETER-STYLE IN MPAC; COMPONENTS AT MPAC, MPAC +3, AND MPAC +5.

R0131       TRG*SMNB AND TRG*NBSM BOTH EXPECT TO SEE THE 2'S COMPLEMENT ANGLES
R0132   AT CDUSPOT (ORDER Y Z X, AT CDUSPOT, CDUSPOT +2, AND CDUSPOT +4; ODD
R0133   LOCATIONS NEED NOT BE ZEROED).   TRG*NBSM DOES THE NB TO SM TRANSFOR-
R0134   MATION;  TRG*SMNB, VICE VERSA.

R0135       CDU*NBSM DOES ITS TRANSFORMATION USING THE PRESENT CONTENTS OF
R0136   THE CDU COUNTERS.   OTHERWISE IT IS LIKE TRG*NBSM.

R01361      CDU*SMNB IS THE COMPLEMENT OF CDU*NBSM.

 01362                             23,3640   77776 1  CDU*SMNB EXIT
 01363  REF   2  LAST 1256         23,3641  0 3532 0           TC      CDUTRIGS
 01364  REF   1                    23,3642  1 3645 1           TCF     C*MM*N1

 0137                              23,3643   77776 1  TRG*SMNB EXIT
 0138   REF   2  LAST 1256         23,3644  0 3540 0           TC      CD*TR*GS
 0139   REF   3  LAST 1068         23,3645  0 7553 0  C*MM*N1  TC      MPACVBUF           AX*SR*T EXPECTS VECTOR IN VBUF
 0140   REF  32  LAST 1097         23,3646  4 6266 1           CS      THREE              SIGNAL FOR SM TO NB TRANSFORMATION
 0141   REF   1                    23,3647  0 3667 0  C*MM*N2  TC      AX*SR*T
 0142   REF 235  LAST 1256         23,3650  0 6060 1           TC      INTPRET
 0143                              23,3651   43575 1           VLOAD   RVQ
 0144   REF  58  LAST 1257         23,3652   00123 1                   VBUF

 0145                              23,3653   77776 1  CDU*NBSM EXIT
 0146   REF   3  LAST 1259         23,3654  0 3532 0           TC      CDUTRIGS
 0147   REF   1                    23,3655  1 3660 0           TCF     C*MM*N3

 0148                              23,3656   77776 1  TRG*NBSM EXIT
 0149   REF   3  LAST 1259         23,3657  0 3540 0           TC      CD*TR*GS
 0150   REF   4  LAST 1259         23,3660  0 7553 0  C*MM*N3  TC      MPACVBUF           FOR AX*SR*T
 0151   REF  33  LAST 1259         23,3661  3 6266 0           CA      THREE              SIGNAL FOR NB TO SM TRANSFORMATION
 0152   REF   1                    23,3662  1 3647 0           TCF     C*MM*N2

R0153       *NBSM* AND *SMNB* EXPECT TO SEE THE SINES AND COSINES (AT SINCDU
R0154   AND COSCDU) RATHER THAN THE ANGLES THEMSELVES.   OTHERWISE THEY ARE
R0155   LIKE TRG*NBSM AND TRG*SMNB.

R0156       NOTE THAT JUST AS CD*TR*GS NEED BE CALLED ONLY ONCE FOR EACH SERIES
R0157   OF TRANSFORMATIONS USING THE SAME ANGLES, SO TOO ONLY ONE OF TRG*NBSM
```

```
R0158   AND TRG*SMNB NEED BE CALLED FOR EACH SERIES.   FOR SUBSEQUENT TRANSFOR-
R0159   MATIONS USE *NBSM* AND *SMNB*.

 0160                         23,3663   77776 1  *SMNB*    EXIT
 0161   REF   2  LAST 1259    23,3664   1 3645 1           TCF     C*MM*N1

 0162                         23,3665   77776 1  *NBSM*    EXIT
 0163   REF   2  LAST 1259    23,3666   1 3660 0           TCF     C*MM*N3

R0164          AX*SR*T COMBINES THE OLD SMNB AND NBSM.   FOR THE NB TO SM
R0165   TRANSFORMATION, ENTER WITH +3 IN A.   FOR SM TO NB, ENTER WITH -3.
R0166   THE VECTOR TO BE TRANSFORMED ARRIVES, AND IS RETURNED, IN VBUF.
R0167   AX*SR*T EXPECTS TO FIND THE SINES AND COSINES OF THE ANGLES OF ROTATION
R0168   AT SINCDU AND COSCDU, IN THE ORDER Y Z X.   A CALL TO CD*TR*GS, WITH
R0169   THE 2'S COMPLEMENT ANGLES (ORDER Y Z X) AT CDUSPOT, WILL TAKE CARE OF
R0170   THIS.   HERE IS A SAMPLE CALLING SEQUENCE:-

R0171                                    TC      CDUTRIGS
R0172                                    CS      THREE         ("CA  THREE" FOR NBSM)
R0173                                    TC      AX*SR*T

R0174   THE CALL TO CD*TR*GS NEED NOT BE REPEATED, WHEN AX*SR*T IS CALLED MORE
R0175   THAN ONCE, UNLESS THE ANGLES HAVE CHANGED.

R0176        AX*SR*T IS GUARANTEED SAFE ONLY FOR VECTORS OF MAGNITUDE LESS THAN
R0177   UNITY.   A LOOK AT THE CASE IN WHICH A VECTOR OF GREATER MAGNITUDE
R0178   HAPPENS TO LIE ALONG AN AXIS OF THE SYSTEM TO WHICH IT IS TO BE TRANS-
R0179   FORMED CONVINCES ONE THAT THIS IS A RESTRICTION WHICH MUST BE ACCEPTED.

 0180   REF   2  LAST 1256    23,3667  54 142 1  AX*SR*T   TS      DEXDEX          WHERE IT BECOMES THE INDEX OF INDEXES
 0181                         23,3670  0 0006 1            EXTEND
 0182   REF   1               23,3671  22 145 1            QXCH    RTNSAVER

 0183   REF   3  LAST 1260    23,3672  10 142 1  R*TL**P   CCS     DEXDEX                    +3 --> 0      -3 --> 2
 0184   REF   4  LAST 1260    23,3673  4 0142 1            CS      DEXDEX          THUS:     +2 --> 1      -2 --> 1
 0185   REF  34  LAST 1259    23,3674  6 6266 0            AD      THREE                     +1 --> 2      -1 --> 0
 0186                         23,3675  0 0006 1            EXTEND
 0187   REF 367  LAST 1258    23,3676  5 0000 1            INDEX   A
 0188   REF   1               23,3677  3 3756 0            DCA     INDEXI
 0189   REF   1               23,3700  52 144 1            DXCH    DEXI

 0190   REF 113  LAST 1181    23,3701  3 4744 1            CA      ONE
 0191   REF 159  LAST 1113    23,3702  54 130 1            TS      BUF
 0192                         23,3703  0 0006 1            EXTEND
 0193   REF   2  LAST  100    23,3704  5 0143 1            INDEX   DEX1
 0194   REF  59  LAST 1259    23,3705  4 0123 0            DCS     VBUF
 0195   REF   1               23,3706  1 3710 0            TCF     LOOP1             REALLY BE A SUBTRACT, AND VICE VERSA

 0196   REF 160  LAST 1260    23,3707  52 131 0  LOOP2     DXCH    BUF             LOADING VECTOR COMPONENT, STORING INDEX
```

```
0197    REF 738   LAST 1257    23,3710   52 155 1   LOOP1     DXCH     MPAC
0198    REF   1                23,3711   3 3754 1             CA       SINESLOC
0199    REF   3   LAST 1260    23,3712   6 0143 1             AD       DEX1
0200    REF  81   LAST 1074    23,3713   54 116 0             TS       ADDRWD

0201    REF  21   LAST 1083    23,3714   0 7130 1             TC       DMPSUB          MULTIPLY BY SIN(CDUANGLE)
0202    REF   5   LAST 1260    23,3715   10 142 1             CCS      DEXDEX
0203    REF 739   LAST 1261    23,3716   52 155 1             DXCH     MPAC            NBSM CASE
0204                           23,3717   1 3722 1             TCF      +3
0205                           23,3720   0 0006 1             EXTEND                   SMNB CASE
0206    REF 740   LAST 1261    23,3721   4 0155 1             DCS      MPAC
0207    REF   1                23,3722   52 160 1             DXCH     TERM1TMP

0208    REF  20   LAST 1258    23,3723   3 6263 0             CA       SIX             SINCDU AND COSCDU (EACH 6 WORDS) MUST
0209    REF  82   LAST 1261    23,3724   26 116 0             ADS      ADDRWD            BE CONSECUTIVE AND IN THAT ORDER

0210                           23,3725   0 0006 1             EXTEND
0211    REF 161   LAST 1260    23,3726   5 0130 0             INDEX    BUF
0212    REF   4   LAST 1261    23,3727   5 0143 1             INDEX    DEX1
0213    REF  60   LAST 1260    23,3730   3 0123 1             DCA      VBUF
0214    REF 741   LAST 1261    23,3731   52 155 1             DXCH     MPAC
0215    REF  22   LAST 1261    23,3732   0 7130 1             TC       DMPSUB          MULTIPLY BY COS(CDUANGLE)
0216    REF 742   LAST 1261    23,3733   52 155 1             DXCH     MPAC
0217    REF   2   LAST 1261    23,3734   20 160 1             DAS      TERM1TMP
0218    REF   3   LAST 1261    23,3735   52 160 1             DXCH     TERM1TMP
0219                           23,3736   20 001 1             DDOUBL
0220    REF 162   LAST 1261    23,3737   50 130 0             INDEX    BUF
0221    REF   5   LAST 1261    23,3740   50 143 1             INDEX    DEX1
0222    REF  61   LAST 1261    23,3741   52 123 0             DXCH     VBUF
0223    REF 163   LAST 1261    23,3742   52 131 0             DXCH     BUF             LOADING INDEX, STORING VECTOR COMPONENT

0224    REF 368   LAST 1260    23,3743   10 000 0             CCS      A               'CAUSE THAT'S WHERE THE INDEX NOW IS
0225    REF   1                23,3744   1 3707 0             TCF      LOOP2

0226                           23,3745   0 0006 1             EXTEND
0227    REF   6   LAST 1261    23,3746   26 142 1             DIM      DEXDEX          DECREMENT MAGNITUDE PRESERVING SIGN

0228    REF   7   LAST 1261    23,3747   10 142 1   TSTPOINT  CCS      DEXDEX          ONLY THE BRANCHING FUNCTION IS USED
0229    REF   1                23,3750   1 3672 0             TCF      R*TL**P
0230    REF   2   LAST 1260    23,3751   0 0145 1             TC       RTNSAVER
0231    REF   2   LAST 1261    23,3752   1 3672 0             TCF      R*TL**P
0232    REF   3   LAST 1261    23,3753   0 0145 1             TC       RTNSAVER


0233    REF   6   LAST 1258    23,3754    00735 0   SINESLOC  ADRES    SINCDU          FOR USE IN SETTING ADDRWD


0234                           23,3755    00004 0   INDEXI    DEC      4               **********     DON'T     **********
0235                           23,3756    00002 0             DEC      2               **********     TOUCH     **********
0236                           23,3757    00000 1             DEC      0               **********     THESE     **********
```

```
 0237                           23,3760   00004 0         DEC     4                ********** CONSTANTS *********

R0238   *******************************************************************************************************************

 0240                           10,2030                   BANK    10
 0241   REF   1                 10,2000                   SETLOC  FLESHLOC
 0242                           10,2030                   BANK
 0243   REF   1                                           COUNT*  $$/POWFL

R0244       ROUTINE FLESHPOT COMPUTES THE BODY-STABLE MEMBER TRANSFORMATION MATRIX (COMMONLY CALLED XNB) AND STORES
R0246   IT IN THE LOCATIONS SPECIFIED BY THE ECADR ENTERING IN A.

 0247                           10,2030   77776 1  CALCSMSC EXIT
 0248   REF 295  LAST  975      10,2031  0 4607 1           TC      BANKCALL
 02481  REF   2  LAST  865      10,2032   20036 0           CADR    FLESHPOT -1
 02482  REF 236  LAST 1259      10,2033  0 6060 1           TC      INTPRET
 02483                          10,2034   77616 0           RVQ

 0249   REF  11  LAST 1250      10,2035   02664 1  XNBECADR ECADR   XNB

 0250   REF   1                 10,2036  3 2035 0     -1    CAF     XNBECADR

 0251   REF  30  LAST 1257      10,2037  54 142 1  FLESHPOT TS      TEM2
 0252   REF  70  LAST 1087      10,2040  56 003 1           XCH     EBANK
 0253   REF  31  LAST 1262      10,2041  56 142 0           XCH     TEM2
 0254   REF  15  LAST 1087      10,2042  7 4350 1           MASK    LOW8
 0255   REF   8  LAST 1097      10,2043  6 5000 1           AD      OCT1400
 0256   REF  23  LAST 1068      10,2044  54 141 1           TS      TEM1

 0257                           10,2045  0 0006 1           EXTEND
 0258   REF   3  LAST  493      10,2046  3 0744 0           DCA     COSCDUY
 0259   REF 743  LAST 1261      10,2047  52 155 1           DXCH    MPAC
 0260   REF  19  LAST  864      10,2050  0 7124 1           TC      DMP
 0261   REF   7  LAST  914      10,2051   00745 1           ADRES   COSCDUZ
 0262   REF 744  LAST 1262      10,2052  52 155 1           DXCH    MPAC
 0263                           10,2053  20 001 1           DDOUBL
 0264   REF  24  LAST 1262      10,2054  50 141 0           INDEX   TEM1
 0265                           10,2055  52 001 1           DXCH    0                 = COSY COSZ

 0266                           10,2056  0 0006 1           EXTEND
 0267   REF   6  LAST  914      10,2057  3 0740 1           DCA     SINCDUZ
 0268   REF  25  LAST 1262      10,2060  50 141 0           INDEX   TEM1
 0269                           10,2061  52 003 0           DXCH    2                 = SINZ

 0270                           10,2062  0 0006 1           EXTEND
 0271   REF   3  LAST  493      10,2063  4 0736 1           DCS     SINCDUY
 0272   REF 745  LAST 1262      10,2064  52 155 1           DXCH    MPAC
 0273   REF  23  LAST 1261      10,2065  0 7130 1           TC      DMPSUB            ADDRWD SET TO COSCDUZ
 0274   REF 746  LAST 1262   10,2066  52 155 1         DXCH    MPAC
 0275                        10,2067  20 001 1         DDOUBL
 0276   REF  26  LAST 1262   10,2070  50 141 0         INDEX   TEM1
 0277                        10,2071  52 005 0         DXCH    4                    = - SINY COSZ

 0278                        10,2072  0 0006 1         EXTEND
 0279   REF   5  LAST  914   10,2073  4 0742 1         DCS     SINCDUX
 0280   REF 747  LAST 1263   10,2074  52 155 1         DXCH    MPAC
 0281   REF  24  LAST 1262   10,2075  0 7130 1         TC      DMPSUB               ADDRWD SET TO COSCDUZ STILL
 0282   REF 748  LAST 1263   10,2076  52 155 1         DXCH    MPAC
 0283                        10,2077  20 001 1         DDOUBL
 0284   REF 749  LAST 1263   10,2100  52 160 1         DXCH    MPAC     +3

 0285                        10,2101  0 0006 1         EXTEND
 0286   REF   6  LAST 1263   10,2102  4 0742 1         DCS     SINCDUX
 0287   REF 750  LAST 1263   10,2103  52 155 1         DXCH    MPAC
 0288   REF  20  LAST 1262   10,2104  0 7124 1         TC      DMP
 0289   REF   7  LAST 1262   10,2105   00737 1         ADRES   SINCDUZ
 0290                        10,2106  0 0006 1         EXTEND
 0291   REF 751  LAST 1263   10,2107  4 0155 1         DCS     MPAC
 0292   REF 752  LAST 1263   10,2110  52 162 0         DXCH    MPAC     +5
 0293   REF  21  LAST 1263   10,2111  0 7124 1         TC      DMP
 0294   REF   4  LAST 1262   10,2112   00735 0         ADRES   SINCDUY
 0295   REF 753  LAST 1263   10,2113  52 155 1         DXCH    MPAC
 0296                        10,2114  20 001 1         DDOUBL
 0297                        10,2115  20 001 1         DDOUBL
 0298   REF 754  LAST 1263   10,2116  52 162 0         DXCH    MPAC     +5

 0299   REF 755  LAST 1263   10,2117  52 155 1         DXCH    MPAC
 0300   REF  22  LAST 1263   10,2120  0 7124 1         TC      DMP
 0301   REF   4  LAST 1262   10,2121   00743 1         ADRES   COSCDUY
 0302   REF 756  LAST 1263   10,2122  52 155 1         DXCH    MPAC
 0303                        10,2123  20 001 1         DDOUBL
 0304                        10,2124  20 001 1         DDOUBL
 0305   REF 164  LAST 1261   10,2125  52 131 0         DXCH    BUF

 0306                        10,2126  0 0006 1         EXTEND
 0307   REF   5  LAST 1263   10,2127  3 0744 0         DCA     COSCDUY
 0308   REF 757  LAST 1263   10,2130  52 155 1         DXCH    MPAC
 0309   REF  23  LAST 1263   10,2131  0 7124 1         TC      DMP
 0310   REF   6  LAST  914   10,2132   00747 0         ADRES   COSCDUX
 0311   REF 758  LAST 1263   10,2133  52 155 1         DXCH    MPAC
 0312                        10,2134  20 001 1         DDOUBL
 0313   REF 759  LAST 1263   10,2135  20 162 0         DAS     MPAC     +5

 0314                        10,2136  0 0006 1         EXTEND
 0315   REF   5  LAST 1263   10,2137  3 0736 0         DCA     SINCDUY
 0316   REF 760  LAST 1263   10,2140  52 155 1         DXCH    MPAC
 0317   REF  25  LAST 1263   10,2141  0 7130 1         TC      DMPSUB               ADDRWD SET TO COSCDUX
 0318   REF 761  LAST 1263   10,2142  52 155 1         DXCH    MPAC
 0319                          10,2143  20 001 1       DDOUBL
 0320   REF 165   LAST 1263    10,2144  20 131 0       DAS     BUF

 0321   REF 166   LAST 1264    10,2145  52 131 0       DXCH    BUF
 0322   REF 762   LAST 1263    10,2146  52 155 1       DXCH    MPAC

 0323                          10,2147  0 0006 1       EXTEND
 0324   REF 763   LAST 1264    10,2150  3 0155 0       DCA     MPAC
 0325   REF  27   LAST 1263    10,2151  50 141 0       INDEX   TEM1
 0326                          10,2152  52 015 1       DXCH    14                      = SINY COSX + SINX SINZ COSY

 0327                          10,2153  0 0006 1       EXTEND
 0328   REF 764   LAST 1264    10,2154  3 0160 0       DCA     MPAC      +3
 0329   REF  28   LAST 1264    10,2155  50 141 0       INDEX   TEM1
 0330                          10,2156  52 017 0       DXCH    16                      = - SINX COSZ

 0331                          10,2157  0 0006 1       EXTEND
 0332   REF 765   LAST 1264    10,2160  3 0162 1       DCA     MPAC      +5
 0333   REF  29   LAST 1264    10,2161  50 141 0       INDEX   TEM1
 0334                          10,2162  52 021 0       DXCH    20                      = COSX COSY - SINX SINY SINZ

 0335   REF  30   LAST 1264    10,2163  3 0141 0       CA      TEM1
 0336   REF  83   LAST 1261    10,2164  54 116 0       TS      ADDRWD
 0337                          10,2165  0 0006 1       EXTEND
 0338   REF  22   LAST  867    10,2166  3 0006 1       DCA     Z
 0339   REF  27   LAST 1258    10,2167  6 4742 1       AD      FOUR
 0340   REF  43   LAST 1114    10,2170  52 165 1       DXCH    LOC
 0341   REF  39   LAST 1120    10,2171  3 4735 1       CAF     BIT8
 0342   REF  11   LAST 1001    10,2172  54 023 1       TS      EDOP
 0343   REF   2   LAST 1009    10,2173  1 7501 0       TCF     VXV
 0344   REF 766   LAST 1264    10,2174  52 155 1       DXCH    MPAC
 0345                          10,2175  20 001 1       DDOUBL
 0346   REF  31   LAST 1264    10,2176  50 141 0       INDEX   TEM1
 0347                          10,2177  52 007 1       DXCH    6

 0348   REF 767   LAST 1264    10,2200  52 160 1       DXCH    MPAC      +3
 0349                          10,2201  20 001 1       DDOUBL
 0350   REF  32   LAST 1264    10,2202  50 141 0       INDEX   TEM1
 0351                          10,2203  52 011 0       DXCH    10

 0352   REF 768   LAST 1264    10,2204  52 162 0       DXCH    MPAC      +5
 0353                          10,2205  20 001 1       DDOUBL
 0354   REF  33   LAST 1264    10,2206  50 141 0       INDEX   TEM1
 0355                          10,2207  52 013 1       DXCH    12

 0356   REF  32   LAST 1262    10,2210  3 0142 0       CA      TEM2
 0357   REF  71   LAST 1262    10,2211  54 003 0       TS      EBANK
 0358   REF   6   LAST  981    10,2212  1 4622 1       TCF     SWRETURN
```

```
R000I         THE TFE SUBROUTINES MAY BE USED IN EITHER EARTH OR MOON CENTERED COORDINATES. THE TFF ROUTINES NEVER
R0003  KNOW WHICH ORIGIN APPLIES. IT IS THE USER WHO KNOWS, AND WHO SUPPLIES  RONE, VONE AND I/SQRT(MU)  AT THF
R0005  APPROPRIATF SCALE LEVEL FOR THE PROPER PRIMARY BODY.

R0006         EARTH ORIGIN        PCSITION    -29        METERS
R0007                             VELOCITY    -7         METERS/CENTISECOND
R0009                             1/SQRT(MU)  +I7        SQRT(CS SQ/METERS CUBED)

R00I1         MOON ORIGIN         PCSITION    -27        METERS
R00I2                             VELOCITY    -5         METERS/CENTISECONDS
R00I4                             1/SQRT(MU)  +I4        SQRT(CS SQ/METERS CUBED)

R0016  ALL CATA PROVIDED TO AND RECEIVED FROM ANY TFF SUBROUTINE WILL BE AT ONE OF THE LEVELS ABOVE. IN ALL CASES,
R00I8  THE FREE FALL TIME IS RETURNED IN CENTISECONDS AT (-28). PROGRAM  TFE/CONIC  WILL GFNERATE VONE/RTMU  AND
R0020  LEAVE IT IN  VONE' AT (+10) IF EARTH ORIGIN AND (+9) IF MOON ORIGIN.
R0021         THE USER MUST STORE THE STATE VECTOR IN  RONE, VONE  AND MU IN  THE FORM I/SQRT(MU) IN  TFF/RTMU
R0023  AT THE PROPER SCALE BEFORE CALLING  TFF/CONIC. SINCE  RONE, VONE  ARE IN THE FXTENDED VERB STORAGE AREA,
R0025  THE USER MUST ALSO LOCK OUT THE EXTENDED VERBS, AND RELEASE THEM WHEN FINISHED.
R0027         PROGRAMS     CALC/TFF  AND  CALC/TPER  ASSUME THAT THE TERMINAL RADIUS IS LESS THAN THE PRESENT
R0029  RADIUS. THIS RESTRICTION CAN BE REMOVED BY A  15 W CODING CHANGE, BUT AT PRESENT IT IS NOT DEFMED NFCFSSARY.
R0031
R0032         THE FOLLOWING ERASABLE QUANTITIES ARE USED BY THE TFF ROUTINES, AND ARE LOCATED IN THE PUSH LIST.
R0034

A0035                                                      BELOW     E:   IS USED FOR EARTH ORIGIN SCALE
A0036                                                                M:   IS USED EOR MOON  ORIGIN SCALE

A0037                                    TFFSW    =     I19D BITI    0 = CALCTFF        I = CALCTPER
 0038                      00I2          TEFDELQ  =     I0D          Q2-Q1              E: (-16)  M: (-I5)
 0039                      00I4          RMAGI    =     I2D          ABVAL(RN)  M       E: (-29)  M: (-27)
A0040                                    RPER     =     I4D          PERIGEE RADIUS M   E: (-29)  M: (-27)
 004I                      00I6          TFFQI    =     I4D          R.V / SQRT(MUF)    E: (-16)  M: (-I5)
A0042                                    SDELF/2                     SIN(THETA) /2
 0043                      0016          CDELF/2  =     14D          COS(THETA) /2
A0044                                    RAPO     =     I6D          APOGEE RADIUS  M   E: (-29)  M: (-27)
 0045                      0020          NRTERM   =     I6D          TERMINAL RADIUS M  E: (-29+NR)
A0046                                                                                   M: (-27+NR)
 0047                      0022          RTERM    =     18D          TERMINAL RADIUS M  E: (-29)  M: (-27)
 0048                      0024          TFEVSQ   =     20D          -(V SQUARED/MU)  I/M  E: (20)  M: (I8)
 0049                      0026          1FF1/ALF =     22D          SFMI MAJ AXIS  M  E: (-22-2 NA)
A0050                                                                                  M: (-20-2 NA)
 005I                      0030          TEFRTALF =     24D          SQRT(ALEA)  E: (I0+NA)  M: (9+NA)
 0052                      0032          TEFALFA  =     26D          ALFA  I/M   E: (26-NR)  M: (24-NR)
 0053                      0034          1FFNP    =     28D          SEMI LATUS RECTUM  M  E: (-38+2 NR)
A0054                                                                                     M: (-36+2 NR)
 0055                      0036          TFF/RTMU =     30D          I/SQRT(MU)         E: (I7)   M: (I4)
 0056                      0040          NRMAG    =     32D          PRESENT RADIUS  M  E: (-29+NR)
A0057                                                                                   M: (-27+NR)
 0058                      0042          TFFX     =     34D
 0059                      0044          TEETEM   =     36D          TEMPORARY
```

```
A0060                                         REGISTERS S1, S2 ARE UNTOUCHED BY ANY TFF SUBROUTINE
A0061                                         INDEX REGISTERS X1, X2 ARE USED BY ALL TFF SUBROUTINES. THEY ARE ESTAB-
A0062                                         LISHED IN TFF/CONIC AND MUST BE PRESERVED BETWEEN CALLS TO SUBSEQUENT
A0063                                         SUBROUTINES.
A0064                                         -NR                            C(X1) = NORM COUNT OF RMAG
A0065                                         -NA                            C(X2)= NORM COUNT OF SQRT(ABS(ALFA))
```

```
P0066

R0067   SUBROUTINE NAME:     TFFCONIC                                            DATE:    01.29.67
R0069   MOD NO:  0                                                               LOG SECTION:    TIME OF FREE FALL
R0071   MOD BY:  RR BAIRNSFATHER
R0072   MOD NO:  1                  MOD BY:  RR BAIRNSFATHER      DATE:  11 APR 67
R0073   MOD NO:  2                  MOD BY:  RR BAIRNSFATHER      DATE:  21 NOV 67      ADD MOON MU.
R0075   MOD NO:  3                  MOD BY:  RR BAIRNSFATHER      DATE:  21 MAR 68      ACCEPT DIFFERENT EARTH/MOON SCALES
R0077   FUNCTIONAL DESCRIPTION:      THIS SUBROUTINE IS CALLED TO COMPUTE THOSE CONIC PARAMETERS REQUIRED BY THE TFF
R0079            SUBROUTINES AND TO ESTABLISH THEM IN THE PUSH LIST AREA. THE PARAMETERS ARE LISTED UNDER OUTPUT.
R0081            THE EQUATIONS ARE
R0082                   -   -  -
R0083                   H = RN*VN                                                ANGULAR MOMENTUM
R0085                         - -
R0086                   LCP = H.H / MU                                           SEMI LATUS RECTUM
R0088                                 -  -
R0089                   ALFA = 2/RN - VN.VN / MU                                 RECIPROCAL SEMI MAJ AXIS, SIGNED

R0091            AND ALFA IS POS FOR ELLIPTIC  ORBITS
R0092                         0   FOR PARABOLIC ORBITS
R0093                        NEG FOR HYPERBOLIC ORBITS.
R0094            SUBROUTINE ALSO COMPUTES AND SAVES  RMAG.
R0095   CALLING SEQUENCE:
R0096            TFFCONIC  EXPECTS CALLER TO ENTER WITH CORRECT GRAVITATIONAL CONSTANT IN MPAC, IN THE FORM
R0098            1/SQRT(MU). PROGRAM WILL SAVE IN  TFF/RTMU  . THE SCALE IS DETERMINED BY WHETHER EARTH OR MOON
R0100            ORIGIN IS USED.  THE CALLER MUST LOCK OUT THE EXTENDED VERBS BEFORE PROVIDING STATE VECTOR IN RONE,
R0102            VONE  AT PROPER SCALE. THE EXTENDED VERBS MUST BE RESTORED WHEN THE CALLER IS FINISHED USING THE
R0104            TFF ROUTINES.
R0105            ENTRY POINT  TFFCONMU  EXPECTS THAT  TFF/RTMU  IS ALREADY LOADED.
R0107            TO SPECIFY MU:      DLOAD  CALL                IF MU ALREADY STORED:    CALL
R0109                                       YOURMU       1/RTMU   E: (17)  M: (14)               TFFCONMU
R0111                                       TFFCONIC
R0112            PUSHLOC = PDL+0, ARBITRARY IF LEQ 18D

R0113   SUBROUTINES CALLED:  NONE
R0114   NORMAL EXIT MODES:   RVQ
R0115   ALARMS:  NONE
R0116   OUTPUT:  THE FOLLOWING ARE STORED IN THE PUSH LIST AREA.
R0117            RMAG1  E:(-29) M:(-27) M  RN, PRESENT RADIUS LENGTH.
R0118            NRMAG  E: (-29+NR)     M  RMAG, NORMALIZED
R0119                   M: (-27+NR)
R0120            X1                     -NR, NORM COUNT
R0121            TFFNP  E: (-38+2NR)    M  LCP, SEMI LATUS RECTUM, WEIGHTED BY NR.       FOR VGAMCALC
R0123                   M: (-36+2NR)
R0124            TFF/RTMU  E:(17)  M:(14)       1/SQRT(MU)
R0125            TFFVSQ E:(20)  M:(18)  1/M   -(V SQ/MU): PRESENT VELOCITY,NORMLIZED.    FOR VGAMCALC
R0127            TFFALFA  E: (26-NR)    1/M   ALFA, WEIGHTED BY NR
R0128                     M: (24-NR)
R0129            TFFRTALF  E: (10+NA)   SQRT(ALFA), NORMALIZED
R0130                      M: (9+NA)
```

```
R0131             X2                    -NA, NORM COUNT
R0132             TFF1/ALF   E: (-22-2NA) SIGNED SEMI MAJ AXIS, WEIGHTED BY NA
R0133                        M: (-20-2NA)
R0134             PUSHLOC AT PDL+0
R0135             THE FOLLOWING  IS STORED IN GENERAL ERASABLE
R0136             VONE'  E:(10)   M:(9)    V/RT(MU), NORMALIZED VELOCITY
R0137    ERASABLE INITIALIZATION REQUIRED:
R0138             RONE     E:(-29)   M:(-27)   M       STATE VECTOR                  LEFT BY CALLER
R0140             VONE     E:(-7)    M:(-5)    M/CS    STATE VECTOR                  LEFT BY CALLER
R0142             TFF/RTMU   E:(17)   M:(14)       1/RT(CS SQ/M CUBE)                IF ENTER VIA  TFFCONMU.
R0144    DEBRIS:  QPRET,     PDL+0 ... PDL+3
R0145


 0146                         33,3575                        BANK    33
 0147    REF   1              27,2000                        SETLOC TOF-FF
 0148                         27,3363                        BANK

 0149    REF   2 LAST   48 TO   48:     2     2*             COUNT* $$/TFF

 0150    REF   4  LAST   720  27,3363   00037 0  TFFCONIC STORE   TFF/RTMU            1/SQRT(MU)          E: (17)    M: (14)

 0151                         27,3364   53575 0  TFFCONMU VLOAD   UNIT                COME HERE WITH TFFRTMU LOADED.
 0152    REF  15  LAST   723  27,3365   02200 1                   RONE                SAVED RN.   M       E: (-29)   M: (-27)
 0153                         27,3366   77725 1           PDDL                        UR/2 TO PDL+0, +5
 0154                         27,3367   00045 0                   36D                 MAGNITUDE
 0155    REF   1              27,3370   00015 0           STORE   RMAG1               M     E: (-29)    M: (-27)

 0156                         27,3371   77701 1           NORM
 0157    REF  68  LAST 1233   27,3372   00047 1                   X1                  -NR
 0158    REF   1              27,3373   24041 1           STOVL   NRMAG               RMAG   M    E: (-29+NR)   M: (-27+NR)
 0159    REF  10  LAST   723  27,3374   02206 1                   VONE                SAVED VN.   M/CS    E: (-7)    M: (-5)
 0160                         27,3375   77761 1           VXSC
 0161    REF   5  LAST 1268   27,3376   00037 0                   TFF/RTMU            E: (17)    M: (14)
 0162    REF   1              27,3377   02161 0           STORE   VONE'               VN/SQRT(MU)    E: (10)     M: (9)

 0163                         27,3400   47361 0           VXSC    VXV
 0164    REF   2  LAST 1268   27,3401   00041 1                   NRMAG               E: (-29+NR)  M: (-27+NR)
A0165                                                                                 UR/2 FROM PDL
 0166                         27,3402   47572 1           VSL1    VSQ                 BEFORE:  E:(-19+NR)  M:(-18+NR)
 0167    REF   1              27,3403   14035 1           STODL   TFFNP               LC P   M    E:(-38+2NR)  M:(-36+2NR)
A0168                                                                                 SAVE ALSO FOR VGAMCALC
 0169    REF   1              27,3404   06475 1                   TFF1/4
 0170                         27,3405   63271 0           DDV     PDVL                (2/RMAG)  1/M    F:(26-NR)    M:(24-NR)
 0171    REF   3  LAST 1268   27,3406   00041 1                   NRMAG               RMAG  M    E:(-29+NR)   M:(-27+NR)
 0172    REF   2  LAST 1268   27,3407   02161 0                   VONE'               SAVED VN.   E: (10)     M: (9)
 0173                         27,3410   57436 1           VSQ     DCOMP               KEEP MPAC+2 HONEST FOR SQRT.
 0174    REF   1              27,3411   00025 0           STORE   TFFVSQ              -(V SQ/MU)    E:(20)    M:(18)
A0175                                                                                 SAVE FOR VGAMCALC
 0176                         27,3412   43257 0           SR*     DAD
 0177                        27,3413   20573 1                  0 -6,1           GET -VSQ/MU   E:(26-NR)   M:(24-NR)
 0178                        27,3414   77626 0           STADR
A0179                                                                            2/RMAG   FROM PDL+2
 0180   REF     1            27,3415   77744 0           STORE  TFFALFA          ALFA  1/M   E:(26-NR)   M:(24-NR)
 0181                        27,3416   41457 1           SL*    PUSH             TEMP SAVE ALFA    E:(20)   M:(18)
 0182                        27,3417   20173 0                  0 -6,1
 0183                        27,3420   75446 0           ABS    SQRT             E:(10)   M:(9)
 0184                        27,3421   77701 1           NORM
 0185   REF    29  LAST 1234 27,3422   00050 1                  X2               X2 = -NA
 0186   REF     1            27,3423   00031 0           STORE  TFFRTALF         SQRT( ABS(ALFA) )  E:(10+NA)   M:(9+NA)
 0187                        27,3424   75316 1           DSQ    SIGN             NOT SO ACCURATE, BUT OK
A0188                                                                            ALFA FROM PDL+2   E:(20)   M:(18)
 0189                        27,3425   55254 1           BZE    BDDV             SET 1/ALFA =0, TO SHOW SMALL ALFA
 0190                        27,3426   57430 1                  +2
 0191   REF     2  LAST 1268 27,3427   06475 1                  TFF1/4
 0192   REF     1            27,3430   00027 1  +2       STORE  TFF1/ALF         1/ALFA   E:(-22-2 NA)   M:(-20-2 NA)
 0193                        27,3431   77616 0  DUMPCNIC RVQ

A0194                                                                                                    39 W
```

```
P0195    SUBROUTINE NAME:      TFFRP/RA                                                        DATE:  01.17.67
R0197    MOD NO:  0                                                                            LOG SECTION:    TIME OF FREE FALL
R0199    MOD BY:  RR BAIRNSFATHER
R0200    MOD NO:  1              MOD BY:  RR BAIRNSFATHER      DATE:  11 APR 67
R0201    MOD NO:  2              MOD BY:  RR BAIRNSFATHER      DATE:  21 MAR 68            ACCEPT DIFFERENT EARTH/MOON SCALES
R0203                                                                                      ALSO IMPROVE ACCURACY OF RAPO.
R0205    FUNCTIONAL DESCRIPTION:          USED BY CALCTPER AND TFF DISPLAYS TO CALCULATE PERIGEE RADIUS AND ALSO
R0207              APOGEE RADIUS FOR A GENERAL CONIC.
R0208              PROGRAM GIVES PERIGEE RADIUS AS                  APOGEE RADIUS IS GIVEN BY
R0210                     RP = P /(1+E)                                    RA = (1+E) / ALFA
R0212              WHERE   2
R0213                     E  = 1 - P ALFA
R0214              IF RA IS NEGATIVE OR SHOWS DIVIDE OVERFLOW, THEN RA = POSMAX BECAUSE
R0216                     1. APOGEE RADIUS IS NOT MEANINGFUL FOR HYPERBOLA
R0217                     2. APOGEE RADIUS IS NOT DEFINED FOR PARABOLA
R0218                     3. APOGEE RADIUS EXCEEDS THE SCALING FOR ELLIPSE.
R0219              THIS SUBROUTINE REQUIRES THE SIGNED  RECIPROCAL SEMI MAJ AXIS,  ALFA,  AND SEMI LATUS RECTUM AS DATA.
R0221    CALLING SEQUENCE:  CALL
R0222                                 TFFRP/RA
R0223              PUSHLOC = PDL+0, ARBITRARY IF LEQ 10D
R0224              C(MPAC) UNSPECIFIED

R0225    SUBROUTINES CALLED:  NONE
R0226    NORMAL EXIT MODE:     RVQ
R0227              IF ELLIPSE, WITHIN NORMAL SCALING, RAPO IS CORRECT.
R0228              OTHERWISE, RAPO = POSMAX.
R0229    ALARMS:   NONE
R0230    OUTPUT:   STORED IN PUSH LIST AREA. SCALE OF OUTPUT AGREES WITH DATA SUPPLIED TO  TFF/CONIC.
R0232              RPER    E:(-29)  M:(-27)  M      PERIGEE RADIUS                         DESTROYED BY CALCTFF/CALCTPER, TFFTRIG.
R0234              RAPO    E:(-29)  M:(-27)  M      APOGEE  RADIUS                         WILL BE DESTROYED BY CALCTFF/CALCTPER
R0236              PUSHLOC AT PDL+0
R0237    ERASABLE INITIALIZATION REQUIRED:
R0238              TFFALFA E:(26-NR)       M    1/SEMI MAJ AXIS                            LEFT BY TFFCONIC
R0240                      M:(24-NR)
R0241              TFFNP   E: (-38+2NR)    M  LC P, SEMI LATUS RECTUM                      LEFT BY TFFCONIC
R0243                      M: (-36+2NR)
R0244              X1                      -NR, NORM COUNT OF RMAG                         LEFT BY TFFCONIC
R0246              X2                      -NA, NORM COUNT OF ALFA                         LEFT BY TFFCONIC
R0248    DEBRIS:   QPRET,     PDL+0 ... PDL+1
```

```
P0249
 0250                                0020             RAPO       =       16D              APOGEE RADIUS  M  E:(-29)  M:(-27)
 0251                                0016             RPER       =       14D              PERIGEE RADIUS  M  E:(-29)  M:(-27)
A0252
 0253                          27,3432   41345 0  TFFRP/RA DLOAD   DMP
 0254    REF   2  LAST 1269    27,3433   00033 1                   TFFALFA          ALFA  1/M  E:(26-NR)   M:(24-NR)
 0255    REF   2  LAST 1268    27,3434   00035 1                   TFFNP            LC P  M   E:(-38+2NR)   M:(-36+2NR)
 0256                          27,3435   57457 0           SR*     DCOMP            ALFA P (-12+NR)
 0257                          27,3436   20571 0                   0 -8D,1          ALFA P  (-4)
 0258                          27,3437   51415 0           DAD     ABS              (DCOMP GIVES VALID TP RESULT FOR SQRT)
A0259                                                                               (ABS PROTECTS SQRT IF F IS VERY NEAR 0)
 0260    REF   1               27,3440   17770 1                   DP2(-4)
 0261                          27,3441   43366 0           SQRT    DAD              E SQ = (1- P ALFA)   (-4)
 0262    REF   3  LAST 1269    27,3442   06475 1                   TFF1/4
 0263                          27,3443   55206 0           PUSH    BDDV             (1+E)  (-2)  TO PDL+0
 0264    REF   3  LAST 1271    27,3444   00035 1                   TFFNP            LCP  M E:(-38+2NR)   M:(-36+2NR)
 0265                          27,3445   53657 0           SR*     SR*              (DOES SR THEN SL TO AVOID OVFL)
 0266                          27,3446   20601 1                   0,1              X1=-NR
 0267                          27,3447   20572 0                   0 -7,1           (EFFECTIVE SL)
 0268    REF   3  LAST  724    27,3450   14017 1           STODL   RPER             PERIGEE RADIUS  M   E:(-29)   M:(-27)
A0269                                                                               (1+E)  (-2)   FROM PDL+0
 0270                          27,3451   41005 1           DMP     BOVB
 0271    REF   2  LAST 1269    27,3452   00027 1                   TFF1/ALF         E:(-22-2NA)  M:(-20-2NA)
 0272    REF   5  LAST 1231    27,3453   57756 1                   TCDANZIG         CLEAR OVFIND, IF ON.
 0273                          27,3454   53654 0           BZF     SL*
 0274    REF   1               27,3455   57464 0                   MAXRA            SET POSMAX, IF ALFA=0
 0275                          27,3456   57603 0                   0 -5,2           -5+NA
 0276                          27,3457   40057 1           SL*     BOV
 0277                          27,3460   57576 1                   0,2
 0278    REF   2  LAST 1271    27,3461   57464 0                   MAXRA            SET POSMAX IF OVFL.
 0279                          27,3462   77644 1           BPL                      CONTINUE WITH VALID RAPO.
 0280                          27,3463   57466 1                   +3
 0281                          27,3464   77745 1  MAXRA    DLOAD                    RAPO CALC IS NOT VALID. SET RAPO =
 0282    REF   3  LAST  859    27,3465   17774 0                   NEARONE          POSMAX AS A TAG.
 0283    REF   1               27,3466   00021 1  +3       STORE   RAPO             APOGEE RADIUS  M   E:(-29)   M:(-27)
 0284                          27,3467   77616 0  DUMPRPRA RVQ

A0285                                                                                                    30 W
```

```
R0286  SUBROUTINE NAME:     CALCTPER  /  CALCTFF                                      DATE:    01.29.67
R0288  MOD NO:  0                                                                     LOG SECTION:    TIME OF FREE FALL
R0290  MOD BY:  RR BAIRNSFATHER
R0291  MOD NO:  1               MOD BY:  RR BAIRNSFATHER       DATE:  21 MAR 67
R0292  MOD NO:  2               MOD BY:  RR BAIRNSFATHER       DATE:  14 APR 67
R0293  MOD NO:  3               MOD BY:  RR BAIRNSFATHER       DATE:  8JUL 67        NEAR EARTH MUE AND NEG TFF (GONEPAST)
R0295  MOD NO:  4               MOD BY:  RR BAIRNSFATHER       DATE:  21 NOV 67      ADD VARIABLE MU.
R0297  MOD NO:  5               MOD BY:  RR BAIRNSFATHER       DATE:  21 MAR 68      ACCEPT DIFFERENT EARTH/MOON SCALES
R0299  FUNCTIONAL DESCRIPTION:      PROGRAM CALCULATES THE FREE-FALL TIME OF FLIGHT FROM PRESENT POSITION  RN  AND
R0301            VELOCITY  VN  TO A RADIUS LENGTH SPECIFIED BY  RTERM  , SUPPLIED BY THE USER. THE POSITION VECTOR
R0303            RN  MAY BE ON EITHER SIDE OF THE CONIC, BUT  RTERM  IS CONSIDERED ON THE INBOUND SIDE.
R0305            THE EQUATIONS ARE

R0306                 Q2 = -SQRT(RTERM (2-RTERM ALFA) - LCP)    (INBOUND SIDE))        LEQ +- LCE/SQRT(ALFA)
R0308                        -  -
R0309                 Q1 = RN.VN / SQRT(MU)                                           LEQ +- LCE/SQRT(ALFA)

R0311                 Z = NUM / DEN                                                   LEQ +- 1/SQRT(ALFA)

R0313            WHERE, IF INBOUND
R0314                 NUM = RTERM - RN                                                LEQ +- 2 LCE/ALFA
R0316                 DEN = Q2+Q1                                                     LEQ +- 2 LCE/SQRT(ALFA)

R0318            AND, IF OUTBOUND
R0319                 NUM = Q2-Q1                                                     LEQ +- 2 LCE/SQRT(ALFA)
R0321                 DEN = 2 - ALFA (RTERM + RN) .                                   LEQ +- 2 LCE

R0323            IF   ALFA ZZ  <  1.0            (FOR ALL CONICS EXCEPT ELLIPSES HAVING ABS(DEL ECC ANOM) G 90 DEG)

R0325            THEN  X = ALFA Z Z
R0326            AND   TFF = (RTERM +RN -2 ZZ T(X) ) Z/SQRT(MU)

R0327                 EXCEPT IF ALFA PNZ, AND IF TFF NEG,
R0328                 THEN   TFF = 2 PI /(ALFA SQRT(ALFA)) + TFF

R0329            OR IF  ALFA ZZ  GEQ  1.0            (FOR ELLIPSES HAVING ABS(DEL ECC ANOM) GEQ 90 DEG)

R0331            THEN  X = 1/ALFA Z Z
R0332            AND   TFF = (PI/SQRT(ALFA) -Q2 +Q1 +2(X T(X) -1) /ALFA Z) /ALFA SQRT(MU)

R0334            WHERE  T(X) IS A POLYNOMIAL APPROXIMATION TO THE SERIES
R0335                            2     3                       2
R0336                 1/3 -X/5 +X /7 -X /9 ...               (X   <  1.0)

R0337  CALLING SEQUENCE:  TIME TO RTERM                        TIME TO PERIGEE
R0339                     CALL                                 CALL
R0340                          CALCTFF                              CALCTPER
R0342                     C(MPAC) = TERMNL RAD  M              C(MPAC) = PERIGEE RAD  M
R0344            FOR EITHER,   E: (-29)    M: (-27)
R0345            FOR EITHER, PUSHLOC = PDL+0 , ARBITRARY IF LEQ 8D.
```

```
R0346  SUBROUTINES CALLED:  T(X),  VIA RTB
R0347  NORMAL EXIT MODE:  RVQ
R0348        HOWEVER, PROGRAM EXITS WITH ONE OF THE FOLLOWING VALUES FOR TFF (-28) CS  IN MPAC. USER MUST STORE.
R0350             A.  TFF= FLIGHT TIME. NORMAL CASE FOR POSITIVE FLIGHT TIME LESS THAN ONE ORBITAL PERIOD.
R0352             B.  (THIS OPTION IS NO LONGER USED.)
R0353             C.  TFF = POSMAX.  THIS INDICATES THAT THE CONIC FROM THE PRESENT POSITION WILL NOT RETURN TO
R0355                 THE SPECIFIED ALTITUDE.  ALSO INDICATES OUTBOUND PARABOLA OR HYPERBOLA.
R0357  OUTPUT:  C(MPAC)  (-28)  CS     TIME OF FLIGHT, OR TIME TO PERIGEE
R0358           TFFX     (0)           X,                                    LEFT FOR ENTPY DISPLAY TFF ROUTINES
R0360           NRTERM  E: (-29+NR)    M  RTERM, WEIGHTED BY NR               LEFT FOR ENTRY DISPLAY TFF ROUTINES
R0362                   M: (-27+NR)
R0363           TFFTEM , E: (-59+2NR)  LCP Z Z SGN(SCELF)                    LEFT FOR ENTRY DISPLAY TFF ROUTINES
R0365                   M: (-55+2NR)   LCP /ALFA SGN(SDELF)                  LEFT FOR ENTRY DISPLAY TFF ROUTINES
R0367           NOTE:  TFFTEM = PDL 36D AND WILL BE DESTROYED BY .:UNIT:.
R0368           RMAG1  E:(-29)  M:(-27)  PDL 12 NOT TOUCHED.
R0369           TFFQ1  E:(-16)  M:(-15)  PDL 14D
R0370           TFFDELQ E:(-16) M:(-15)  PDL 10D
R0371           PUSHLOC AT PDL+0
R0372  ERASABLE INITIALIZATION REQUIRED:
R0373           RONE   E:(-29)  M:(-27)  M   STATE VECTOR                   LEFT BY USER
R0375           VONE'  E:(+10)  M:(+9)   VN/SQRT(MU)                        LEFT BY TFF/CONIC
R0377           RMAG1  E:(-29)  M:(-27)  PRESENT RADIUS,  M                 LEFT BY TFFCONIC
R0379           C(MPAC)E:(-29)  M:(-27)  RTERM, TERMINAL RADIUS LENGTH, M   LEFT BY USER

R0381           THE FOLLOWING ARE STORED IN THE PUSH LIST AREA.
R0382           TFF/RTMU  E:(17)  M:(14)  1/SQRT(MU)                        LEFT BY TFFCONIC.
R0384           NRMAG  E: (-29+NR)  M  RMAG, NORMALIZED                     LFFT BY TFFCONIC
R0386                  M: (-27+NR)
R0387           X1                     -NR, NORM COUNT                       LEFT BY TFFCONIC
R0389           TFFNP  E: (-38+2NR)  M   LCP, SFMI LATUS RECTUM, WEIGHT  NR LEET BY TFFCONIC
R0391                  M: (-36+2NR)
R0392           TFFALFA  E: (26-NR)    1/M  ALFA, WEIGHT  NR                 LEFT BY TFFCONIC
R0394                    M: (24-NR)
R0395           TFFRTALF  E:(10+NA)    SQRT(ALFA), NORMALIZED                LEFT BY TFFCONIC
R0397                     M:(9+NA)
R0398           X2                     -NA, NORM COUNT                       LEFT BY TFFCONIC
R0400           TFF1/ALF  E: (-22-2NA)  SIGNED SEMIMAJ AXIS, WEIGHTED BY NA  LEFT BY TFFCONIC
R0402                     M: (-20-2NA)
R0403  DEBRIS:  QPRET,   PDL+0 ... PDL+3
R0404           RTERM  E:(-29)  M:(-27)  RTERM, TERMINAL RADIUS LENGTH
R0405           RAPO   E:(-29)  M:(-27)  PDL 16D  (=NRTERM)
R0406           RPER   E:(-29)  M:(-27)  PDL 14D   (=TFFQ1)
```

```
P0407
 0408                     27,3470  77614 1  CALCTPER SETGO                  ENTER WITH RPER  IN MPAC
 0409  REF   1            27,3471  03436 0                  TFFSW
 0410                     27,3472  57475 0                  +3
 0411                     27,3473  77614 1  CALCTFF  CLEAR                  ENTER WITH RTERM IN MPAC
 0412  REF   2  LAST 1274 27,3474  03676 0                  TFFSW
 0413  REF   1            27,3475  00023 0  +3       STORE  RTERM           E: (-29)  M: (-27)
 0414                     27,3476  77657 0           SL*
 0415                     27,3477  20201 0                  0,1             X1=-NR
 0416  REF   1            27,3500  00021 1           STORE  NRTERM          RTERM  E: (-29+NR)  M: (-27+NR)
 0417                     27,3501  44205 0           DMP    BDSU
 0418  REF   3  LAST 1271 27,3502  00033 1                  TFFALFA         ALFA  E: (26-NR)  M: (24-NR)
 0419  REF   4  LAST 1271 27,3503  06475 1                  TFF1/4
 0420                     27,3504  41206 0           PUSH   DMP             (2-ALFA RTERM)  (-3)  TO PDL+0
 0421  REF   2  LAST 1274 27,3505  00021 1                  NRTERM          E: (-29+NR)  M: (-27+NR)
 0422                     27,3506  53725 1           PDDL   SR*             RTERM(2-ALFA RTERM) TO PDL+2
A0423                                                                       E: (-32+NR)   M: (-30+NR)
 0424  REF   4  LAST 1271 27,3507  00035 1                  TFFNP           LC P   E:(-38+2NR)  M:(-36+2NR)
 0425                     27,3510  20573 1                  0 -6,1          X1 = -NR
 0426                     27,3511  43276 0           DCOMP  DAD             DUE TO SHIFTS, KEEP PRECISION FOR SQRT
A0427                                                                       RTERM(2-ALFA RTERM) FROM PDL+2
A0428                                                                       E: (-32+NR)  M: (-30+NR)
 0429                     27,3512  77657 0           SR*                    LEAVE  E: (-32)  M: (-30)
 0430                     27,3513  20601 1                  0,1             X1 = -NR
 0431                     27,3514  71214 0           BOFF   DLOAD           CHECK TFF / TPER SWITCH
 0432  REF   3  LAST 1274 27,3515  03756 0                  TFFSW
 0433                     27,3516  57520 1                  +2              IF TFF, CONTINUE
 0434  REF   1            27,3517  06505 1                  TFFZEROS        IF TPER, SET Q2 = 0
 0435                     27,3520  75440 0  +2       BMN    SQRT            E: (-16)  M: (-15)

 0436  REF   1            27,3521  57653 0                  MAXTFF1         NO FREE FALL CONIC TO RTERM FROM HERE
A0437                                                                       RESET PDL, SET TFF=POSMAX, AND EXIT.

 0438                     27,3522  41076 0           DCOMP  BOVB            RT IS ON INBOUND SIDE.  ASSURE OVFIND=0
 0439  REF   6  LAST 1271 27,3523  57756 1                  TCDANZIG        ANY PORT IN A STORM.
 0440  REF   1            27,3524  24045 0           STOVL  TFFTEM          Q2   E: (-16)  M: (-15)
 0441  REF   3  LAST 1268 27,3525  02161 0                  VONE'           VN/SQRT(MU) E: (10)  M: (9)
 0442                     27,3526  52441 1           DOT    SL3
 0443  REF  16  LAST 1268 27,3527  02200 1                  RONE            SAVED RN.  E: (-29)  M: (-27)
 0444  REF   1            27,3530  00017 1           STORE  TFFQ1           Q1, SAVE FOR GONEPAST TEST.
A0445                                                                       E: (-16)  M: (-15)
 0446                     27,3531  44240 1           BMN    BDSU
 0447  REF   1            27,3532  57553 0                  INBOUND         USE ALTERNATE Z
 0448  REF   2  LAST 1274 27,3533  00045 0                  TFFTEM          Q2  E: (-16)  M: (-15)

A0449                                       OUTBOUND  Z CALC CONTINUES HERE

 0450  REF   1            27,3534  14043 0           STODL  TFFX            NUM=Q2-Q1  E: (-16)  M: (-15)
 0451  REF   4  LAST 1274 27,3535  00033 1                  TFFALFA         ALFA  E: (26-NR)  M: (24-NR)
 0452                     27,3536  44205 0           DMP    BDSU
 0453  REF  4 LAST 1268  27,3537  00041 1                    NRMAG         RMAG  E: (-29+NR)  M: (-27+NR)
A0454                                                                      (2-RTERM ALFA)  (-3) FROM PDL+0
 0455                    27,3540  51406 1  SAVEDEN   PUSH    ABS           DEN TO PDL+0  E: (-3) OR (-16)
A0456                                                                                    M: (-3) OR (-15)
 0457                    27,3541  40015 1            DAD     BOV           INDETERMINANCY TEST
 0458  REF  1            27,3542  17762 1                    LIM(-22)      =1.0-B(-22)
 0459  REF  1            27,3543  57564 1                    TFFXTEST      GO IF DEN >/= B(-22)
 0460                    27,3544  65345 0            DLOAD   PDDL          SET DEN=0  OTHERWISE
 0461  REF  2 LAST 1274  27,3545  06505 1                    TFFZEROS
A0462                                                                      XCH ZERO WITH PDL+0
 0463                    27,3546  57545 1            DLOAD   DCOMP
 0464  REF  5 LAST 1274  27,3547  00033 1                    TFFALFA       ALFA  E: (26-NR)  M: (24-NR)
 0465                    27,3550  71240 1            BMN     DLOAD         FOR TPER: Z INDET AT DELE/2=0 AND 90.
 0466  REF  1            27,3551  57660 0                    TFFELL        ASSUME 90, AND LEAVE 0 IN PDL: 1/Z=D/N

A0467                                                                      Z INDET. AT PERIGEE FOR PARAB OR HYPERB.
 0468                    27,3552  77616 0  DUMPTFF1  RVQ                   RETURN  TFF =0

A0469                                      INBOUND   Z  CALC CONTINUES HERE
 0470                    27,3553  77745 1  INBOUND   DLOAD                 RESET PDL+0
 0471                    27,3554  45345 1            DLOAD   DSU           ALTERNATE Z CALC
 0472  REF  2 LAST 1274  27,3555  00023 0                    RTERM         E: (-29)  M: (-27)
 0473  REF  2 LAST 1268  27,3556  00015 0                    RMAG1         E: (-29)  M: (-27)
 0474  REF  2 LAST 1274  27,3557  14043 0            STODL   TFFX          NUM=RTERM-RN  E: (-29)  M: (-27)
 0475  REF  3 LAST 1274  27,3560  00045 0                    TFFTEM        Q2  E: (-16)  M: (-15)
 0476                    27,3561  52015 1            DAD     GOTO
 0477  REF  2 LAST 1274  27,3562  00017 1                    TFFQ1         Q1  E: (-16)  M: (-15)
 0478  REF  1            27,3563  57540 1                    SAVEDEN       DEN = Q2+Q1  E: (-16)  M: (-15)

 0479                    27,3564  65215 1  TFFXTEST  DAD     PDDL           (ABS(DEN) TO PDL+2))  E: (-3) OR (-16)
A0480                                                                                             M: (-3) OR (-15)
 0481  REF  1            27,3565  17764 1                    DP(-22)       RESTORE ABS(DEN) TO MPAC
 0482  REF  3 LAST 1275  27,3566  00043 0                    TFFX          NUM E:(-16) OR (-29)  M:(-15) OR (-27)
 0483                    27,3567  53605 1            DMP     SR*
 0484  REF  2 LAST 1269  27,3570  00031 0                    TFFRTALF      SQRT(ALFA)  E: (10+NA)  M: (9+NA)
 0485                    27,3571  57201 0                    0 -3,2        X2=-NA
 0486                    27,3572  77671 1            DDV                   C(MPAC) =NUM SQRT(ALFA)  E:(-3) OR (-16)
A0487                                                                                               M:(-3) OR (-15)
A0488                                                                      ABS(DEN) FROM PDL+2  E:(-3) OR (-16)
A0489                                                                                           M:(-3) OR (-15)
 0490                    27,3573  40145 0            DLOAD   BOV           (THE DLOAD IS SHARED WITH TFFELL)
 0491  REF  4 LAST 1275  27,3574  00043 0                    TFFX          NUM  E: (-16) OR (-29)  M:(-15) OR (-27)
 0492  REF  1            27,3575  57656 0                    TFFELL        USE EQN FOR DELE GEQ 90, LEQ -90

A0493                                      OTHERWISE, CONTINUE FOR GENERAL CONIC FOR TFF EQN

 0494                    27,3576  45471 1            DDV     STADR
A0495                                                                      DEN FROM PDL+0   E: (-3) OR (-16)
A0496                                                                                       M: (-3) OR (-15)
 0497  REF  4 LAST 1275  27,3577  77732 1            STORE   TFFTEM        Z  SAVE FOR SIGN OF SDELF.
```

```
A0498                                                                                    E: (-13)  M: (-12)
 0499                             27,3600    63406 0             PUSH    DSQ             Z TO PDL+0
 0500                             27,3601    41206 0             PUSH    DMP             Z SQ TO PDL+2  E: (-26)  M: (-24)
 0501     REF    5  LAST 1274     27,3602    00035 1                     TFFNP           LC P  E: (-38+2NR)  M: (-36+2NR)
 0502                             27,3603    75261 0             SL      SIGN
 0503                             27,3604    20206 1                     5
 0504     REF    5  LAST 1275     27,3605    00045 0                     TFFTEM          AFFIX SIGN FOR SDELF (ENTRY DISPLAY)
 0505     REF    6  LAST 1276     27,3606    14045 0             STODL   TFFTEM          P ZSQ  E: (-59+2NR)  M: (-55+2NR)
A0506                                                                                    (ARG IS USED IN TFF/TRIG)
A0507                                                                                    ZSQ FROM PDL+2   E: (-26)  M: (-24)
 0508                             27,3607    41206 0             PUSH    DMP             RESTORE PUSH LOC
 0509     REF    6  LAST 1275     27,3610    00033 1                     TFFALFA         ALFA  E: (26-NR)  M: (24-NR)
 0510                             27,3611    77657 0             SL*
 0511                             27,3612    20201 0                     0,1             X1=-NR
 0512     REF    5  LAST 1275     27,3613    00043 0             STORE   TFFX            X
 0513                             27,3614    41234 1             RTB     DMP
 0514     REF    1                27,3615    57740 0                     T(X)             POLY
A0515                                                                                    ZSQ FROM PDL+2  E: (-26)  M: (-24)
 0516                             27,3616    44302 0             SR2     BDSU            2 ZSQ T(X)  E: (-29)  M: (-27)
 0517     REF    3  LAST 1275     27,3617    00023 0                     RTERM           RTERM  E: (-29)  M: (-27)
 0518                             27,3620    41215 1             DAD     DMP
 0519     REF    3  LAST 1275     27,3621    00015 0                     RMAG1           E: (-29)  M: (-27)
A0520                                                                                    Z FROM PDL+0  E: (-13)  M: (-12)
 0521                             27,3622    51042 0             SR3     BPL             TFF SQRT(MU)   E: (-45)  M: (-42)
 0522     REF    1                27,3623    57644 0                     ENDTFF          (NO PUSH UP)
 0523                             27,3624    75206 1             PUSH    SIGN            TFF SQRT(MU)  TO PDL+0
 0524     REF    3  LAST 1275     27,3625    00017 1                     TFFQ1           Q1 FOR GONEPAST TEST
 0525                             27,3626    71244 0             BPL     DLOAD           GONE PAST ?
 0526     REF    1                27,3627    57650 0                     NEGTFF          YES. TFF < 0 .
 0527     REF    3  LAST 1271     27,3630    00027 1                     TFF1/ALF        1/ALFA  E: (-22-2NA)  M: (-20-2NA)
 0528                             27,3631    51076 1             DCOMP   BPL             ALFA > 0 ?
 0529     REF    2  LAST 1276     27,3632    57650 0                     NEGTFF          NO. TFF IS NEGATIVE.

A0530                                                      CORRECT FOR ORBITAL PERIOD.

 0531                             27,3633    77676 0             DCOMP                   YES. CORRECT FOR ORB PERIOD.
 0532                             27,3634    56205 0             DMP     DDV
 0533     REF    1                27,3635    17760 0                     PI/16           2 PI (-5)
 0534     REF    3  LAST 1275     27,3636    00031 0                     TFFRTALF        SQRT(ALFA)  E: (10+NA)  M: (9+NA)
 0535                             27,3637    53657 0             SL*     SL*
 0536                             27,3640    57602 1                     0 -4,2          X2=-NA
 0537                             27,3641    57602 1                     0 -4,2
 0538                             27,3642    43257 0             SL*     DAD
 0539                             27,3643    57576 1                     0,2
A0540                                                                                    TFF SQRT(MU) FROM PDL+0  E:(-45) M:(-42)
 0541                             27,3644    40005 0   ENDTFF    DMP     BOV             TFF SQRT(MU) IN MPAC      E:(-45) M:(-42)
 0542     REF    6  LAST 1268     27,3645    00037 0                     TFF/RTMU        E: (17)  M: (14)
 0543     REF    1                27,3646    57654 1                     MAXTFF          SET POSMAX IF OVFL.

 0544                             27,3647    77616 0   DUMPTFF2 RVQ                      RETURN  TFF   (-28) CS IN MPAC.
 0545                         27,3650   77745 1  NEGTFF    DLOAD
A0546                                                                         TFF SQRT(MU)  FROM PDL+0, NEGATIVE.
 0547                         27,3651   77650 1            GOTO
 0548     REF   2  LAST 1276  27,3652   57644 0                     ENDTFF

 0549                         27,3653   77745 1  MAXTFF1   DLOAD                RESET PDL
 0550                         27,3654   43545 1  MAXTFF    DLOAD    RVQ
 0551     REF   4  LAST 1271  27,3655   17774 0                     NEARONE

R0552     TIME OF FLIGHT ELLIPSE WHEN DEL (ECCENTRIC ANOM) GEQ 90 AND LEQ -90.

A0553                                                                         NUM FROM TFFX.  E: (-16) OR (-29)
A0554                                                                                         M: (-15) OR (-27)
 0555                         27,3656   77712 0  TFFELL    SL2                  NUM  E:(-14) OR (-27)  M:(-13) OR (-25)
 0556                         27,3657   41465 0            BDDV     PUSH        TEMP SAVE D/N IN PDL+0
A0557                                                                         DEN FROM PDL+0 E:(-3)/( 16) M:(-3)/(-15)
A0558                                                                         N/D TO PDL+0  E: (11)  M: (10)
 0559                         27,3660   45345 1  TFFEL1    DLOAD    DSU         (ENTER WITH D/N=0 IN PDL+0)
 0560     REF   7  LAST 1276  27,3661   00045 0                     TFFTEM      Q2  E: (-16)  M: (-15)
 0561     REF   4  LAST 1276  27,3662   00017 1                     TFFQ1       Q1  E: (-16)  M: (-15)
 0562     REF   1             27,3663   14013 0            STODL    TFFDELQ     Q2-Q1  E: (-16)  M: (-15)
A0563                                                                         D/N FROM PDL+0
 0564                         27,3664   77626 0            STADR
 0565     REF   8  LAST 1277  27,3665   77732 1            STORE    TFFTEM      D/N  E: (11)  M: (10)
 0566                         27,3666   53605 1            DMP      SL*
 0567     REF   4  LAST 1276  27,3667   00027 1                     TFF1/ALF    1/ALFA E: (-22-2NA)  M: (-20-2NA)
 0568                         27,3670   57576 1                     0,2         1/ALFA Z  E: (-11-NA)  M: (-10-NA)
 0569                         27,3671   41206 0            PUSH     DMP         TO PDL+0
 0570     REF   9  LAST 1277  27,3672   00045 0                     TFFTEM      1/Z  E: (11)  M: (10)
 0571                         27,3673   41057 0            SL*      BOVB
 0572                         27,3674   57576 1                     0,2         X2= -NA
 0573     REF  15  LAST 1216  27,3675   31765 1                     SIGNMPAC    IN CASE X= 1.0, CONTINUE
 0574     REF   6  LAST 1276  27,3676   00043 0            STORE    TFFX        X=1/ALFA ZSQ
 0575                         27,3677   41234 1            RTB      DMP
 0576     REF   2  LAST 1276  27,3700   57740 0                     T(X)        POLY
 0577     REF   7  LAST 1277  27,3701   00043 0                     TFFX
 0578                         27,3702   45242 1            SR3      DSU
 0579     REF   1             27,3703   17766 0                     DP2(-3)
 0580                         27,3704   41405 0            DMP      PUSH        2(X T(X)-1) /Z ALFA  E: (-15-NA)
A0581                                                                                              M: (-14-NA)
A0582                                                                         1/ALFA Z FROM PDL+0  E: (-11-NA)
A0583                                                                                              M: (-10-NA)
 0584                         27,3705   41345 0            DLOAD    DMP         GET SIGN FOR SDELF
 0585     REF  10  LAST 1277  27,3706   00045 0                     TFFTEM      1/Z  E: (11)  M: (10)
 0586     REF   4  LAST 1276  27,3707   00015 0                     RMAG1       E: (-29)  M: (-27)
 0587                         27,3710   43312 0            SL2      DAD
 0588     REF   5  LAST 1277  27,3711   00017 1                     TFFQ1       Q1  E: (-16)  M: (-15)
 0589     REF  11  LAST 1277  27,3712   14045 0            STODL    TFFTEM      (Q1+R 1/Z)  =SGN OF SDELF E:(-16) M:(-15
 0590     REF   6  LAST 1276  27,3713   00035 1                     TFFNP       LC P E: (-38+2NR) M: (-36+2NR)
 0591                         27,3714   53605 1            DMP      SL*         CALC FOR ARG FOR TFF/TRIG.
 0592   REF   5  LAST 1277   27,3715   00027 1                  TFF1/ALF          1/ALFA   E:(-22-2NA)  M:(-20-2NA)
 0593                        27,3716   57575 1                  1,2               X2=-NA
 0594                        27,3717   53765 0         SIGN     SL*
 0595   REF  12  LAST 1277   27,3720   00045 0                  TFFTEM            AFFIX SIGN FOR SDELF
 0596                        27,3721   57576 1                  0,2
 0597   REF  13  LAST 1278   27,3722   14045 0         STODL    TFFTEM            P/ALFA  E:(-59+2NR)  M:(-55+2NR)
A0598                                                                             (ARG FOR USE IN TFF/TRIG)
 0599   REF   6  LAST 1278   27,3723   00027 1                  TFF1/ALF          1/ALFA E:(-22-2NA)  M:(-20-2NA)
 0600                        27,3724   41366 1         SQRT     DMP
 0601   REF   2  LAST 1276   27,3725   17760 0                  PI/16             PI (-4)
 0602                        27,3726   77615 0         DAD
A0603                                                                             2(XT(X)-1)/Z ALFA FROM PDL E:(-15-NA)
A0604                                                                                                        M:(-14-NA)
 0605                        27,3727   45257 0         SL*      DSU
 0606                        27,3730   57577 0                  0 -1,2
 0607   REF   2  LAST 1277   27,3731   00013 0                  TFFDELQ           Q2-Q1  E: (-16)  M: (-15)
 0608                        27,3732   53605 1         DMP      SL*
 0609   REF   7  LAST 1278   27,3733   00027 1                  TFF1/ALF          1/ALFA  E:(-22-2NA)  M:(-20-2NA)
 0610                        27,3734   57601 1                  0 -3,2
 0611                        27,3735   52057 1         SL*      GOTO
 0612                        27,3736   57602 1                  0 -4,2
 0613   REF   3  LAST 1277   27,3737   57644 0                  ENDTFF            TFF SQRT(MU) IN MPAC E:(-45) M:(-42)
```

```
P0614   PROGRAM NAME:      T(X)                                                 DATE:    01.17.67
R0616   MOD NO:  0                                                              LOG SECTION:    TIME OF FREE FALL
R0618   MOD BY:  RR BAIRNSFATHER
R0619   FUNCTIONAL DESCRIPTION:      THE POLYNOMIAL T(X) IS USED BY TIME OF FLIGHT SUBROUTINES  CALCTFF AND
R0621            CALCTPER TO APPROXIMATE THE SERIES
R0622                                   2      3
R0623                    1/3 -X/5 +X /7 -X /9 ...

R0624            WHERE  X = ALFA  Z Z        IF ALFA Z Z  LEQ 1
R0625                   X = 1/(ALFA Z Z )   IF ALFA Z Z    G  1

R0626            ALSO   X IS NEG FOR HYPERBOLIC ORBITS
R0627                   X = 0 FOR PARABOLIC ORBITS
R0628                   X IS POSITIVE FOR ELLIPTIC ORBITS
R0629            FOR FLIGHT 278, THE POLYNOMIAL  T(X) IS FITTED OVER THE RANGE  (0,+1)  AND HAS A MAXIMUM
R0631            DEVIATION FROM THE SERIES OF  2 E-5       (T(X) IS A CHEBYCHEV  TYPE FIT AND WAS OBTAINED USING
R0633            MAC PROGRAM AUTCURFIT294RRB  AND IS VALID TO THE SAME TOLERANCE OVER THE RANGE  (-.08,+1). )
R0635   CALLING SEQUENCE:  RTB
R0636                                T(X)
R0637            C(MPAC) = X

R0638   SUBROUTINES CALLED:  NONE
R0639   NORMAL EXIT MODE:    TC   DANZIG
R0640   ALARMS:  NONE
R0641   OUTPUT:  C(MPAC) = T(X)
R0642   ERASABLE INITIALIZATION REQUIRED:
R0643            C(MPAC)  =  X
R0644   DEBRIS:  NONE

 0645   REF   7  LAST 1187    27,3740  0 7243 0  T(X)      TC      POLY
 0646                         27,3741   00004 0            DEC     4                    N-1
 0647                         27,3742   12525 0            2DEC    3.333333333 F-1
 0647                         27,3743   12525 0
 0648                         27,3744   71463 0            2DEC*   -1.999819135 E-1 *
 0648                         27,3745   57703 1
 0649                         27,3746   04423 0            2DEC*   1.418148467  E-1 *
 0649                         27,3747   17645 0
 0650                         27,3750   74604 0            2DEC*   -1.01310997  E-1 *
 0650                         27,3751   43667 1
 0651                         27,3752   01626 1            2DEC*   5.609004986  E-2 *
 0651                         27,3753   37256 1
 0652                         27,3754   77404 1            2DEC*   -1.536156925 E-2 *
 0652                         27,3755   52071 0
 0653   REF  61  LAST 1209    27,3756  0 6102 1  ENDT(X)   TC      DANZIG

 0654   REF   1               27,3756            TCDANZIG =        ENDT(X)
```

```
P0655   TFF CONSTANTS
 0656                        32,3716                       BANK    32

 0657   REF    2  LAST    48  27,2000                       SETLOC TOF-FF1
 0658                        27,3757                       BANK

A0659                                                                NOTE _  NOTE _ ADJUSTED MUE FOR NEAR EARTH TRAJ.

A0660                                             MUE        =       3.990 815 471 E10  M CUBE/CS SQ
A0661                                             RTMUE      =       1.997702549 E5 B-18*      MODIFIED EARTH MU

A0663                                                                NOTE _  NOTE _ ADJUSTED MUE FOR NEAR EARTH TRAJ.

A0664                                             MUM        =       4.902 778  E8      M CUBE /CS SQ

A0665                                             RTMUM      2DEC*   2.21422176 E4 B-18*
 0666                        27,3757   06220 1   PI/16      2DEC    3.141592653 B-4
 0666                        27,3760   37553 0
 0667                        27,3761   37777 1   LIM(-22)   2OCT    37777 37700       1.0 -B(-22)
 0667                        27,3762   37700 1
 0668                        27,3763   00000 1   DP(-22)    2OCT    00000 00100       B(-22)
 0668                        27,3764   00100 0
 0669                        27,3765   04000 0   DP2(-3)    2DEC    1  B-3
 0669                        27,3766   00000 1
 0670                        27,3767   02000 0   DP2(-4)    2DEC    1 B-4             1/16
 0670                        27,3770   00000 1
R0671   RPAD1    2DEC    6373338 B-29    M  (-29)  =20 909 901.57 FT

 0672   REF    4  LAST   720  23,2335                       RPAD1      =       RPAD
 0673                        27,3771   00305 1   R300K      2DEC    6464778 B-29       (-29)  M
 0673                        27,3772   11205 0
 0674                        27,3773   37777 1   NEARONE    2DEC    .999999999
 0674                        27,3774   37777 1
 0675   REF   17  LAST 1246   23,2504                       TFFZEROS EQUALS HI6ZEROS
 0676   REF    1             23,2474                       TFF1/4   EQUALS HIDP1/4
```

```
R0001   PROGRAM DESCRIPTION                                                              DATE  20 DECEMBER 1967
R0003   PROGRAM NAME -  SELF-CHECK                                                       LOG SECTION AGC BLOCK TWO SELF-CHECK
R0005   MOD NO -  1                                                                      ASSEMBLY SUBROUTINE UTILITYM REV 25
R0007   MOD BY - GAUNTT


R0008   FUNCTIONAL DESCRIPTION

R0009        PROGRAM HAS TWO MAIN PARTS. THE FIRST IS SELF-CHECK WHICH RUNS AS A ZERO PRIORITY JOB WITH NO CORE SET, AS
R0011   PART OF THE BACK-UP IDLE LOOP. THE SECOND IS SHOW-BANKSUM WHICH RUNS AS A REGULAR EXECUTIVE JOB WITH ITS OWN
R0013   STARTING VERB.
R0014        THE PURPOSE OF SELF-CHECK IS TO CHECK OUT VARIOUS PARTS OF THE COMPUTER AS OUTLINED BELOW IN THE OPTIONS.
R0016        THE PURPOSE OF SHOW-BANKSUM IS TO DISPLAY THE SUM OF EACH BANK , ONE AT A TIME.
R0020        IN ALL THERE ARE  7 POSSIBLE OPTIONS IN THIS BLOCK II VERSION OF SELF-CHECK. MORE DETAIL DESCRIPTION MAY BE
R0022   FOUND IN E-2065 BLOCK II AGC SELF-CHECK AND SHOW BANKSUM BY EDWIN D. SMALLY DECEMBER 1966, AND ADDENDA 2 AND 3.
R0024        THE DIFFERENT OPTIONS ARE CONTROLLED BY PUTTING DIFFERENT NUMBERS IN THE SMODE REGISTER (NOUN 27). BELOW IS
R0026   A DESCRIPTION OF WHAT PARTS OF THE COMPUTER THAT ARE CHECKED BY THE OPTIONS, AND THE CORRESPONDING NUMBER, IN
R0028   OCTAL, TO LOAD INTO SMODE.
R0032   +-4    ERASABLE MEMORY
R0033   +-5    FIXED MEMORY
R0034   +-1,2,3,6,7,10    EVERYTHING IN OPTIONS 4 AND 5.
R0036   -0     SAME AS +-10 UNTIL AN ERROR IS DETECTED.
R0037   +0     NO CHECK, PUTS COMPUTER INTO THE BACKUP IDLE LOOP.


R0038   WARNINGS

R0039        USE OF E MEMORY RESERVED FOR SELF-CHECK (EVEN IN IDLE LOOP) AS TEMP STORAGE BY OTHER PROGRAMS IS DANGEROUS.
R0041        SMODE SET GREATER THAN OCT 10 PUTS COMPUTER INTO BACKUP IDLE LOOP.


R0042   CALLING SEQUENCE

R0043        TO CALL SELF-CHECK KEY IN
R0044             V 21 N 27 E  OPTION NUMBER E
R0047        TO CALL SHOW-BANKSUM KEY IN
R0048             V 91 E          DISPLAYS FIRST BANK
R0049             V 33 E          PROCEED, DISPLAYS NEXT BANK


R0050   EXIT MODES, NORMAL AND ALARM

R0051        SELF-CHECK NORMALLY CONTINUES INDEFINITELY UNLESS THERE IS AN ERROR DETECTED. IF SO + OPTION NUMBERS PUT
R0053   COMPUTER INTO BACKUP IDLE LOOP, - OPTION NUMBERS RESTART THE OPTION.
R0054        THE -0 OPTION PROCEEDS FROM THE LINE FOLLOWING THE LINE WHERE THE ERROR WAS DETECTED.
R0057        SHOW-BANKSUM PROCEEDS UNTIL A TERMINATE IS KEYED IN (V 34 E). THE COMPUTER IS PUT INTO THE BACKUP IDLE LOOP
R0059


R0060   OUTPUT
```

```
R0061         SELF-CHECK UPON DETECTING AN ERROR LOADS THE SELF-CHECK ALARM CONSTANT (01102) INTO THE FAILREG SET AND
R0063    TURNS ON THE ALARM LIGHT. THE OPERATOR MAY THEN DISPLAY THE THREE FAILREGS BY KEYING IN V 05 N 09 E. FOR FURTHER
R0065    INFORMATION HE MAY KEY IN V 05 N 08 E, THE DSKY DISPLAY IN R1 WILL BE ADDRESS+1 OF WHERE THE ERROR WAS DETECTED,
R0067    IN R2 THE BBCON OF SELF-CHECK, AND IN R3 THE TOTAL NUMBER OF ERRORS DETECTED BY SELF-CHECK SINCE THE LAST MAN
R0069    INITIATED FRESH START (SLAP1).
R0073         SHOW-BANKSUM STARTING WITH BANK 0 DISPLAYS IN R1 THE BANK SUM (A +-NUMBER EQUAL TO THE BANK NUMBER), IN R2
R0075    THE BANK NUMBER, AND IN R3 THE BUGGER WORD.


R0076    ERASABLE INITIALIZATION REQUIRED

R0077         ACCOMPLISHED BY FRESH START
R0078              SMODE SET TO +0


R0079    DEBRIS

R0080         ALL EXITS FROM THE CHECK OF ERASABLE (ERASCHK) RESTORE ORIGINAL CONTENTS TO REGISTERS UNDER CHECK.
R0082    EXCEPTION IS A RESTART. RESTART THAT OCCURS DURING ERASCHK RESTORES ERASABLE, UNLESS THERE IS EVIDENCE TO DOUBT
R0084    E MEMORY, IN WHICH CASE PROGRAM THEN DOES A FRESH START (DOFSTART).


 0085                               25,3771                      BANK    25
 0086    REF   1                    43,2000                      SETLOC SELFCHEC
 0087                               43,3235                      BANK

 0088    REF   1                                                 COUNT* $$/SELF
 0089    REF  53  LAST 1097            4744           SBIT1      EQUALS BIT1
 0090    REF  47  LAST 1097            4743           SBIT2      EQUALS BIT2
 0091    REF  36  LAST 1097            4742           SBIT3      EQUALS BIT3
 0092    REF  47  LAST 1097            4741           SBIT4      EQUALS BIT4
 0093    REF  39  LAST 1012            4740           SBIT5      EQUALS BIT5
 0094    REF  43  LAST 1054            4737           SBIT6      EQUALS BIT6
 0095    REF  34  LAST 1094            4736           SBIT7      EQUALS BIT7
 0096    REF  40  LAST 1264            4735           SBIT8      EQUALS BIT8
 0097    REF  24  LAST  981            4734           SBIT9      EQUALS BIT9
 0098    REF  35  LAST 1097            4733           SBIT10     EQUALS BIT10
 0099    REF  27  LAST 1097            4732           SBIT11     EQUALS BIT11
 0100    REF  30  LAST 1097            4731           SBIT12     EQUALS BIT12
 0101    REF  39  LAST 1097            4730           SBIT13     EQUALS BIT13
 0102    REF  70  LAST 1258            4727           SBIT14     EQUALS BIT14
 0103    REF  43  LAST 1097            4726           SBIT15     EQUALS BIT15

 0104    REF 234  LAST 1223            4746           S+ZERO     EQUALS ZERO
 0105    REF  54  LAST 1282            4744           S+1        EQUALS BIT1
 0106    REF  48  LAST 1282            4743           S+2        EQUALS BIT2
 0107    REF  35  LAST 1260            6266           S+3        EQUALS THREE
 0108    REF  28  LAST 1264            4742           S+4        EQUALS FOUR
 0109    REF  18  LAST 1032            4747           S+5        EQUALS FIVE
 0110    REF  21  LAST 1261            6263           S+6        EQUALS SIX
 0111  REF  20  LAST 1097       4750                S+7       EQUALS SEVEN
 0112  REF  16  LAST 1262       4350                S8BITS    EQUALS LOW8                 00377
 0113  REF   3  LAST  316       4762                CNTRCON   =      OCT50                USED IN CNTRCHK
 0114                        43,3235    00061 0     ERASCON1  OCTAL  00061                USED IN ERASCHK
 0115                        43,3236    01373 1     ERASCON2  OCTAL  01373                USED IN ERASCHK
 0116  REF   9  LAST 1262       5000                ERASCON6  =      OCT1400              USED IN ERASCHK
 0117                        43,3237    01461 0     ERASCON3  OCTAL  01461                USED IN ERASCHK
 0118                        43,3240    01773 0     ERASCON4  OCTAL  01773                USED IN ERASCHK
 0119  REF  20  LAST 1022       5003                S10BITS   EQUALS LOW10                01777, USED IN ERASCHK
 0120  REF   3  LAST  904       5011                SBNK03    EQUALS PRIO6                06000, USED IN ROPECHK
 0121  REF   7  LAST 1097       4341                -MAXADRS  =      HI5                  FOR ROPECHK
 0122                        43,3241    00060 1     SIXTY     OCTAL  00060
 0123                        43,3242    60017 1     SUPRCON   OCTAL  60017                USED IN ROPECHK
 0124                        43,3243    17777 0     S13BITS   OCTAL  17777
 0125                        43,3244    25252 0     CONC+S1   OCTAL  25252                USED IN CYCLSHFT
 0126                        43,3245    52400 1     CONC+S2   OCTAL  52400                USED IN CYCLSHFT
 0127                        43,3246    76777 1     ERASCON5  OCTAL  76777
 0128  REF   2  LAST  244       5652                S-7       =      OCT77770
 0129  REF   2  LAST 1006       6133                S-4       EQUALS NEG4
 0130  REF   4  LAST  893       7766                S-3       EQUALS NEG3
 0131  REF   7  LAST 1101       7767                S-2       EQUALS NEG2
 0132  REF  13  LAST 1097       7770                S-1       EQUALS NEGONE
 0133  REF  25  LAST  995       4745                S-ZERO    EQUALS NEGO

 0134  REF  46  LAST 1130    E3,1400                          EBANK= LST1
 0135  REF   3  LAST  303    43,3247    01371 0     ADRS1     ADRES  SKEEP1
 0136  REF   4  LAST 1114    43,3250    03341 1     SELFADRS  ADRES  SELFCHK              SELFCHK RETURN ADDRESS. SHOULD BE PUT
A0137                                                                                     IN SELFRET WHEN GOING FROM SELFCHK TO
A0138                                                                                     SHOWSUM AND PUT IN SKEEP1 WHEN GOING
A0139                                                                                     FROM SHOWSUM TO SELF-CHECK.

 0140  REF   6  LAST  226    43,3251   3 1360 0     PRERRORS  CA     ERESTORE             IS IT NECESSARY TO RESTORE ERASABLE
 0141                        43,3252   0 0006 1               EXTEND
 0142  REF   1               43,3253   1 3262 0               BZF    ERRORS               NO
 0143                        43,3254   0 0006 1               EXTEND
 0144  REF   3  LAST  226    43,3255   3 1376 1               DCA    SKEEP5
 0145  REF   3  LAST  226    43,3256   51'377 0               INDEX  SKEEP7
 0146                        43,3257   52 001 1               DXCH   0000                 RESTORE THE TWO ERASABLE REGISTERS
 0147  REF   2  LAST  302    43,3260   3 4746 0               CA     S+ZERO
 0148  REF   7  LAST 1283    43,3261   55'360 1               TS     ERESTORE
 0149                        43,3262   0 0004 0     ERRORS    INHINT
 0150  REF 322  LAST 1210    43,3263   3 0002 0               CA     Q
 0151  REF   3  LAST  486    43,3264   55'357 0               TS     SFAIL                SAVE Q FOR FAILURE LOCATION
 0152  REF   7  LAST  317    43,3265   55'363 1               TS     ALMCADR              FOR DISPLAY WITH BBANK AND ERCOUNT
 0153  REF   3  LAST  222    43,3266   25'365 0               INCR   ERCOUNT              KEEP TRACK OF NUMBER OF MALFUNCTIONS.
 0154  REF   1               43,3267   0 5573 0     TCALARM2  TC     ALARM2
 0155                        43,3270    01102 0               OCT    01102                SELF-CHECK MALFUNCTION INDICATOR
 0156  REF   5  LAST  317    43,3271   11'362 0               CCS    SMODE
 0157  REF   3  LAST 1283    43,3272   3 4746 0     SIDLOOP   CA     S+ZERO
 0158  REF   6  LAST 1283    43,3273   55'362 0               TS     SMODE
```

```
0159  REF   5  LAST 1283  43,3274  0 3341 1             TC      SELFCHK         GO TO IDLE LOOP
0160  REF   4  LAST 1283  43,3275  0 1357 1             TC      SFAIL           CONTINUE WITH SELF-CHECK

0161  REF 369  LAST 1261  43,3276  10 C00 0  -1CHK      CCS     A
0162  REF   1             43,3277  1 3251 0             TCF     PRERRORS
0163  REF   2  LAST 1284  43,3300  1 3251 0             TCF     PRERRORS
0164  REF 370  LAST 1284  43,3301  10 C00 0             CCS     A
0165  REF   3  LAST 1284  43,3302  1 3251 0             TCF     PRERRORS
0166  REF 323  LAST 1283  43,3303  0 0002 0             TC      Q

0167                      43,3304  0 CC06 1  SMODECHK   EXTEND
0168  REF   4  LAST 1283  43,3305  23'371 0             QXCH    SKEEP1
0169  REF   1             43,3306  0 3335 1             TC      CHECKNJ         CHECK FOR NEW JOB
0170  REF   7  LAST 1283  43,3307  11'362 0             CCS     SMODE
0171  REF   1             43,3310  0 3315 0             TC      SOPTIONS
0172  REF   1             43,3311  0 3306 1             TC      SMODECHK +2     TO BACKUP IDLE LOOP
0173  REF   2  LAST 1284  43,3312  0 3315 0             TC      SOPTIONS
0174  REF   2  LAST  112  43,3313  25'366 0             INCR    SCOUNT
0175  REF   5  LAST 1284  43,3314  0 1371 0             TC      SKEEP1          CONTINUE WITH SELF-CHECK

0176  REF   1             43,3315  6 5652 0  SOPTIONS   AD      S-7
0177                      43,3316  0 0006 1             EXTEND
0178                      43,3317  6 3321 1             BZMF    +2              FOR OPTIONS BELOW NINE.
0179  REF   1             43,3320  0 3272 0  BNKOPTN    TC      SIDLOOP         ILLEGAL OPTION.  GO TO IDLE LOOP.
0180  REF   3  LAST 1284  43,3321  25'366 0             INCR    SCOUNT          FOR OPTIONS BELOW NINE.
0181  REF   1             43,3322  6 4750 1             AD      S+7

0182  REF 371  LAST 1284  43,3323  50 C00 1             INDEX   A
0183  REF   1             43,3324  0 3325 0             TC      SOPTION1
0184  REF   6  LAST 1284  43,3325  0 1371 0  SOPTION1   TC      SKEEP1          WAS TC+TCF
0185  REF   7  LAST 1284  43,3326  0 1371 0  SOPTION2   TC      SKEEP1          WAS IN:OUT1
0186  REF   8  LAST 1284  43,3327  0 1371 0  SOPTION3   TC      SKEEP1          WAS COUNTCHK
0187  REF   1             43,3330  0 3342 1  SOPTION4   TC      ERASCHK
0188  REF   1             43,3331  0 3523 0  SOPTION5   TC      ROPECHK
0189  REF   9  LAST 1284  43,3332  0 1371 0  SOPTION6   TC      SKEEP1
0190  REF  10  LAST 1284  43,3333  0 1371 0  SOPTION7   TC      SKEEP1
0191  REF  11  LAST 1284  43,3334  0 1371 0  SOPTON10   TC      SKEEP1          CONTINUE WITH SELF-CHECK

0192                      43,3335  0 0006 1  CHECKNJ    EXTEND
0193  REF   7  LAST 1114  43,3336  23'361 1             QXCH    SELFRET         SAVE RETURN ADDRESS WHILE TESTING NEWJOB
0194  REF  58  LAST 1155  43,3337  0 4626 1             TC      POSTJUMP        TO SEE IF ANY JOBS HAVE BECOME ACTIVE.
0195  REF   2  LAST 1108  43,3340   03216 1             CADR    ADVAN

0196  REF   2  LAST 1284  43,3341  0 3304 0  SELFCHK    TC      SMODECHK        ** CHARLEY, COME IN HERE
R0197 SKEEP7 HOLDS LOWEST OF TWO ADDRESSES BEING CHECKED.
R0198 SKEEP6 HOLDS B(X+1).
R0199 SKEEP5 HOLDS B(X).
R0200 SKEEP4 HOLDS C(EBANK) DURING ERASLOOP AND CHECKNJ.
R0201 SKEEP3 HOLDS LAST ADDRESS BEING CHECKED (HIGHEST ADDRESS).
```

```
L         AGC BLOCK TWO SELF-CHECK                                                                  USER'S PAGE NO.   5      E3 S4

R0202     SKEEP2 CONTROLS CHECKING OF NON-SWITCHABLE ERASABLE MEMORY WITH BANK NUMBERS IN EB.
R0204     ERASCHK TAKES APPROXMATELY 7 SECONDS
 0205     REF   2  LAST  302   43,3342  3 4744 1  ERASCHK  CA      S+1
 0206     REF   3  LAST  302   43,3343  55'372 1           TS      SKEEP2
 0207     REF   4  LAST 1283   43,3344  3 4746 0  0EBANK   CA      S+ZERO
 0208     REF  72  LAST 1264   43,3345  54 C03 0           TS      EBANK
 0209     REF   1              43,3346  3 3237 1           CA      ERASCON3          01461
 0210     REF   4  LAST 1283   43,3347  55'377 1           TS      SKEEP7            STARTING ADDRESS
 0211     REF   1              43,3350  3 5003 1           CA      S10BITS           01777
 0212     REF   3  LAST  302   43,3351  55'373 0           TS      SKEEP3            LAST ADDRESS CHECKED
 0213     REF   1              43,3352  0 3372 1           TC      ERASLOOP

 0214     REF   1              43,3353  3 5000 1  E134567B CA      ERASCON6          01400
 0215     REF   5  LAST 1285   43,3354  55'377 1           TS      SKEEP7            STARTING ADDRESS
 0216     REF   2  LAST 1285   43,3355  3 5003 1           CA      S10BITS           01777
 0217     REF   4  LAST 1285   43,3356  55'373 0           TS      SKEEP3            LAST ADDRESS CHECKED
 0218     REF   2  LAST 1285   43,3357  0 3372 1           TC      ERASLOOP

 0219     REF   2  LAST 1285   43,3360  3 5000 1  2EBANK   CA      ERASCON6          01400
 0220     REF   6  LAST 1285   43,3361  55'377 1           TS      SKEEP7            STARTING ADDRESS
 0221     REF   1              43,3362  3 3240 1           CA      ERASCON4          01773
 0222     REF   5  LAST 1285   43,3363  55'373 0           TS      SKEEP3            LAST ADDRESS CHECKED
 0223     REF   3  LAST 1285   43,3364  0 3372 1           TC      ERASLOOP

 0224     REF   4  LAST 1285   43,3365  55'372 1  NOEBANK  TS      SKEEP2            +0
 0225     REF   1              43,3366  3 3235 0           CA      ERASCON1          00061
 0226     REF   7  LAST 1285   43,3367  55'377 1           TS      SKEEP7            STARTING ADDRESS
 0227     REF   1              43,3370  3 3236 0           CA      ERASCON2          01373
 0228     REF   6  LAST 1285   43,3371  55'373 0           TS      SKEEP3            LAST ADDRESS CHECKED

 0229                          43,3372  0 0004 0  ERASLOOP INHINT
 0230     REF  73  LAST 1285   43,3373  3 0003 1           CA      EBANK             STORES C(EBANK)
 0231     REF   3  LAST  226   43,3374  55'374 1           TS      SKEEP4
 0232                          43,3375  0 0006 1           EXTEND
 0233     REF   8  LAST 1285   43,3376  5 1377 0           NDX     SKEEP7
 0234                          43,3377  3 0001 0           DCA     0000
 0235     REF   4  LAST 1283   43,3400  53'376 0           DXCH    SKEEP5            STORES C(X) AND C(X+1) IN SKEEP6 AND 5.
 0236     REF   9  LAST 1285   43,3401  3 1377 0           CA      SKEEP7
 0237     REF   8  LAST 1283   43,3402  55'360 1           TS      ERESTORE          IF RESTART, RESTORE C(X) AND C(X+1)
 0238     REF 237  LAST 1126   43,3403  54 001 1           TS      L
 0239     REF 238  LAST 1285   43,3404  24 001 0           INCR    L
 0240     REF 372  LAST 1284   43,3405  50 000 1           NDX     A
 0241                          43,3406  52 001 1           DXCH    0000              PUTS OWN ADDRESS IN X AND X +1
 0242     REF  10  LAST 1285   43,3407  51'377 0           NDX     SKEEP7
 0243                          43,3410  4 0001 1           CS      0001              CS  X+1
 0244     REF  11  LAST 1285   43,3411  51'377 0           NDX     SKEEP7
 0245                          43,3412  6 0000 1           AD      0000              AD  X
 0246     REF   1              43,3413  0 3276 1           TC      -1CHK
 0247     REF   9  LAST 1285   43,3414  3 1360 0           CA      ERESTORE          HAS ERASABLE BEEN RESTORED
 0248                          43,3415  0 0006 1           EXTEND
 0249  REF   1              43,3416  1 3442 1              BZF      ELOOPFIN         YES, EXIT ERASLOOP.
 0250                       43,3417  0 0006 1              EXTEND
 0251  REF  12   LAST 1285  43,3420  5 1377 0              NDX      SKEEP7
 0252                       43,3421  4 0001 1              DCS      0000             COMPLEMENT OF ADDRESS OF X AND X+1
 0253  REF  13   LAST 1286  43,3422  51'377 0              NDX      SKEEP7
 0254                       43,3423  52 001 1              DXCH     0000             PUT COMPLEMENT OF ADDRESS OF X AND X+1
 0255  REF  14   LAST 1286  43,3424  51'377 0              NDX      SKEEP7
 0256                       43,3425  4 0000 0              CS       0000             CS  X
 0257  REF  15   LAST 1286  43,3426  51'377 0              NDX      SKEEP7
 0258                       43,3427  6 0001 0              AD       0001             AD X+1
 0259  REF   2   LAST 1285  43,3430  0 3276 1              TC       -1CHK
 0260  REF  10   LAST 1285  43,3431  3 1360 0              CA       ERESTORE         HAS ERASABLE BEEN RESTORED
 0261                       43,3432  0 0006 1              EXTEND
 0262  REF   2   LAST 1286  43,3433  1 3442 1              BZF      ELOOPFIN         YES, EXIT ERASLOOP.
 0263                       43,3434  0 0006 1              EXTEND
 0264  REF   5   LAST 1285  43,3435  3 1376 1              DCA      SKEEP5
 0265  REF  16   LAST 1286  43,3436  51'377 0              NDX      SKEEP7
 0266                       43,3437  52 001 1              DXCH     0000             PUT B(X) AND B(X+1) BACK INTO X AND X+1
 0267  REF   5   LAST 1285  43,3440  3 4746 0              CA       S+ZERO
 0268  REF  11   LAST 1286  43,3441  55'360 1              TS       ERESTORE         IF RESTART, DO NOT RESTORE C(X), C(X+1)
 0269                       43,3442  0 0003 1    ELOOPFIN  RELINT
 0270  REF   2   LAST 1284  43,3443  0 3335 1              TC       CHECKNJ          CHECK FOR NEW JOB
 0271  REF   4   LAST 1285  43,3444  3 1374 0              CA       SKEEP4           REPLACES B(EBANK)
 0272  REF  74   LAST 1285  43,3445  54 003 0              TS       EBANK
 0273  REF  17   LAST 1286  43,3446  25'377 0              INCR     SKEEP7
 0274  REF  18   LAST 1286  43,3447  4 1377 1              CS       SKEEP7
 0275  REF   7   LAST 1285  43,3450  6 1373 1              AD       SKEEP3
 0276                       43,3451  0 0006 1              EXTEND
 0277                       43,3452  1 3454 0              BZF      +2
 0278  REF   4   LAST 1285  43,3453  0 3372 1              TC       ERASLOOP         GO TO NEXT ADDRESS IN SAME BANK
 0279  REF   5   LAST 1285  43,3454  11'372 1              CCS      SKEEP2
 0280  REF   1              43,3455  0 3365 1              TC       NOEBANK
 0281  REF   6   LAST 1286  43,3456  25'372 0              INCR     SKEEP2           PUT +1 IN SKEEP2.
 0282  REF  75   LAST 1286  43,3457  3 0003 1              CA       EBANK
 0283  REF   1              43,3460  6 4734 0              AD       SBIT9
 0284  REF  76   LAST 1286  43,3461  54 003 0              TS       EBANK
 0285  REF   1              43,3462  6 3246 1              AD       ERASCON5         76777, CHECK FOR BANK E2
 0286                       43,3463  0 0006 1              EXTEND
 0287  REF   1              43,3464  1 3360 0              BZF      2EBANK
 0288  REF  77   LAST 1286  43,3465  10 003 0              CCS      EBANK
 0289  REF   1              43,3466  0 3353 1              TC       E134567B         GO TO EBANKS 1,3,4,5,6, AND 7
 0290  REF   3   LAST 1285  43,3467  3 5000 1              CA       ERASCON6         END OF ERASCHK
 0291  REF  78   LAST 1286  43,3470  54 003 0              TS       EBANK
R0292  CNTRCHK PERFORMS A CS OF ALL REGISTERS FROM OCT. 60 THROUGH OCT. 10.
R0293  INCLUDED ARE ALL COUNTERS, T6-1, CYCLE AND SHIFT, AND ALL RUPT REGISTERS
 0294  REF   1              43,3471  3 4762 0    CNTRCHK   CA       CNTRCON          00050
 0295  REF   7   LAST 1286  43,3472  55'372 1    CNTRLOOP  TS       SKEEP2
 0296  REF   1              43,3473  6 4741 1              AD       SBIT4            +10 OCTAL
 0297  REF 373   LAST 1285  43,3474  50 000 1              INDEX    A
 0298                       43,3475  4 0000 0              CS       0000
 0299   REF   8  LAST 1286   43,3476  11'372 1             CCS     SKEEP2
 0300   REF   1              43,3477  0 3472 0             TC      CNTRLOOP

R0301   CYCLSFFT CHECKS THE CYCLE AND SHIFT REGISTERS
 0302   REF   1              43,3500  3 3244 0  CYCLSHFT CA      CONC+S1          25252
 0303   REF  38  LAST 1089   43,3501  54 020 1             TS      CYR              C(CYR) = 12525
 0304   REF  21  LAST 1079   43,3502  54 022 0             TS      CYL              C(CYL) = 52524
 0305   REF  20  LAST 1079   43,3503  54 021 0             TS      SR               C(SR) = 12525
 0306   REF  12  LAST 1264   43,3504  54 023 1             TS      EDOP             C(EDOP) = 00125
 0307   REF  39  LAST 1287   43,3505  6 0020 0             AD      CYR              37777        C(CYR) = 45252
 0308   REF  22  LAST 1287   43,3506  6 0022 1             AD      CYL              00-12524     C(CYL) = 25251
 0309   REF  21  LAST 1287   43,3507  6 0021 1             AD      SR               00-25251     C(SR) = 05252
 0310   REF  13  LAST 1287   43,3510  6 0023 0             AD      EDOP             00-25376     C(EDOP) = +0
 0311   REF   1              43,3511  6 3245 1             AD      CONC+S2          C(CONC+S2) = 52400
 0312   REF   3  LAST 1286   43,3512  0 3276 1             TC      -1CHK
 0313   REF  40  LAST 1287   43,3513  6 0020 0             AD      CYR              45252
 0314   REF  23  LAST 1287   43,3514  6 0022 1             AD      CYL              72523
 0315   REF  22  LAST 1287   43,3515  6 0021 1             AD      SR               77775
 0316   REF  14  LAST 1287   43,3516  6 0023 0             AD      EDOP             77775
 0317   REF   3  LAST 1285   43,3517  6 4744 1             AD      S+1              77776
 0318   REF   4  LAST 1287   43,3520  0 3276 1             TC      -1CHK

 0319   REF   4  LAST 1284   43,3521  25'367 1             INCR    SCOUNT +1
 0320   REF   3  LAST 1284   43,3522  0 3304 0             TC      SMODECHK
R0321   SKEEP1 HOLDS SUM
R0322   SKEEP2 FOLDS PRESENT CONTENTS OF ADDRESS IN ROPECHK AND SHOWSUM ROUTINES
R0323   SKEEP2 FOLDS BANK NUMBER IN LOW ORDER BITS DURING SHOWSUM DISPLAY
R0324   SKEEP3 HOLDS PRESENT ADDRESS (00000 TO 01777 IN COMMON FIXED BANKS)
R0325                                  (04000 TO 07777 IN FXFX BANKS)
R0326   SKEEP3 HOLDS BUGGER WORD DURING SHOWSUM DISPLAY
R0327   SKEEP4 HOLDS BANK NUMBER AND SUPER BANK NUMBER
R0328   SKEEP5 COUNTS 2 SUCCESSIVE TC SELF WORDS
R0329   SKEEP6 CONTROLS ROPECHK OR SHOWSUM OPTION
R0330   SKEEP7 CONTROLS WHEN ROUNTINE IS IN COMMON FIXED OR FIXED FIXED BANKS

 0331   REF   1              43,3523  3 4745 0  ROPECHK  CA      S-ZERO           *
 03311  REF   4  LAST  303   43,3524  55'376 0           TS      SKEEP6           * -0 FOR ROPECHK.
 03312  REF   6  LAST 1286   43,3525  3 4746 0  STSHOSUM CA      S+ZERO           * SHOULD BE ROPECHK

 0332   REF   5  LAST 1286   43,3526  55'374 1           TS      SKEEP4           BANK NUMBER
 0333   REF   4  LAST 1287   43,3527  3 4744 1           CA      S+1
 0334   REF  19  LAST 1286   43,3530  55'377 1  COMMFX   TS      SKEEP7
 0335   REF   7  LAST 1287   43,3531  3 4746 0           CA      S+ZERO
 0336   REF  12  LAST 1284   43,3532  55'371 1           TS      SKEEP1
 0337   REF   8  LAST 1286   43,3533  55'373 0           TS      SKEEP3
 0338   REF   5  LAST 1287   43,3534  3 4744 1           CA      S+1
 0339   REF   6  LAST 1286   43,3535  55'375 0           TS      SKEEP5           COUNTS DOWN 2 TC SELF WORDS
 0340   REF   6  LAST 1287   43,3536  3 1374 0  CCMADRS  CA      SKEEP4
 0341   REF 239  LAST 1285   43,3537  54 001 1           TS      L                TO SET SUPER BANK
 0342   REF   8  LAST 1283   43,3540  7 4341 1           MASK    HI5
 0343    REF   9  LAST 1287   43,3541  6 1373 1             AD      SKEEP3
 0344    REF   2  LAST  455   43,3542  0 4642 0             TC      SUPDACAL            SUPER DATA CALL
 0345    REF   1              43,3543  0 3566 1             TC      ADSUM
 0346    REF   1              43,3544  6 4732 0             AD      SBIT11              02000
 0347    REF   1              43,3545  0 3577 1             TC      ADRSCHK

 0348    REF 374  LAST 1286   43,3546  4 0000 0  FXFX       CS      A
 0349    REF  20  LAST 1287   43,3547  55'377 1             TS      SKEEP7
 0350                         43,3550  0 0006 1             EXTEND
 0351                         43,3551  1 3554 1             BZF     +3
 0352    REF   1              43,3552  3 4731 0             CA      SBIT12              04000, STARTING ADDRESS OF BANK 02
 0353                         43,3553  0 3555 1             TC      +2
 0354    REF   1              43,3554  3 5011 1             CA      SBNK03              06000, STARTING ADDRESS OF BANK 03
 0355    REF  10  LAST 1288   43,3555  55'373 0             TS      SKEEP3
 0356    REF   8  LAST 1287   43,3556  3 4746 0             CA      S+ZERO
 0357    REF  13  LAST 1287   43,3557  55'371 1             TS      SKEEP1
 0358    REF   6  LAST 1287   43,3560  3 4744 1             CA      S+1
 0359    REF   7  LAST 1287   43,3561  55'375 0             TS      SKEEP5              COUNTS DOWN 2 TC SELF WORDS
 0360    REF  11  LAST 1288   43,3562  51'373 1  FXADRS     INDEX   SKEEP3
 0361                         43,3563  3 0000 1             CA      0000
 0362    REF   2  LAST 1288   43,3564  0 3566 1             TC      ADSUM
 0363    REF   2  LAST 1288   43,3565  0 3577 1             TC      ADRSCHK

 0364    REF   9  LAST 1287   43,3566  55'372 1  ADSUM      TS      SKEEP2
 0365    REF  14  LAST 1288   43,3567  6 1371 0             AD      SKEEP1
 0366    REF  15  LAST 1288   43,3570  55'371 1             TS      SKEEP1
 0367    REF   9  LAST 1288   43,3571  3 4746 0             CAF     S+ZERO
 0368    REF  16  LAST 1288   43,3572  6 1371 0             AD      SKEEP1
 0369    REF  17  LAST 1288   43,3573  55'371 1             TS      SKEEP1
 0370    REF  10  LAST 1288   43,3574  4 1372 1             CS      SKEEP2
 0371    REF  12  LAST 1288   43,3575  6 1373 1             AD      SKEEP3
 0372    REF 324  LAST 1284   43,3576  0 0002 0             TC      Q

 0373    REF 375  LAST 1288   43,3577  22 000 1  ADRSCHK    LXCH    A
 0374    REF  13  LAST 1288   43,3600  3 1373 1             CA      SKEEP3
 0375    REF  21  LAST 1288   43,3601  7 5003 0             MASK    LOW10               RELATIVE ADDRESS
 0376    REF   1              43,3602  6 4341 0             AD      -MAXADRS            SUBTRACT MAX RELATIVE ADDRESS = 1777.
 0377                         43,3603  0 0006 1             EXTEND
 0378    REF   1              43,3604  1 3673 1             BZF     SOPTION             CHECKSUM FINISHED IF LAST ADDRESS.
 0379    REF   8  LAST 1288   43,3605  11'375 0             CCS     SKEEP5              IS CHECKSUM FINISHED
 0380                         43,3606  0 3611 1             TC      +3                  NO
 0381                         43,3607  0 3611 1             TC      +2                  NO
 0382    REF   2  LAST 1288   43,3610  0 3673 0             TC      SOPTION             GO TO ROPECHK SHOWSUM OPTION
 0383    REF 240  LAST 1287   43,3611  10 001 1             CCS     L                   -0 MEANS A TC SELF WORD.
 0384    REF   1              43,3612  0 3621 1             TC      CONTINU
 0385    REF   2  LAST 1288   43,3613  0 3621 1             TC      CONTINU
 0386    REF   3  LAST 1288   43,3614  0 3621 1             TC      CONTINU
 0387    REF   9  LAST 1288   43,3615  11'375 0             CCS     SKEEP5
 0388    REF   4  LAST 1288   43,3616  0 3622 1             TC      CONTINU +1
 0389    REF   1              43,3617  3 7770 0             CA      S-1
```

```
L         AGC BLOCK TWO SELF-CHECK                                                          USER'S PAGE NO.   9       E3 S4

 0390    REF   5  LAST 1288    43,3620  0 3622 1            TC       CONTINU +1        AD IN THE BUGGER WORD
 0391    REF   7  LAST 1288    43,3621  3 4744 1  CONTINU   CA       S+1               MAKE SURE TWO CONSECUTIVE TC SELF WORDS
 0392    REF  10  LAST 1288    43,3622  55'375 0            TS       SKEEP5
 03921   REF   5  LAST 1287    43,3623  11'376 0            CCS      SKEEP6            *
 03922   REF  23  LAST 1114    43,3624  10 067 1            CCS      NEWJOB            * +1, SHOWSUM
 03923   REF   6  LAST  889    43,3625  0 5113 1            TC       CHANG1            *
 03924                         43,3626  0 3630 1            TC       +2                *
 0393    REF   3  LAST 1286    43,3627  0 3335 1            TC       CHECKNJ           -0 IN SKEEP6 FOR ROPECHK

 0394    REF  14  LAST 1288    43,3630  25'373 1  ADRS+1    INCR     SKEEP3
 0395    REF  21  LAST 1288    43,3631  11'377 1            CCS      SKEEP7
 0396    REF   1               43,3632  0 3536 1            TC       COMADRS
 0397    REF   2  LAST 1289    43,3633  0 3536 1            TC       COMADRS
 0398    REF   1               43,3634  0 3562 0            TC       FXADRS
 0399    REF   2  LAST 1289    43,3635  0 3562 0            TC       FXADRS

 0400    REF   7  LAST 1287    43,3636  4 1374 1  NXTBNK    CS       SKEEP4
 0401    REF   1               43,3637  6 3726 1            AD       LSTBNKCH          LAST BANK TO BE CHECKED
 0402                          43,3640  0 0006 1            EXTEND
 0403    REF   1               43,3641  1 3130 1            BZF      ENDSUMS           END OF SUMMING OF BANKS.
 0404    REF   8  LAST 1289    43,3642  3 1374 0            CA       SKEEP4
 0405    REF   2  LAST 1288    43,3643  6 4732 0            AD       SBIT11
 0406    REF   9  LAST 1289    43,3644  55'374 1            TS       SKEEP4            37 TO 40 INCRMTS SKEEP4 BY END RND CARRY
 0407    REF   1               43,3645  0 3651 0            TC       CHKSUPR
 0408    REF   1               43,3646  3 4726 0  17TO20    CA       SBIT15
 0409    REF  10  LAST 1289    43,3647  27'374 1            ADS      SKEEP4            SET FOR BANK 20
 0410    REF   1               43,3650  0 3665 1            TC       GONXTBNK
 0411    REF   9  LAST 1287    43,3651  7 4341 1  CHKSUPR   MASK     HI5
 0412                          43,3652  0 0006 1            EXTEND
 0413    REF   1               43,3653  1 3663 0            BZF      NXTSUPR           INCREMENT SUPER BANK
 0414    REF   1               43,3654  6 3243 1  27TO30    AD       S13BITS
 0415                          43,3655  0 0006 1            EXTEND
 0416                          43,3656  1 3660 0            BZF      +2                BANK SET FOR 30
 0417    REF   2  LAST 1289    43,3657  0 3665 1            TC       GONXTBNK
 0418    REF   1               43,3660  3 3241 0            CA       SIXTY             FIRST SUPER BANK
 0419    REF  11  LAST 1289    43,3661  27'374 1            ADS      SKEEP4
 0420    REF   3  LAST 1289    43,3662  0 3665 1            TC       GONXTBNK
 0421    REF   1               43,3663  6 3242 0  NXTSUPR   AD       SUPRCON           SET BNK 30 + INCR SUPR BNK AND CANCEL
 0422    REF  12  LAST 1289    43,3664  27'374 1            ADS      SKEEP4            ERC BIT OF THE 37 TO 40 ADVANCE.
 0423    REF  22  LAST 1289    43,3665  11'377 1  GONXTBNK  CCS      SKEEP7
 0424    REF   1               43,3666  0 3530 1            TC       COMMEX
 0425    REF   8  LAST 1289    43,3667  3 4744 1            CA       S+1
 0426    REF   1               43,3670  0 3546 0            TC       EXFX
 0427    REF   1               43,3671  3 4736 1            CA       SBIT7             HAS TO BE LARGER THAN NO OF FXSW BANKS.
 0428    REF   2  LAST 1289    43,3672  0 3530 1            TC       COMMEX

 0429    REF  13  LAST 1289    43,3673  3 1374 0  SOPTION   CA       SKEEP4
 0430    REF  10  LAST 1289    43,3674  7 4341 1            MASK     HI5               = BANK BITS
 0431    REF   5  LAST  452    43,3675  0 4322 0            TC       LEFT5
 0432    REF 241  LAST 1288    43,3676  54 001 1            TS       L                 BANK NUMBER BEFORE SUPER BANK
```

```
0433     REF  14  LAST 1289   43,3677  3 1374 0              CA      SKEEP4
0434     REF   1              43,3700  7 4350 1              MASK    S8BITS           = SUPER BANK BITS
0435                          43,3701  0 0006 1              EXTEND
0436     REF   1              43,3702  1 3710 0              BZF     SOPT             BEFORE SUPER BANK
0437     REF  23  LAST 1287   43,3703  54 021 0              TS      SR               SUPER BANK NECESSARY
0438     REF 242  LAST 1289   43,3704  3 0001 0              CA      L
0439     REF  21  LAST 1288   43,3705  7 4750 0              MASK    SEVEN
0440     REF  24  LAST 1290   43,3706  6 0021 1              AD      SR
0441     REF 243  LAST 1290   43,3707  54 001 1              TS      L                BANK NUMBER WITH SUPER BANK
0442     REF   6  LAST 1289   43,3710  3 1376 1  SOPT        CA      SKEEP6           *
0443                          43,3711  0 0006 1              EXTEND                   *
0444                          43,3712  1 3714 1              BZF     +2               * ON -0 CONTINUE WITH ROPE CHECK.
0445     REF   1              43,3713  0 3112 0              TC      SDISPLAY         * ON +1 GO TO DISPLAY OF SUM.
0446     REF  18  LAST 1288   43,3714  11'371 1              CCS     SKEEP1           FORCE SUM TO ABSOLUTE VALUE.
04461                         43,3715  0 3717 0              TC      +2
04462                         43,3716  0 3720 1              TC      +2
04463    REF   9  LAST 1289   43,3717  6 4744 1              AD      S+1
04464    REF  19  LAST 1290   43,3720  55'371 1              TS      SKEEP1
0447     REF 244  LAST 1290   43,3721  4 0001 1  BNKCHK      CS      L                = - BANK NUMBER
0448     REF  20  LAST 1290   43,3722  6 1371 0              AD      SKEEP1
0449     REF   2  LAST 1288   43,3723  6 7770 0              AD      S-1
0450     REF   5  LAST 1287   43,3724  0 3276 1              TC      -1CHK            CHECK SUM
0451     REF   2  LAST  303   43,3725  0 3636 1              TC      NXTBNK

0454     REF  24  LAST 1289      0067                        EBANK=  NEWJOB
0455                          43,3726   66100 0  LSTBNKCH    BBCON*                   * CONSTANT, LAST BANK.
```

```
P0001               SUBROUTINE TO UPDATE THE PROGRAM NUMBER DISPLAY ON THE DSKY.

 0002   REF   1                                            COUNT* $$/PHASE
 0003                              5313                    BLOCK  02
 0004   REF   1                    4000                    SETLOC FFTAG1
 0005                              5313                    BANK

 0006   REF 325  LAST 1288         5313  50 002 0  NEWMODEX INDEX  Q                 UPDATE MODREG. ENTRY FOR MODE IN FIXED.
 0007                              5314  3 0000 1           CAF    0
 0008   REF 326  LAST 1291         5315  24 C02 0           INCR   Q

 0009   REF  20  LAST 1229         5316  55'010 0  NEWMODEA TS     MODREG            ENTRY FOR MODE IN A.
 0014                              5317  3 5322 1  MMDSPLAY CAF    +3                DISPLAY MAJOR MODE.
 0015   REF  41  LAST 1210         5320  22 006 1  PREBJUMP LXCH   BBANK             PUTS BBANK IN L
 0016   REE  15  LAST 1221         5321  1 4631 0           TCF    BANKJUMP          PUTS Q INTO A
 0017   REF   1                    5322   31754 0           CADR   SETUPDSP

R0018               RETURN TO CALLER +3 IF MODE = THAT AT CALLER +1. OTHERWISE RETURN TO CALLER +2.

 0020   REF 327  LAST 1291         5323  50 002 0  CHECKMM  INDEX  Q
 0021                              5324  4 0000 0           CS     0
 0022   REF  21  LAST 1291         5325  6 1010 1           AD     MODREG
 0023                              5326  0 0006 1           EXTEND
 0024   REF   5  LAST 1113         5327  1 6762 0           BZF    Q+2
 0025   REF   5  LAST  537         5330  1 6760 1           TCF    Q+1               NO MATCH

 0026   REF   6  LAST 1291         6763            TCQ      =      Q+2 +1

 0028   REF   1                 14,2000                     SETLOC PHASTAB1
 0029                           14,3754                     BANK

 0030   REF   1                                            COUNT* $$/PHASE
 0031                           14,3754  C 0004 0  SETUPDSP INHINT
 0032   REF  24  LAST  991      14,3755  52 071 0           DXCH   RUPTREG1          SAVE CALLER-S RETURN 2CADR
 0033   REF  11  LAST 1097      14,3756  3 4346 1           CAF    PRIO30              EITHER A TASK OR JOB CAN COME TO
 0034   REF  25  LAST 1119      14,3757  0 5063 1           TC     NOVAC               NEWMODEX
 0035   REE  22  LAST 1291         1010                     EBANK= MODREG
 0036   REF   1                 14,3760   03572 1           2CADR  DSPMMJOB
 0036   REF   1                 14,3761   60102 1
 0037   REF  25  LAST 1291      14,3762  52 071 0           DXCH   RUPTREG1
 0038                           14,3763  0 0003 1           RELINT
 0039   REF  23  LAST 1264      14,3764  52 006 0           DXCH   Z                 RETURN

 0040   REF   2  LAST  472      40,3572            DSPMMJOB EQUALS DSPMMJB


 0041                              5331                     BLOCK  02
 0042   REF   2  LAST 1291         4000                     SETLOC FFTAG1
 0043                              5331                     BANK
```

```
L        PHASE TABLE MAINTENANCE                                                              USER'S PAGE NO.   2      EO S4

P0044    PHASCHNG IS THE MAIN WAY OF MAKING PHASE CHANGES FOR RESTARTS.  THERE ARE THREE FORMS OF PHASCHNG, KNOWN AS TYPE
R0046    A, TYPE B, AND TYPE C. THEY ARE ALL CALLED AS FOLLOWS, WHERE OCT XXXXX   CONTAINS THE PHASE INFORMATION,

A0048                                                         TC       PHASCHNG
A0049                                                         OCT      XXXXX

R0050    TYPE A IS CONCERNED WITH FIXED PHASE CHANGES, THAT IS, PHASE INFORMATIONTHAT IS STORED PERMANENTLY.  THESE
R0052    OPTIONS ARE, WHERE G STANDS FOR A GROUP AND .X FOR THE PHASE,

R0053                    G.0              INACTIVE, WILLNOT PERMIT A GROUP G RESTART
R0055                    G.1              WILL CAUSE THE LAST DISPLAY TO BE REACTIVATED, USED MAINLY IN MANNED FLIGHTS
R0057                    G.EVEN           A DOUBLE TABLF RESTART, CAN CAUSE ANY COMBINATION OF TWO JOBS, TASKS, AND/OR
R0059                                     LONGCALL TO BE RESTARTED.
R0060                    G.ODD NOT .1     A SINGLE TABLE RESTART, CAN CAUSE EITHER A JOB, TASK, OR LONGCALL RESTART

R0062    THIS INFORMATION IS PUT INTO THE OCTAL WORD AFTER TC PHASCHNG AS FOLLOWS

R0063                    TLO OOP PPP PPP GGG                                              ,

R0065    WHERE EACH LETTER OR NUMBER STANDS FOR A BIT.  THE G:S STAND FOR THE GROUP, OCTAL 1 - 7, THE P:S FOR THE PHASE,
R0067    OCTAL 0 - 127.  O:S MUST BE 0.              IF ONE WISHES TO HAVE THE TBASE OF GROUP G TO BE SET AT THIS TIME,
R0069    T IS SET TO 1, OTHERWISF IT IS SET TO 0.  SIMIARLY IF ONE WISHES TO SET LONGBASE, THEN L IS SET TO 1, OTHERWISE
R0071    IT IS SET TO 0.  SOME EXAMPLES,

A0072                                                         TC       PHASCHNG          THIS WILL CAUSE GROUP 3 TOBE SET TO 0,
A0073                                                         OCT      00003             MAKING GROUP 3 INACTIVE

A0074                                                         TC       PHASCHNG          IF A RESTART OCCURS THIS WOULD CAUSE
A0075                                                         OCT      00012             GROUP 2 TO RESTART THE LAST DISPLAY

A0076                                                         TC       PHASCHNG          THIS SETS THE TBASE OF GROUP 4 AND IN
A0077                                                         OCT      40064             CASE OF A RESTART WOULD START UP THE TWO
A0078                                                                                    THINGS LOCATED IN THE DOUBLE 4.6 RESTART
A0079                                                                                    LOCATION
A0080                                                         TC       PHASCHNG          THIS SETS LONGBASE AND UPON A RESTART
A0081                                                         OCT      20135             CAUSES 5.13 TO BE RESTARTED  (SINCE
A0082                                                                                    LONGBASE WAS SET THIS SINGLE ENTRY
A0083                                                                                    SHOULD BE A LONGCALL)
A0084                                                         TC       PHASCHNG          SINCE BOTH TBASE4 AND LONGBASE ARE SET,
A0085                                                         OCT      60124             4.12 SHOULD CONTAIN BOTH A TASK AND A
A0086                                                                                    LONGCALL TO BE RESTARTED

R0087    TYPE C PHASCHNG CONTAINS THE VARIABLE TYPE OF PHASCHNG INFORMATION. INSTEAD OF THE INFORMATION BEING IN A
R0089    PERMANENT FORM, ONE STORES THE DESIRED RESTART INFORMATION IN A VARIABKE LOCATION. THE BITS ARE AS FOLLOWS,

R0091                    TLO 1AD XXX CJW GGG

R0092    WHERE EACH LETTER OR NUMBER STANDS FOR A BIT.  THE G:S STAND FOR THE GROUP, OCTAL 1 - 7.  IF THE RESTART IS TO
R0094    BE BY WAITLIST, W IS SET TO 1, IF IT IS A JOB, J IS SET TO 1, IF IT IS A LONGCALL, C IS SET TO 1. ONLY ONE OF
R0096    THESE THREE BIT S MAY BE SET.  X:S ARE IGNORED  1 MUST BE 1, AND O MUST  BE 0.  AGAIN T STANDS FOR THE TBASE,
R0098    AND L FOR LONGBASE.  THE BITS A AND D ARE CONCERNED WITH THE VARIABLE INFORMATION. IF D IS SET TO 1, A PRIORITY
R0100    OR DELTA TIME WILL BE READ FROM THE NEXT LOCATION AFTER THE OCTAL INFORMATION, IF THIS IS TO BE INDIRECT, THAT
R0102    IS, THE NAME OF A LOCATION COMT+INING THE INFORMATION (DELTA TIME ONLY), THEN THIS IS GIVEN AS THE -GENADR OF
R0104    THAT LOCATION WHICH CONTAINS THE DELTA TIME.  IF THE OLD PRIORITY OR DELTA TIME IS TO BE USED, THAT WHICH IS
R0106    ALREADY IN THE VARIABLE STORAGE, THEN D IS SET TO 0. NEXT THE A BIT IS USED.  IF IT IS SET TO 0, THE ADDRESS
R0108    THAT WOULD BE RESTARTED DURING A RESTART IS THE NEXT LOCATION AFTER THE  PHASE INFORMATION, THAT IS, EITHER
R0110    (TC PHASCHNG) +2 OR +3, DEPENDING ON WHETHER D HAD BEEN SET OR NOT.  IF A IS SET TO 1, THEN THE ADDRESS THAT
R0I12    WOULD BE RESTARTED IS THE 2CADR THAT IS READ FROM THE NEXT TWO LOCATIONS.  EXAMPLES,

A0114                                          AD       TC       PHASCHNG         THIS WOULD CAUSE LOCATION AD +3 TO BE
A0115                                          AD+1     OCT      05023            RESTARTED BY GROUP THREE WITHA PRIORITY
A0116                                          AD+2     OCT      23000            OF 23.  NOTE UPON RETURNING IT WOULD
A0117                                          AD+3                               ALSO GO TO AD+3

A0118                                          AD       TC       PHASCHNG         GROUP  1 WOULD CAUSE CAUSE CALLCALL TO
A0119                                          AD+1     OCT      27441            BE STARTED AS A LONGCALL FROM THE TIME
A0120                                          AD+2    -GENADR   DELTIME          STORED IN LONGBASE (LONGBASE WAS SET) BY
A0121                                          AD+3     2CADR    CALLCALL         A DELTATIME STORED IN DELTIME.  THE
A0122                                          AD+4                               BBCON OF THE 2CADR SHOULD CONTAIN THE E
A0123                                          AD+5                               BANK OF DELTIME. PHASCHNG RETURNS TO
A0124                                                                             LOCATION AD+5

R0125    NOTE THAT IF A VARIABLE PRIORITY IS GIVEN FOR A JOB, THE JOB WILL BE RESTARTED AS A NOVAC IF THE PRIORITY IS
R0127    NEGATIVE, AS A FINDVAC IF THE PRIORITY IS POSITIVE.


R0128    TYPE B PHASCHNG IS A COMBINATION OF VARIABLE AND FIXED PHASE CHANGES. IT WILL START UP A JOB AS INDICATED
R0130    BELOW AND ALSO START UP ONE FIXED RESTART, THAT IS EITHER AN G.1 OR  A G.ODD OR THE FIRST ENTRY OF G.EVEN
R0132    DOUBLE ENTRY.  THE BIT INFORMATION IS AS FOLLOWS,

R0133                    TLI CAP PPP PPP GGG

R0134    WHERE EACH LETTER OR NUMBER STANDS FOR A BIT.  THE G:S STAND FOR THE GROUP, OCTAL 1 - 7. THE P:S FOR THE FIXED
R0136    PHASE INFORMATION, OCTAL 0 - 127. 1 MUST BE 1.  AND AGAIN T STANDS FOR THE TBASE AND L FOR LONGBASE. D THIS
R0138    TIME STANDS ONLY FOR PRIORITY SINCE THIS WILL BE CONSIDERED A JOB, AND IT MUST BE GIVEN DIRECTLY IF GIVEN.
R0I40    AGAIN A STANDS FOR THE ADDRESS OF THE LOCATION TO BE RESTARTED, 1 IF THE 2CADR IS GIVEN , OR 0 IF IT IS TO BE
R0142    THE NEXT LOCATION.(THE RETURN LOCATION OF PHASCHNG) EXAMPLES,

A0143                                          AD       TC       PHASCHNG         TBASE IS SET AND ARESTART CAUSE GROUP 3
A0144                                          AD+1     OCT      56043            TO START THE JOB AJOBAJOB WITH PRIORITY
A0145                                          AD+2     OCT      31000            31 AND THE FIRST ENTRY OF 3.4SPOT(WE CAN
A0146                                          AD+3     2CADR    AJOBAJOB         ASSUME IT IS A TASK SINCE WE SET TBASE3)
A0147                                          AD+4                               UPON RETURN FROM PHASCHNG CONTROL WOULD
A0148                                          AD+5                               GO TO AD+5

A0149                                          AD       TC       PHASCHNG         UPON A RESTART THE LAST DISPLAY WOULD BE
A0150                                          AD+1     OCT      I00I5            RESTARTED AND A JOB WITH THE PREVIOUSLY
A0151                                          AD+2                               STORED PRIORITY WOULD BE BEGUN AT AD+2
A0152                                                                             BY MEANS OF GROUP 5
```

```
R0153   THE NOVAC-FINDVAC CHOICE FOR JOBS HOLDS HERE ALSO - NEGATIVE PRIORITY CAUSES A NOVAC CALL, POSITIVE A FINDVAC.

R0155   SUMMARY OF BITS
R0156   TYPE A          TL0 00P PPP PPP GGG
R0157   TYPE B          TL1 DAP PPP PPP GGG
R0158   TYPE C          TL0 1AD XXX CJW GGG
```

```
P0159   2PHSCHNG IS USED WHEN ONE WISHES TO START UP A GROUP OR CHANGE A GROUP WHILE UNDER THE CONTROL OF A DIFFERENT
R0161   GROUP. FOR EXAMPLE, CHANGE THE PHASE OF GROUP 3 WHILE THE PORTION OF THE PROGRAM IS UNDER GROUP 5. ALL 2PHSCHNG
R0163   CALLS ARE MADE IN THE FOLLOWING MANNER,

A0164                                                       TC       2PHSCHNG
A0165                                                       OCT      XXXXX
A0166                                                       OCT      YYYYY

R0167   WHERE OCT XXXXX MUST BE OF TYPE A AND OCT YYYYY MAY BE OF EITHER TYPE A OR TYPE B OR TYPEC.  THERE IS ONE
R0169   DIFFERENCE --- NOTE- IF LONGBASE IS TO BE SET THIS INFORMATION IS GIVEN IN THE OCT YYYYY INFORMATION, IT WILL
R0171   BE DISREGARDED IF GIVEN WITH THE OCT XXXXX INFORMATION. A COUPLE OF EXAMPLES MAY HELP,

A0173                                              AD       TC       2PHSCHNG        SET TBASE3 AND IF A RESTART OCCURS START
A0174                                              AD+1     OCT      40083           THE TWO ENTRIES IN 3.8 TABLE LOCATION
A0175                                              AD+2     OCT      05025           THIS IS OF TYPE C, SET THE JOB TO BE
A0176                                              AD+3     OCT      18000           TO BE LOCATION AD+4, WITH A PRIORITY 18,
A0177                                              AD+4                              FOR GROUP 5 PHASE INFORMATION

 0178   REF   1                                             COUNT* $$/PHASE
 0179                             5331  0 0004 0  2PHSCHNG INHINT                     THE ENTRY FOR A DOUBLE PHASE CHANGE
 0180   REF 328  LAST 1291        5332  50 C02 0           NDX      Q
 0181                             5333  3 0000 1           CA       0
 0182   REF 329  LAST 1295        5334  24 C02 0           INCR     Q
 0183   REF   1                   5335  54 C72 0           TS       TEMPP2

 0184   REF   1                   5336  7 4750 0           MASK     OCT7
 0185                             5337  6 0000 1           DOUBLE
 0186   REF   1                   5340  54 071 0           TS       TEMPG2

 0187   REF   2  LAST 1295        5341  3 C072 1           CA       TEMPP2
 0188   REF   1                   5342  7 5021 0           MASK     OCT17770        NEED ONLY 1770, BUT WHY GET A NEW CONST.
 0189                             5343  0 0006 1           EXTEND
 0190   REF  31  LAST 1282        5344  7 4731 1           MP       BIT12
 0191   REF   3  LAST 1295        5345  56 072 1           XCH      TEMPP2

 0192   REF  44  LAST 1282        5346  7 4726 1           MASK     BIT15
 0193   REF   1                   5347  54 C66 0           TS       TEMPSW2         INDICATES WHETHER TO SET TBASE OR NOT

 01932  REF 330  LAST 1295        5350  50 002 0           INDEX    Q
 01934                            5351  3 0000 1           CA       0
 01936  REF 331  LAST 1295        5352  24 C02 0           INCR     Q
 01938  REF   1                   5353  54 C65 0           TS       TEMPSW

 0194   REF   1                   5354  1 5365 0           TCF      PHASJUMP

 0195                             5355  0 0004 0  PHASCHNG INHINT                     NORMAL PHASCHNG ENTRY POINT.
 0196   REF 332  LAST 1295        5356  50 C02 0           INDEX    Q
 0197                             5357  3 C000 1           CA       0
 0198   REF 333  LAST 1295        5360  24 002 0           INCR     Q
 0199                             5361  0 0004 0  PHSCHNGA INHINT                     FIRST OCTAL PARAMETER IN A.
```

```
0200     REF   2  LAST 1295       5362  54 065 0            TS      TEMPSW
0201     REF 114  LAST 1260       5363  3 4744 1            CA      ONE
02015    REF   2  LAST 1295       5364  54 066 0            TS      TEMPSW2
0202                              5365  0 0006 1  PHASJUMP  EXTEND
0203     REF   1                  5366  3 5371 1            DCA     ADRPCHN2          OFF TO SWITCHED BANK
0204                              5367  52 006 0            DTCB

0205     REF  47  LAST 1283    E3,1400                      EBANK=  LST1
0206     REF   1                  5370   02213 0  ADRPCHN2  2CADR   PHSCHNG2
0206     REF   1                  5371   20103 1


0207     REF   1                  5372  22 073 0  ONEORTWO  LXCH    TEMPBBCN
0208     REF  42  LAST 1291       5373  22 006 1            LXCH    BBANK
0209     REF   2  LAST 1296       5374  22 073 0            LXCH    TEMPBBCN

0210     REF   1                  5375  7 5015 1            MASK    OCT14000          SEE WHAT KIND OF PHASE CHANGE IT IS
0211     REF 376  LAST 1288       5376  10 000 0            CCS     A
0212     REF   1                  5377  1 7771 0            TCF     CHECKB             IT IS OF TYPE :B:

0213     REF   1                  5400  3 0062 0            CA      TEMPP
0214     REF  35  LAST 1282       5401  7 4736 0            MASK    BIT7
0215     REF 377  LAST 1296       5402  10 000 0            CCS     A                  SHALL WE USE THE OLD PRIORITY
0216     REF   1                  5403  1 5425 0            TCF     GETPRIO            NO GET A NEW PRIORITY (OR DELTA T)

0217     REF   1                  5404  50 061 0  OLDPRIO   NDX     TEMPG              USE THE OLD PRIORITY (OR DELTA T)
0218     REF   1                  5405  3 1051 1            CA      PHSPRDT1 -2
0219     REF   1                  5406  54 070 1            TS      TEMPPR

0220     REF   2  LAST 1296       5407  3 0062 0  CON1      CA      TEMPP             SEE IF A 2CADR IS GIVEN
0221     REF  41  LAST 1282       5410  7 4735 0            MASK    BIT8
0222     REF 378  LAST 1296       5411  10 000 0            CCS     A
0223     REF   1                  5412  1 5431 0            TCF     GETNEWNM

0224     REF 334  LAST 1295       5413  3 0002 0            CA      Q
0225     REF   1                  5414  54 063 0            TS      TEMPNM
0226     REF   1                  5415  3 0006 1            CA      BB
0227                              5416  0 0006 1            EXTEND                    PICK UP USERS SUPERBANK
0228     REF  24  LAST 1127       5417  04 007 1            ROR     SUPERBNK
0229     REF   1                  5420  54 064 1            TS      TEMPBB

0230     REF   1                  5421  3 5424 0  TOCON2    CA      CON2ADR           BACK TO SWITCHED BANK
0231     REF   3  LAST 1296       5422  22 073 0            LXCH    TEMPBBCN
0232                              5423  52 006 0            DTCB

0233     REF   1                  5424   02301 1  CON2ADR   GENADR  CON2

0234     REF 335  LAST 1296       5425  50 002 0  GETPRIO   NDX     Q                 DON:T CARE IF DIRECT OR INDIRECT
0235                              5426  3 0000 1            CA      0                 LEAVE THAT DECISION TO RESTARTS
0236     REF 336  LAST 1296       5427  24 002 0            INCR    Q                 OBTAIN RETURN ADDRESS
```

```
 0237   REF    1                    5430   1 5406 1             TCF      CON1 -1

 0238                               5431   0 0006 1  GETNEWNM EXTEND
 0239   REF 337  LAST 1296          5432   5 0002 0             INDEX    Q
 0240                               5433   3 0001 0             DCA      0
 0241   REF   2  LAST 1296          5434  52 064 1              DXCH     TEMPNM
 0242   REF  76  LAST 1129          5435   3 4743 0             CA       TWO
 0243   REF 338  LAST 1297          5436  26 002 1              ADS      Q                    OBTAIN RETURN ADDRESS

 0244   REF   1                     5437   1 5421 1             TCF      TOCON2

 0245   REF   2  LAST  519          5015                 OCT14000 EQUALS   PRIO14
 0246   REF  38  LAST 1258          0061                 TEMPG    EQUALS   ITEMP1
 0247   REF  24  LAST 1258          0062                 TEMPP    EQUALS   ITEMP2
 0248   REF  21  LAST  746          0063                 TEMPNM   EQUALS   ITEMP3
 0249   REF   9  LAST  746          0064                 TEMPBB   EQUALS   ITEMP4
 0250   REF   9  LAST  618          0065                 TEMPSW   EQUALS   ITEMP5
 0251   REF   5  LAST  618          0066                 TEMPSW2  EQUALS   ITEMP6
 0252   REF  26  LAST 1291          0070                 TEMPPR   EQUALS   RUPTREG1
 0253   REF   7  LAST  817          0071                 TEMPG2   EQUALS   RUPTREG2
 0254   REF   8  LAST  998          0072                 TEMPP2   EQUALS   RUPTREG3

 0255   REF   5  LAST  998          0073                 TEMPBBCN EQUALS   RUPTREG4
 0256   REF  43  LAST 1296          0006                 BB       EQUALS   BBANK


 0257                           14,3765                           BANK     14
 0258   REF   1                 10,2000                           SETLOC   PHASETAB
 0259                           10,2213                           BANK

 0260   REF   1                 E3,1436                           EBANK=   PHSNAME1
 0261   REF   1                                                   COUNT*   $$/PHASE
 0262   REF   4  LAST 1296      10,2213  22 073 0      PHSCHNG2   LXCH     TEMPBBCN
 0263   REF   3  LAST 1296      10,2214   3 0065 1                CA       TEMPSW
 0264   REF   2  LAST 1295      10,2215   7 4750 0                MASK     OCT7
 0265                           10,2216   6 0000 1                DOUBLE
 0266   REF   2  LAST 1296      10,2217  54 061 1                 TS       TEMPG

 0267   REF   4  LAST 1297      10,2220   3 0065 1                CA       TEMPSW
 0268   REF   2  LAST 1295      10,2221   7 5021 0                MASK     OCT17770
 0269                           10,2222   0 0006 1                EXTEND
 0270   REF  32  LAST 1295      10,2223   7 4731 1                MP       BIT12
 0271   REF   3  LAST 1296      10,2224  54 062 1                 TS       TEMPP

 0272   REF   5  LAST 1297      10,2225   3 0065 1                CA       TEMPSW
 0273   REF   1                 10,2226   7 4101 1                MASK     OCT60000
 0274   REF   6  LAST 1297      10,2227  56 065 1                 XCH      TEMPSW
 0275   REF   2  LAST 1296      10,2230   7 5015 1                MASK     OCT14000
 0276   REF 379  LAST 1296      10,2231  10 000 0                 CCS      A
```

```
0277   REF   1              10,2232   1 5372 0              TCF      ONEORTWO

0278   REF   4  LAST 1297   10,2233   3 0062 0              CA       TEMPP           START STORING THE PHASE INFORMATION
0279   REF   3  LAST 1297   10,2234  50 061  0              NDX      TEMPG
0280   REF   2  LAST  228   10,2235  54 750  1              TS       PHASE1 -2

0281   REF   3  LAST 1296   10,2236  10 066  0   BELOW1     CCS      TEMPSW2         IS IT A PHASCHNG OR A 2PHSCHNG
0282   REF   1              10,2237   1 2253 0              TCF      BELOW2          IT:S A PHASCHNG

0283                        10,2240   1 2241 0              TCF      +1              IT:S A 2PHSCHNG
0284   REF   4  LAST 1295   10,2241   4 0C72 0              CS       TEMPP2
0285   REF   5  LAST 1298   10,2242  22 072  1              LXCH     TEMPP2
0286   REF   2  LAST 1295   10,2243  50 071  1              NDX      TEMPG2
0287   REF   5  LAST  869   10,2244  52 750  1              DXCH     -PHASE1 -2

0288   REF   4  LAST 1298   10,2245  10 C66  0              CCS      TEMPSW2
0289                        10,2246  12 247  0              NOOP                     CAN:T GET HERE
0290   REF   2  LAST 1298   10,2247   1 2253 0              TCF      BELOW2

0291   REF  24  LAST  995   10,2250   4 0025 1              CS       TIME1
0292   REF   3  LAST 1298   10,2251  50 C71  1              NDX      TEMPG2
0293   REF   2  LAST  731   10,2252  55'050  1              TS       TBASE1 -2

0294   REF   7  LAST 1297   10,2253  10 C65  0   BELOW2     CCS      TEMPSW          SEE IF WE SHOULD SET TBASE OR LONGBASE
0295   REF   1              10,2254   1 2267 1              TCF      BELOW3          SET LONGBASE ONLY
0296   REF   1              10,2255   1 2272 0              TCF      BELOW4          SET NEITHER

0297   REF  25  LAST 1298   10,2256   4 0025 1              CS       TIME1           SET TBASE TO BEGIN WITH
0298   REF   4  LAST 1298   10,2257  50 C61  0              NDX      TEMPG
0299   REF   3  LAST 1298   10,2260  55'050  1              TS       TBASE1 -2

0300   REF   8  LAST 1298   10,2261   3 0065 1              CA       TEMPSW           SHALL WE NOW SET LONGBASE
0301   REF   1              10,2262   6 2265 1              AD       BIT14COM
0302   REF 380  LAST 1297   10,2263  10 000  0              CCS      A
0303                        10,2264  12 265  0              NOOP                     ***** CANT GET HERE *****
0304                        10,2265    17777 0   BIT14COM   OCT      17777           ***** CANT GET HERE *****
0305   REF   2  LAST 1298   10,2266   1 2272 0              TCF      BELOW4          NO WE NEED ONLY SET TBASE

0306                        10,2267   0 0006 1   BELOW3     EXTEND                   SET LONGBASE
0307   REF  31  LAST 1221   10,2270   3 0025 0              DCA      TIME2
0308   REF   1              10,2271  53'151  1              DXCH     LONGBASE

0309   REF   5  LAST 1298   10,2272   4 0062 1   BELOW4     CS       TEMPP           AND STORE THE FINAL PART OF THE PHASE
0310   REF   5  LAST 1298   10,2273  50 C61  0              NDX      TEMPG
0311   REF   6  LAST 1298   10,2274  54 747  1              TS       -PHASE1 -2

0312   REF 339  LAST 1297   10,2275   3 0002 0              CA       Q
0313   REF   5  LAST 1297   10,2276  22 C73  0              LXCH     TEMPBBCN
0314                        10,2277   0 0003 1              RELINT
0315                        10,2300  52 006  0              DTCB
```

```
 0316   REF   6  LAST 1298   10,2301  22 073 0  CON2      LXCH    TEMPBBCN

 0317   REF   6  LAST 1298   10,2302  3 0062 0            CA      TEMPP
 0318   RFF   6  LAST 1298   10,2303  50 061 0            NDX     TEMPG
 0319   REF   3  LAST 1298   10,2304  54 750 1            TS      PHASE1 -2

 0320   REF   2  LAST 1296   10,2305  3 0070 0            CA      TEMPPR
 0321   REF   7  LAST 1299   10,2306  50 061 0            NDX     TEMPG
 0322   REF   2  LAST 1296   10,2307  55'051 0            TS      PHSPRDT1 -2

 0323                        10,2310  0 0006 1            EXTEND
 0324   REF   3  LAST 1297   10,2311  3 0064 0            DCA     TEMPNM
 0325   REF   8  LAST 1299   10,2312  50 061 0            NDX     TEMPG
 0326   RFF   2  LAST 1297   10,2313  53'435 0            DXCH    PHSNAME1 -2

 0327   REF   1              10,2314  1 2236 0            TCF     BELOW1

 0328                           7771                      BLOCK   03
 0329   REF   4  LAST  745      6000                      SETLOC  FFTAG6
 0330                           7771                      BANK

 0331   PEF   1                                           COUNT*  $$/PHASE
 0332   REF  33  LAST 1297      7771  7 4731 1  CHECKB    MASK    BIT12          SINCE THIS IS OF TYPE B, THIS BIT SHOULD
 0333   REF 381  LAST 1298      7772  10 000 0            CCS     A               BE HEPE IF WF APE TO GET A NEW PRIORITY
 0334   REF   2  LAST 1296      7773  1 5425 0            TCF     GETPRIO        IT IS, SO GET NEW PRIORITY

 0335   REF   1                 7774  1 5404 0            TCF     OLDPRIO        IT ISN:T, USF THE OLD PRIORITY
```

```
0001                          01,3530                          BANK    01
0002  REF   2  LAST  250      01,2000                          SETLCC  RESTART
0003                          01,3530                          BANK

0004  REF   3  LAST 1299      E3,1436                          EBANK=  PHSNAME1          GOPROG MUST SWITCH TO THIS EBANK

0005  REF   1                                                  COUNT*  $$/RSROU
0006  REF 769  LAST 1264      01,3530  3 0161 1    RESTARTS    CA      MPAC +5           GET GROUP NUMBER -1
0007                          01,3531  6 0000 1                DOUBLE                    SAVE FOR INDEXING
0008  REF   1                 01,3532  54 155 1                TS      TEMP2G

0009  REF   1                 01,3533  3 3772 0                CA      PHS2CADR          SET UP EXIT IN CASE IT IS AN EVEN
0010  REF   1                 01,3534  54 157 0                TS      TEMPSWCH          TABLE PHASE

0011  REF   1                 01,3535  3 3567 0                CA      RTRNCADR          TO SAVE TIME ASSUME IT WILL GET NEXT
0012  REF   1                 01,3536  54 707 0                TS      GOLOC +2          GROUP AFTER THIS

0013  REF   1                 01,3537  3 0154 1                CA      TEMPPHS
0014  REF  10  LAST 1283      01,3540  7 5000 0                MASK    OCT1400
0015  REF 382  LAST 1299      01,3541  10 000 0                CCS     A                 IS IT A VARIABLE OR TABLE RESTART
0016  REF   1                 01,3542  1 3553 0                TCF     ITSAVAR           IT:S A VARIABLE RESTART

0017  REF   2  LAST 1300      01,3543  10 154 0    GETPART2    CCS     TEMPPHS           IS IT AN X.1 RESTART
0018  REF 383  LAST 1300      01,3544  10 000 0                CCS     A
0019  REF   1                 01,3545  1 3653 0                TCF     ITSATBL           NO, ITS A TABLE RESTART

0020  REF   3  LAST 1297      01,3546  3 5015 0                CA      PRIO14            IT IS AN X.1 RESTART, THEREFORE START
0021  REF  41  LAST 1206      01,3547  0 5076 0                TC      FINDVAC           THE DISPLAY RESTART JOB
0022  REF  48  LAST 1296      E3,1400                          EBANK=  LST1
0023  REF   1                 01,3550   03051 0                2CADR   INITDSP
0023  REF   1                 01,3551   20103 1

0024  REF   2  LAST 1300      01,3552  0 3567 0                TC      RTRNCADR          FINISHED WITH THIS GROUP, GET NEXT ONE

0025  REF  11  LAST 1300      01,3553  7 5000 0    ITSAVAR     MASK    OCT1400           IS IT TYPE B ?
0026  REF 384  LAST 1300      01,3554  10 000 0                CCS     A
0027  REF   1                 01,3555  1 3624 0                TCF     ITSLIKEB          YES,IT IS TYPE B

0028                          01,3556  0 0006 1                EXTEND                    STORE THE JOB (OR TASK) 2CADR FOR EXIT
0029  REF   2  LAST 1300      01,3557  5 0155 0                NDX     TEMP2G
0030  REF   4  LAST 1300      01,3560  3 1437 0                DCA     PHSNAME1
0031  REF   2  LAST 1300      01,3561  52 706 1                DXCH    GOLOC

0032  REF   3  LAST 1300      01,3562  3 0154 1                CA      TEMPPHS           SEE IF THIS IS A JOB, TASK, OR A LONGCAL
0033  REF   3  LAST 1297      01,3563  7 4750 0                MASK    OCT7
0034  REF   3  LAST 1153      01,3564  6 7767 0                AD      MINUS2
0035  REF 385  LAST 1300      01,3565  10 000 0                CCS     A
0036  REF   1                 01,3566  1 3736 1                TCF     ITSLNGCL          ITS A LONGCALL

0037  REF   7  LAST 1264      01,3567  0 4622 0    RTRNCADR    TC      SWRETURN          CANT GET HERE
```

```
 0038   REF   1                01,3570   1 3572 0            TCF      ITSAWAIT

 0039   REF   1                01,3571   1 3637 1            TCF      ITSAJOB          ITS A JOB

 0040   REF   1                01,3572   3 4343 1  ITSAWAIT  CA       WTLTCADR         SET UP WAITLIST CALL
 0041   REF   3   LAST 1300    01,3573   54 704 0            TS       GOLOC -1

 0042   REF   3   LAST 1300    01,3574   50 155 0            NDX      TEMP2G           DIRECTLY STORED
 0043   REF   3   LAST 1299    01,3575   3 1053 0            CA       PHSPRDT1
 0044   REF 386   LAST 1300    01,3576   10 000 0  TIMETEST  CCS      A                IS IT AN IMMEDIATE RESTART
 0045   REF 387   LAST 1301    01,3577   24 000 1            INCR     A                NO,
 0046   REF   1                01,3600   1 3603 0            TCF      FINDTIME         FIND OUT WHEN IT SHOULD BEGIN

 0047   REF   1                01,3601   1 5440 0            TCF      ITSINDIR         STORED INDIRECTLY

 0048   REF   1                01,3602   1 3622 0            TCF      IMEDIATE         IT WANTS AN IMMEDIATE RESTART

R0049   ***** THIS MUST BE IN FIXED FIXED *****

 0050                              5440                      BLOCK    02
 0051   REF   1                    4000                      SETLOC   FFTAG2
 0052                              5440                      BANK

 0053   REF   1                                              COUNT*   $$/RSROU
 0054   REF   4   LAST 1301        5440  22 706 0  ITSINDIR  LXCH     GOLOC +1         GET THE CORRECT E BANK IN CASE THIS IS
 0055   REF   2   LAST 1296        5441  22 006 1            LXCH     BB               SWITCHED ERRASIBLE

 0056   REF 388   LAST 1301        5442  50 000 1            NDX      A                GET THE TIME INDIRECTLY
 0057                              5443  3 0001 0            CA       1

 0058   REF   3   LAST 1301        5444  22 006 1            LXCH     BB               RESTORE THE BB AND GOLOC
 0059   REF   5   LAST 1301        5445  22 706 0            LXCH     GOLOC +1

 0060   REF   2   LAST 1301        5446  1 3603 0            TCF      FINDTIME         FIND OUT WHEN IT SHOULD BEGIN

R0061   ***** YOU  MAY RETURN TO  SWITCHED FIXED *****

 0062                          01,3603                       BANK     01
 0063   REF   3   LAST 1300    01,2000                       SETLOC   RESTART
 0064                          01,3603                       BANK

 0065   REF   2 LAST 1300 TO 1301:    43     43*             COUNT*   $$/RSROU
 0066                          01,3603   4 0000 0  FINDTIME  COM                       MAKE NEGITIVE SINCE IT WILL BE SUBTRACTD
 0067   REF 245   LAST 1290    01,3604   54 0001 1           TS       L                AND SAVE
 0068   REF   4   LAST 1301    01,3605   50 155 0            NDX      TEMP2G
 0069   REF   4   LAST 1298    01,3606   4 1052 0            CS       TBASE1
 0070                          01,3607   0 0006 1            EXTEND
 0071   REF  26   LAST 1298    01,3610   60 025 0            SU       TIME1
 0072   REF 389   LAST 1301    01,3611   10 000 0            CCS      A
 0073                          01,3612   4 0000 0            COM
```

```
L         RESTARTS ROUTINE                                                                           USER'S PAGE NO.   3       E3 S4

0074   REF   2  LAST  169   01,3613  6 7752 0              AD      OCT37776
0075   REF 115  LAST 1296   01,3614  6 4744 1              AD      ONE
0076   REF 246  LAST 1301   01,3615  6 0001 0              AD      L
0077   REF 390  LAST 1301   01,3616  10 C00 0              CCS     A
0078   REF 235  LAST 1282   01,3617  3 4746 0              CA      ZERO
0079                        01,3620  1 3622 0              TCF     +2
0080                        01,3621  1 3622 0              TCF     +1
0081   REF 116  LAST 1302   01,3622  6 4744 1   IMEDIATE   AD      ONE
0082   REF   6  LAST 1301   01,3623  0 C704 1              TC      GOLOC -1
0083   REF   3  LAST 1300   01,3624  3 3567 0   ITSLIKEB   CA      RTRNCADR         TYPE B,              SO STORE RETURN IN
0084   REF   2  LAST 1300   01,3625  54 157 0              TS      TEMPSWCH         TEMPSWCH IN CASE OF AN EVEN PHASE

0085   REF   1              01,3626  3 3773 1              CA      PRT2CADR         SET UP EXIT TO GET TABLE PART OF THIS
0086   REF   7  LAST 1302   01,3627  54 707 0              TS      GOLOC +2         VARIABLE TYPE OF PHASE

0087   REF   4  LAST 1300   01,3630  3 0154 1              CA      TEMPPHS          MAKE THE PHASE LOOK RIGHT FOR THE TABLE
0088   REF   1              01,3631  7 6115 0              MASK    OCT177           PART OF THIS VARIABLE PHASE
0089   REF   5  LAST 1302   01,3632  54 154 0              TS      TEMPPHS

0090                        01,3633  0 0006 1              EXTEND
0091   REF   5  LAST 1301   01,3634  5 0155 0              NDX     TEMP2G           OBTAIN THE JOB:S 2CADR
0092   REF   5  LAST 1300   01,3635  3 1437 0              DCA     PHSNAME1
0093   REF   8  LAST 1302   01,3636  52 706 1              DXCH    GOLOC

0094   REF   6  LAST 1302   01,3637  50 155 0   ITSAJOB    NDX     TEMP2G           NOW ADD THE PRIORITY AND LET:S GO
0095   REF   4  LAST 1301   01,3640  3 1053 0              CA      PHSPRDT1
0096   REF   9  LAST 1302   01,3641  54 704 0   CHKNOVAC   TS      GOLOC -1         SAVE PRIO UNTIL WE SEE IF ITS
0097                        01,3642  0 0006 1              EXTEND                   A FINDVAC OR A NOVAC
0098   REF   1              01,3643  6 3647 1              BZMF    ITSNOVAC

0099   REF   1              01,3644  3 4345 1              CAF     FVACCADR         POSITIVE, SET UP FINDVAC CALL.
0100   REF  10  LAST 1302   01,3645  56 704 1              XCH     GOLOC -1         PICK UP PRIO,
0101   REF  11  LAST 1302   01,3646  0 C704 1              TC      GOLOC -1         AND GO

0102   REF   1              01,3647  3 4342 0   ITSNOVAC   CAF     NOVACADR         NEGATIVE,
0103   REF  12  LAST 1302   01,3650  56 704 1              XCH     GOLOC -1         SET UP NOVAC CALL,
0104                        01,3651  4 CC00 0              COM                      CORRECT PRIO,
0105   REF  13  LAST 1302   01,3652  0 C704 1              TC      GOLOC -1         AND GO

0106   REF  41  LAST 1287   01,3653  54 020 1   ITSATBL    TS      CYR              FIND OUT IF THE PHASE IS ODD OR EVEN
0107   REF  42  LAST 1302   01,3654  10 020 1              CCS     CYR
0108                        01,3655  1 3656 0              TCF     +1               IT:S EVEN
0109   REF   1              01,3656  1 3754 0              TCF     ITSEVEN

0110   REF   4  LAST 1302   01,3657  3 3567 0              CA      RTRNCADR         IN CASE THIS IS THE SECOND PART OF A
0111   REF  14  LAST 1302   01,3660  54 707 0              TS      GOLOC +2         TYPE B RESTART, WE NEED PROPER EXIT

0112   REF   6  LAST 1302   01,3661  3 0154 1              CA      TEMPPHS          SET UP POINTER FOR FINDING OUR PLACE IN
0113   REF  25  LAST 1290   01,3662  54 021 0              TS      SR               THE RESTART TABLES
0114   REF  26  LAST 1302   01,3663  6 0021 1              AD      SR
```

```
 0115    REF   7  LAST 1302    01,3664  50 155 0             NDX      TEMP2G
 0116    REF   1               01,3665  6 2003 0             AD       SIZETAB +1
 0117    REF   1               01,3666  54 156 1             TS       POINTER

 0118                          01,3667  0 0006 1   CONTBL2   EXTEND                      FIND OUT WHAT:S IN THE TABLE
 0119    REF   2  LAST 1303    01,3670  5 0156 0             NDX      POINTER
 0120    REF   1               01,3671  3 2002 1             DCA      CADRTAB            GET THE 2CADR

 0121    REF  15  LAST 1302    01,3672  22 706 0             LXCH     GOLOC +1           STORE THE BB INFORMATION

 0122    REF 391  LAST 1302    01,3673  10 000 0             CCS      A                  IS IT A JOB OR IS IT  TIMED
 0123    REF 392  LAST 1303    01,3674  24 000 1             INCR     A                  POSITIVE, MUST BE A JOB
 0124    REF   1               01,3675  1 3750 1             TCF      ITSAJOB2

 0125    REF 393  LAST 1303    01,3676  24 000 1             INCR     A                  MUST BE EITHER A WAITLIST OR LONGCALL
 0126    REF  16  LAST 1303    01,3677  54 705 1             TS       GOLOC              LET-S STORE THE CORRECT CADR

 0127    REF   2  LAST 1301    01,3700  3 4343 1             CA       WTLTCADR           SET UP OUR EXIT TO WAITLIST
 0128    REF  17  LAST 1303    01,3701  54 704 0             TS       GOLOC -1

 0129    REF  18  LAST 1303    01,3702  3 0706 0             CA       GOLOC +1           NOW FIND OUT IF IT IS A WAITLIST CALL
 0130    REF  36  LAST 1282    01,3703  7 4733 0             MASK     BIT10              THIS SHOULD BE ONE IF WE HAVE -BB
 0131    REF 394  LAST 1303    01,3704  10 000 0             CCS      A                  FOR THAT MATTER SO SHOULD BE BITS 9,8,7,
A0132                                                                                    6,5, AND LAST BUT NOT LEAST (PERHAPS NOT
A0133                                                                                    IN IMPORTANCE ANYWAY. BIT 4
 0134    REF   1               01,3705  1 3743 0             TCF      ITSWTLST           IT IS A WAITLIST CALL

 0135    REF   3  LAST 1303    01,3706  50 156 0             NDX      POINTER            OBTAIN THE ORIGINAL DELTA T
 0136    REF   1               01,3707  3 2000 0             CA       PRDTTAB            ADDRESS FOR THIS LONGCALL

 0137    REF   1               01,3710  1 5447 1             TCF      ITSLGCL1           NOW GO GET THE DELTA TIME

R0138    ***** THIS MUST BE IN FIXED FIXED *****

 0139                              5447                      BLOCK    02
 0140    REF   2  LAST 1301        4000                      SETLOC   FFTAG2
 0141                              5447                      BANK

 0142    REF   2 LAST 1301 TO 1301:       7       7*         COUNT*   $$/RSROU
 0143    REF  19  LAST 1303        5447  22 706 0  ITSLGCL1  LXCH     GOLOC +1           OBTAIN THE CORRECT F BANK
 0144    REF   4  LAST 1301        5450  22 006 1            LXCH     BB
 0145    REF  20  LAST 1303        5451  22 706 0            LXCH     GOLOC +1           AND PRESERVE OUR E AND F BANKS

 0146                              5452  0 0006 1            EXTEND                      GET THE DELTA TIME
 0147    REF 395  LAST 1303        5453  5 0000 1            NDX      A
 0148                              5454  3 0001 0            DCA      0

 0149    REF  21  LAST 1303        5455  22 706 0            LXCH     GOLOC +1           RESTORE OUR E AND F BANK
 0150    REF   5  LAST 1303        5456  22 006 1            LXCH     BB                 RESTORE THE TASKS E AND F BANKS
 0151    REF  22  LAST 1303        5457  22 706 0            LXCH     GOLOC +1           AND PRESERVE OUR L
 0152   REF   1                5460  1 3711 1             TCF     ITSLGCL2      NOW LET:S PROCESS THIS LONGCALL

R0153   ***** YOU  MAY RETURN TO  SWITCHED FIXED *****

 0154                      01,3711                        BANK    01
 0155   REF   4  LAST 1301 01,2000                        SETLOC  RESTART
 0156                      01,3711                        BANK

 0157   REF   3 LAST 1301 TO 1303:    70   113*           COUNT*  $$/RSROU
 0158   REF   8  LAST 1130 01,3711 53'153 0  ITSLGCL2 DXCH    LONGTIME

 0159                      01,3712  0 0006 1              EXTEND                CALCULATE TIME LEFT
 0160   REF  32  LAST 1298 01,3713  4 0025 1              DCS     TIME2
 0161   REF   9  LAST 1304 01,3714 21'153 0               DAS     LONGTIME
 0162                      01,3715  0 0006 1              EXTEND
 0163   REF   2  LAST 1298 01,3716  3 1151 0              DCA     LONGBASE
 0164   REF  10  LAST 1304 01,3717 21'153 0               DAS     LONGTIME

 0165   REF  11  LAST 1304 01,3720 11'152 1               CCS     LONGTIME      FIND OUT HOW THIS SHOULD BE RESTARTED
 0166   REF   1            01,3721  1 3731 0              TCF     LONGCLCL
 0167                      01,3722  1 3724 1              TCF     +2
 0168   REF   2  LAST 1301 01,3723  1 3617 0              TCF     IMEDIATE -3
 0169   REF  12  LAST 1304 01,3724 11'153 0               CCS     LONGTIME +1
 0170   REF   2  LAST 1304 01,3725  1 3731 0              TCF     LONGCLCL
 0171                      01,3726 13 727 1               NOOP                  CAN:T GET HERE    *********
 0172   REF   3  LAST 1304 01,3727  1 3617 0              TCF     IMEDIATE -3
 0173   REF   4  LAST 1304 01,3730  1 3622 0              TCF     IMEDIATE

 0174   REF   1            01,3731  3 3774 0  LONGCLCL CA      LGCLCADR      WE WILL GO TO LONGCALL
 0175   REF  23  LAST 1303 01,3732 54 704 0               TS      GOLOC -1

 0176                      01,3733  0 0006 1              EXTEND                PREPARE OUR ENTRY TO LONGCALL
 0177   REF  13  LAST 1304 01,3734  3 1153 1              DCA     LONGTIME
 0178   REF  24  LAST 1304 01,3735  0 0704 1              TC      GOLOC -1

 0179   REF   3  LAST 1303 01,3736  3 4343 1  ITSLNGCL CA      WTLTCADR      ASSUME IT WILL GO TO WAITLIST
 0180   REF  25  LAST 1304 01,3737 54 704 0               TS      GOLOC -1

 0181   REF   8  LAST 1303 01,3740 50 155 0               NDX     TEMP2G
 0182   REF   5  LAST 1302 01,3741  4 1053 1              CS      PHSPRDT1      GET THE DELTA T ADDRESS

 0183   REF   2  LAST 1303 01,3742  1 5447 1              TCF     ITSLGCL1      NOW GET THE DELTA TIME

 0184   REF  26  LAST 1304 01,3743  4 0706 1  ITSWTLST CS      GOLOC +1      CORRECT THE BBCON INFORMATION
 0185   REF  27  LAST 1304 01,3744 54 706 1               TS      GOLOC +1

 0186   REF   4  LAST 1303 01,3745 50 156 0               NDX     POINTER       GET THE DT AND FIND OUT IF IT WAS STORED
 0187   REF   2  LAST 1303 01,3746  3 2000 0              CA      PRDTTAB       DIRECTLY OR INDIRECTLY

 0188   REF   1            01,3747  1 3576 1              TCF     TIMETEST      FIND OUT HOW THE TIME IS STORED
 0189   REF  28  LAST 1304   01,3750  56 705 0  ITSAJOB2 XCH    GOLOC          STORE THE CADR

 0190   REF   5  LAST 1304   01,3751  50 156 0           NDX    POINTER        ADD THE PRIORITY AND LET:S GO
 0191   REF   3  LAST 1304   01,3752  3 2000 0           CA     PRDTTAB

 0192   REF   1              01,3753  1 3641 0           TCF    CHKNOVAC

 0193   REF   3  LAST 1302   01,3754  3 0157 1  ITSEVEN  CA     TEMPSWCH       SET UP FOR EITHER THE SECOND PART OF THE
 0194   REF  29  LAST 1305   01,3755  54 707 0           TS     GOLOC +2       TABLE, OR A RETURN FOR THE NEXT GROUP

 0195   REF   9  LAST 1304   01,3756  50 155 0           NDX    TEMP2G         SET UP POINTER FOR OUR LOCATION WITHIN
 0196   REF   2  LAST 1303   01,3757  3 2002 1           CA     SIZETAB        THE TABLE
 0197   REF   7  LAST 1302   01,3760  6 0154 1           AD     TEMPPHS        THIS MAY LOOK BAD BUT LET:S SEE YOU DO
 0198   REF   8  LAST 1305   01,3761  6 0154 1           AD     TEMPPHS        BETTER IN TIME OR NUMBERR OF LOCATIONS
 0199   REF   9  LAST 1305   01,3762  6 0154 1           AD     TEMPPHS
 0200   REF   6  LAST 1305   01,3763  54 156 1           TS     POINTER

 0201   REF   1              01,3764  1 3667 1           TCF    CONTBL2        NOW PROCESS WHAT IS IN THE TABLE

 0202   REF  36  LAST 1282   01,3765  3 6266 0  PHSPART2 CA     THREE          SET THE POINTER FOR THE SECOND HALF OF
 0203   REF   7  LAST 1305   01,3766  26 156 1           ADS    POINTER        THE TABLE

 0204   REF   5  LAST 1302   01,3767  3 3567 0           CA     RTRNCADR       THIS WILL BE OUR LAST TIME THROUGH THE
 0205   REF  30  LAST 1305   01,3770  54 707 0           TS     GOLOC +2       EVEN TABLE , SO AFTER IT  GET THE NEXT
A0206                                                                          GROUP
 0207   REF   2  LAST 1305   01,3771  1 3667 1           TCF    CONTBL2        SO LET:S GET THE SECOND ENTRY IN THE TBL

 0208   REF 770  LAST 1300      0154            TEMPPHS  EQUALS MPAC
 0209   REF 771  LAST 1305      0155            TEMP2G   EQUALS MPAC +1
 0210   REF 772  LAST 1305      0156            POINTER  EQUALS MPAC +2
 0211   REF 773  LAST 1305      0157            TEMPSWCH EQUALS MPAC +3
 0213   REF   8  LAST 1283      7767            MINUS2   EQUALS NEG2
 0214   REF   9  LAST 1108      6115            OCT177   EQUALS LOW7


 0215   REF   1              01,3772   03765 0  PHS2CADR GENADR PHSPART2
 0216   REF   1              01,3773   03543 0  PRT2CADR GENADR GETPART2
 0217   REF   5  LAST 1207   01,3774   05301 0  LGCLCADR GENADR LONGCALL
 0218   REF   2  LAST  463      4345            FVACCADR =      TCFINDVC
 0219   REF   2  LAST  463      4343            WTLTCADR =      TCWAIT
 0220   REF   2  LAST  462      4342            NOVACADR =      TCNOVAC
 0001   REF   1                 4000                 SETLOC FFTAG3
 0002                           5461                 BANK

 0003   REF   1              E3,1471                 EBANK= COMMAND

R0004              FIXED-FIXED ROUTINES.

 0005   REF   1                                      COUNT* $$/IMODE
 0006   REF 236  LAST 1302      5461  3 4746 0  ZEROICDU CAF    ZERO              ZERO ICDU COUNTERS.
 0007   REF  18  LAST 1258      5462  54 032 1           TS     CDUX
 0008   REF  12  LAST 1258      5463  54 033 0           TS     CDUY
 0009   REF  15  LAST 1258      5464  54 034 1           TS     CDUZ
 0010   REF 340  LAST 1298      5465  0 0002 0           TC     Q

 0011   REF  25  LAST 1282      4734            SPSCODE  =      BIT9
```

```
P0012              IMU ZEROING ROUTINE.

 0013                              11,3776                       BANK    11
 0014   REF    1                   07,2000                       SETLOC MODESW
 0015                              07,2701                       BANK

 0016   REF    1                                                 COUNT* $$/IMODE
 0017                              07,2701  0 0004 0   IMUZERO   INHINT                   ROUTINE TO ZERO ICDUS.
 0018   REF   49  LAST  541        07,2702  4 1035 1             CS      DSPTAB +11D      DONT ZERO CDUS IF IMU IN GIMBAL LOCK AND
 0019   REF    4  LAST  223        07,2703  7 4762 1             MASK    BITS4&6          COARSE ALIGN (GIMBAL RUNAWAY PROTECTION)
 0020   REF  396  LAST 1303        07,2704  10 000 0             CCS     A
 0021   REF    1                   07,2705  1 2711 0             TCF     IMUZEROA

 0022   REF   43  LAST 1251        07,2706  0 5571 1             TC      ALARM            IF SO.
 0023                              07,2707   00206 0             OCT     00206

 0024   REF    1                   07,2710  1 3676 1             TCF     CAGETSTJ +4      IMMEDIATE FAILURE.

 0025   REF    2  LAST 1307        07,2711  0 3672 1   IMUZEROA  TC      CAGETSTJ
R0026             DELETE
 0027   REF   38  LAST  903        07,2712  4 1300 1             CS      IMODES33         DISABLE DAP AUTO AND HOLD MODES
 0028   REF    2  LAST  860        07,2713  7 4764 1             MASK    SUPER011             BIT5 FOR GROUND
 0029   REF   39  LAST 1307        07,2714  27'300 1             ADS     IMODES33

 0030   REF   48  LAST  981        07,2715  4 1277 0             CS      IMODES30         INHIBIT ICDUFAIL AND IMUFAIL (IN CASE WE
 0031   REF    1                   07,2716  7 5745 0             MASK    BITS3&4          JUST CAME OUT OF COARSE ALIGN).
 0032   REF   49  LAST 1307        07,2717  27'277 0             ADS     IMODES30

 0033   REF    5  LAST 1307        07,2720  4 4762 1             CS      BITS4&6          SEND ZERO ENCODE WITH COARSE AND ERROR
 0034                              07,2721  0 0006 1             EXTEND                   COUNTER DISABLED.
 0035   REF   51  LAST  903        07,2722  03 012 1             WAND    CHAN12

 0036   REF    3  LAST  176        07,2723  0 3253 0             TC      NOATTOFF         TURN OFF NO ATT LAMP.

 0037   REF   40  LAST 1282        07,2724  3 4740 0             CAF     BIT5
 0038                              07,2725  0 0006 1             EXTEND
 0039   REF   52  LAST 1307        07,2726  05 012 1             WOR     CHAN12

 0040   REF    3  LAST  176        07,2727  0 5461 1             TC      ZEROICDU
 0041   REF   44  LAST 1282        07,2730  3 4737 0             CAF     BIT6             WAIT 320 MS TO GIVE AGS ADEQUATE TIME TO
 0042   REF   33  LAST 1130        07,2731  0 5205 0             TC      WAITLIST         RECEIVE ITS PULSE TRAIN.
 0043   REF    3  LAST  180        E3,1474                       EBANK=  CDUIND
 0044   REF    1                   07,2732   02744 1             2CADR   IMUZERO2
 0044   REF    1                   07,2733   16103 1

 0045   REF   50  LAST 1307        07,2734  4 1277 0             CS      IMODES30         SEE IF IMU OPERATING AND ALARM IF NOT.
 0046   REF   26  LAST 1306        07,2735  7 4734 1             MASK    BIT9
 0047   REF  397  LAST 1307        07,2736  10 000 0             CCS     A
 0048   REF    1                   07,2737  1 2742 0             TCF     MODEEXIT
 0049   REF  44  LAST 1307   07,2740  0 5571 1            TC      ALARM
 0050                        07,2741   00210 1            OCT     210

 0051                        07,2742  0 0003 1  MODEEXIT RELINT                     GENERAL MODE-SWITCHING EXIT.
 0052   REF   8  LAST 1300   07,2743  1 4622 1            TCF     SWRETURN


 0053   REF   1              07,2744  0 3660 1  IMUZERO2 TC      CAGETEST
 0054   REF   4  LAST 1307   07,2745  0 5461 1            TC      ZEROICDU           ZERO CDUX, CDUY, CDUZ

 0055   REF  41  LAST 1307   07,2746  4 4740 1            CS      BIT5               REMOVE ZERO DISCRETE.
 0056                        07,2747  0 0006 1            EXTEND
 0057   REF  53  LAST 1307   07,2750  03 012 1            WAND    CHAN12

 0058   REF  28  LAST 1282   07,2751  3 4732 0            CAF     BIT11              WAIT 10 SECS FOR CTRS TO FIND GIMBALS
 0059   REF   8  LAST  898   07,2752  0 5226 1            TC      VARDELAY

 0060   REF   2  LAST 1308   07,2753  0 3660 1  IMUZERO3 TC      CAGETEST
 0061   REF   2  LAST 1307   07,2754  4 5745 0            CS      BITS3&4            REMOVE IMUFAIL AND ICDUFAIL INHIBIT.
 0062   REF  51  LAST 1307   07,2755  7 1277 0            MASK    IMODES30
 0063   REF  52  LAST 1308   07,2756  55'277 0            TS      IMODES30

 0064   REF   3  LAST 1307   07,2757  4 4764 1            CS      SUPER011           ENABLE DAP AUTO AND HOLD MODES
 0065   REF  40  LAST 1307   07,2760  7 1300 1            MASK    IMODES33                BIT5 FOR GROUND
 0066   REF  41  LAST 1308   07,2761  55'300 1            TS      IMODES33

 0067   REF  50  LAST  964   07,2762  0 4665 0            TC      IBNKCALL           SET ISS WARNING IF EITHER OF ABOVE ARE
 0068   REF   5  LAST  190   07,2763   14703 0            CADR    SETISSW            PRESENT.

 0069   REF   1              07,2764  1 3633 0            TCF     ENDIMU
```

```
P0070              IMU COARSE ALIGN MODE.

 0071                                07,2765  0 0004 0  IMUCOARS INHINT
 0072    REF   3  LAST 1307    07,2766  0 3672 1           TC      CAGETSTJ
 0073    REF   2  LAST  179    07,2767  0 3131 1           TC      SETCOARS

 0074    REF  22  LAST 1282    07,2770  3 6263 0           CAF     SIX
 0075    REF  34  LAST 1307    07,2771  0 5205 0           TC      WAITLIST
 0076    REF   4  LAST 1307    E3,1474                     EBANK=  CDUIND
 0077    REF   1               07,2772   02775 0           2CADR   COARS
 0077    REF   1               07,2773   16103 1

 0078    REF   2  LAST 1307    07,2774  1 2742 0           TCF     MODEEXIT

 0079    REF   3  LAST 1308    07,2775  0 3660 1  COARS    TC      CAGETEST
 0080    REF  45  LAST 1307    07,2776  3 4737 0           CAF     BIT6            ENABLE ALL THREE ISS CDU ERROR COUNTERS
 0081                          07,2777  0 0006 1           EXTEND
 0082    REF  54  LAST 1308    07,3000  05 012 1           WOR     CHAN12

 0083    REF  77  LAST 1297    07,3001  3 4743 0           CAF     TWO             SET CDU INDICATOR
 0084    REF   5  LAST 1309    07,3002  55'474 0  COARS1   TS      CDUIND

 0085    REF   6  LAST 1309    07,3003  51'474 1           INDEX   CDUIND          COMPUTE THETAD - THETAA IN 1:S
 0086    REF  25  LAST 1251    07,3004  3 0321 1           CA      THETAD            COMPLEMENT FORM
 0087                          07,3005  0 0006 1           EXTEND
 0088    REF   7  LAST 1309    07,3006  5 1474 1           INDEX   CDUIND
 0089    REF  19  LAST 1306    07,3007  20 032 1           MSU     CDUX
 0090                          07,3010  0 0006 1           EXTEND
 0091    REF  40  LAST 1282    07,3011  7 4730 0           MP      BIT13           SHIFT RIGHT 2
 0092    REF 247  LAST 1302    07,3012  56 001 0           XCH     L               ROUND
 0093                          07,3013  6 0000 1           DOUBLE
 0094    REF  39  LAST 1297    07,3014  54 061 1           TS      ITEMP1
 0095                          07,3015  1 3017 0           TCF     +2
 0096    REF 248  LAST 1309    07,3016  26 001 1           ADS     L

 0097    REF   8  LAST 1309    07,3017  51'474 1           INDEX   CDUIND          DIFFERENCE TO BE COMPUTED
 0098    REF   2  LAST 1306    07,3020  23'471 1           LXCH    COMMAND
 0099    REF   9  LAST 1309    07,3021  11'474 0           CCS     CDUIND
 0100    REF   1               07,3022  0 3002 0           TC      COARS1

 0101    REF  78  LAST 1309    07,3023  3 4743 0           CAF     TWO             MINIMUM OF 4 MS WAIT
 0102    REF   9  LAST 1308    07,3024  0 5226 1           TC      VARDELAY
```

```
0103   REF   4  LAST 1309   07,3025  0 3660 1  COARS2   TC      CAGETEST         DONT CONTINUE IF CAGED.
0104   REF  40  LAST 1309   07,3026  54 061 1           TS      ITEMP1           SETS TO +0.
0105   REF  79  LAST 1309   07,3027  3 4743 0           CAF     TWO              SET CDU INDICATOR
0106   REF  10  LAST 1309   07,3030  55'474 0    +3     TS      CDUIND

0107   REF  11  LAST 1310   07,3031  51'474 1           INDEX   CDUIND
0108   REF   3  LAST 1309   07,3032  11'471 0           CCS     COMMAND          NUMBER OF PULSES REQUIRED
0109   REF   1              07,3033  0 3037 0           TC      COMPOS           GREATER THAN MAX ALLOWED
0110   REF   1              07,3034  0 3046 0           TC      NEXTCDU +1
0111   REF   1              07,3035  0 3104 1           TC      COMNEG
0112   REF   2  LAST 1310   07,3036  0 3046 0           TC      NEXTCDU +1

0113   REF   1              07,3037  6 3764 1  COMPOS   AD      -COMMAX          COMMAX = MAX NUMBER OF PULSES ALLOWED
0114                        07,3040  0 0006 1           EXTEND                     MINUS ONE
0115   REF   1              07,3041  6 3114 0           BZMF    COMZERO
0116   REF  12  LAST 1310   07,3042  51'474 1           INDEX   CDUIND
0117   REF   4  LAST 1310   07,3043  55'471 0           TS      COMMAND          REDUCE COMMAND BY MAX NUMBER OF PULSES
0118   REF   1              07,3044  4 3765 1           CS      -COMMAX-           ALLOWED

0119   REF  41  LAST 1310   07,3045  24 061 0  NEXTCDU  INCR    ITEMP1
0120   REF  26  LAST 1283   07,3046  6 4745 0           AD      NEGO
0121   REF  13  LAST 1310   07,3047  51'474 1           INDEX   CDUIND
0122   REF   3  LAST  294   07,3050  54 050 0           TS      CDUXCMD          SET UP COMMAND REGISTER.

0123   REF  14  LAST 1310   07,3051  11'474 0           CCS     CDUIND
0124   REF   1              07,3052  0 3030 1           TC      COARS2 +3

0125   REF  42  LAST 1310   07,3053  10 061 1           CCS     ITEMP1           SEE IF ANY PULSES TO GO OUT.
0126   REF   1              07,3054  1 3120 0           TCF     SENDPULS

0127   REF  16  LAST 1119   07,3055  0 5223 1           TC      FIXDELAY         WAIT FOR GIMBALS TO SETTLE.
0128                        07,3056   00226 1           DEC     150


0129   REF  80  LAST 1310   07,3057  3 4743 0           CAF     TWO              AT END OF COMMAND, CHECK TO SEE THAT
0130   REF  43  LAST 1310   07,3060  54 061 1  CHKCORS  TS      ITEMP1           GIMBALS ARE WITHIN 2 DEGREES OF THETAD.
0131   REF 398  LAST 1307   07,3061  50 000 1           INDEX   A
0132   REF  20  LAST 1309   07,3062  3 0032 0           CA      CDUX
0133                        07,3063  0 0006 1           EXTEND
0134   REF  44  LAST 1310   07,3064  5 0061 0           INDEX   ITEMP1
0135   REF  26  LAST 1309   07,3065  20 321 0           MSU     THETAD
0136   REF 399  LAST 1310   07,3066  10 000 0           CCS     A
0137   REF   1              07,3067  1 3075 1           TCF     COARSERR
0138   REF   1              07,3070  1 3072 0           TCF     CORSCHK2
0139   REF   2  LAST 1310   07,3071  1 3075 1           TCF     COARSERR
```

```
0140    REF  45   LAST 1310    07,3072  10 061 1  CORSCHK2 CCS      ITEMP1
0141    REF   1                07,3073  1 3060 0           TCF      CHKCORS
0142    REF   2   LAST 1308    07,3074  1 3633 0           TCF      ENDIMU          END OF COARSE ALIGNMENT.

0143    REF   1                07,3075  6 3103 0  COARSERR AD       COARSTOL        2 DEGREES.
0144                           07,3076  0 0006 1           EXTEND
0145    REF   2   LAST 1310    07,3077  6 3072 1           BZMF     CORSCHK2

0146    REF  45   LAST 1308    07,3100  0 5571 1           TC       ALARM           COARSE ALIGN ERROR.
0147                           07,3101   00211 0           OCT      211

0148    REF   2   LAST  175    07,3102  1 3656 0           TCF      IMUBAD

0149                           07,3103   77511 1  COARSTOL DEC      -.01111         2 DEGREES SCALED AT HALF-REVOLUTIONS


0150    REF   2   LAST 1310    07,3104  6 3764 1  COMNEG   AD       -COMMAX
0151                           07,3105  0 0006 1           EXTEND
0152    REF   2   LAST 1310    07,3106  6 3114 0           BZMF     COMZERO
0153                           07,3107  4 0000 0           COM
0154    REF  15   LAST 1310    07,3110  51'474 1           INDEX    CDUIND
0155    REF   5   LAST 1310    07,3111  55'471 0           TS       COMMAND
0156    REF   2   LAST 1310    07,3112  3 3765 0           CA       -COMMAX-
0157    REF   3   LAST 1310    07,3113  0 3045 0           TC       NEXTCDU

0158    REF 237   LAST 1306    07,3114  3 4746 0  COMZERO  CAF      ZERO
0159    REF  16   LAST 1311    07,3115  51'474 1           INDEX    CDUIND
0160    REF   6   LAST 1311    07,3116  57'471 1           XCH      COMMAND
0161    REF   4   LAST 1311    07,3117  0 3045 0           TC       NEXTCDU


0162    REF   3   LAST  548    07,3120  3 7761 0  SENDPULS CAF      13,14,15
0163                           07,3121  0 0006 1           EXTEND
0164    REF  17   LAST  900    07,3122  05 014 1           WOR      CHAN14
0165    REF   1                07,3123  3 3766 0           CAF      600MS
0166    REF   2   LAST 1310    07,3124  1 3024 0           TCF      COARS2 -1       THEN TO VARDELAY


0167    REF  46   LAST 1309    07,3125  3 4737 0  CA+ECE   CAF      BIT6            ENABLE ALL THREE ISS CDU ERROR COUNTERS
0168                           07,3126  0 0006 1           EXTEND
0169    REF  55   LAST 1309    07,3127  05 012 1           WOR      CHAN12
0170    REF  68   LAST 1206    07,3130  0 5263 0           TC       TASKOVER
```

```
0171   REF  48  LAST 1282   07,3131  3 4741 1  SETCOARS CAF    BIT4            BYPASS IF ALREADY IN COARSE ALIGN
0172                        07,3132  0 0006 1           EXTEND
0173   REF  56  LAST 1311   07,3133  02 012 0           RAND   CHAN12
0174   REF 400  LAST 1310   07,3134  10 000 0           CCS    A
0175   REF 341  LAST 1306   07,3135  0 0002 0           TC     Q

0176   REF  47  LAST 1311   07,3136  4 4737 1           CS     BIT6            CLEAR ISS ERROR COUNTERS
0177                        07,3137  0 0006 1           EXTEND
0178   REF  57  LAST 1312   07,3140  03 012 1           WAND   CHAN12

0179   REF  37  LAST 1303   07,3141  4 4733 0           CS     BIT10           KNOCK DOWN GYRO ACTIVITY
0180                        07,3142  0 0006 1           EXTEND
0181   REF  18  LAST 1311   07,3143  03 014 1           WAND   CHAN14
0182   REF 238  LAST 1311   07,3144  4 4746 1           CS     ZERO
0183   REF   2  LAST  185   07,3145  54 047 0           TS     GYROCMD

0184   REF  49  LAST 1312   07,3146  3 4741 1           CAF    BIT4            PUT ISS IN COARSE ALIGN
0185                        07,3147  0 0006 1           EXTEND
0186   REF  58  LAST 1312   07,3150  05 012 1           WOR    CHAN12

0187   REF  50  LAST 1307   07,3151  4 1035 1           CS     DSPTAB +11D     TURN ON NO ATT LAMP
0188   REF   1              07,3152  7 3174 1           MASK   OCT40010
0189   REF  51  LAST 1312   07,3153  27'035 1           ADS    DSPTAB +11D

0190   REF  42  LAST 1308   07,3154  4 1300 1           CS     IMODES33        DISABLE DAP AUTO AND HOLD MODES
0191   REF  48  LAST 1312   07,3155  7 4737 1           MASK   BIT6
0192   REF  43  LAST 1312   07,3156  27'300 1           ADS    IMODES33

0193   REF  53  LAST 1308   07,3157  4 1277 0           CS     IMODES30        DISABLE IMUFAIL
0194   REF  50  LAST 1312   07,3160  7 4741 0           MASK   BIT4
0195   REF  54  LAST 1312   07,3161  27'277 0           ADS    IMODES30

0196   REF  15  LAST  534   07,3162  4 4740 1  RNDREFDR CS     TRACKBIT        CLEAR TRACK FLAG
0197   REF  35  LAST  903   07,3163  7 0075 1           MASK   FLAGWRD1
0198   REF  36  LAST 1312   07,3164  54 075 1           TS     FLAGWRD1

0199   REF   3  LAST  860   07,3165  4 4726 1           CS     DRFTBIT         CLEAR DRIFT FLAG
0200   REF  23  LAST 1119   07,3166  7 0076 1           MASK   FLAGWRD2
0201   REF  24  LAST 1312   07,3167  54 076 1           TS     FLAGWRD2

0202   REF   6  LAST  974   07,3170  4 4730 0           CS     REFSMBIT        CLEAR REFSMMAT FLAG
0203   REF  12  LAST  974   07,3171  7 0077 0           MASK   FLAGWRD3
0204   REF  13  LAST 1312   07,3172  54 077 0           TS     FLAGWRD3

0205   REF 342  LAST 1312   07,3173  0 0002 0           TC     Q

0206                        07,3174   40010 1  OCT40010 OCT    40010
```

```
P0207              IMU FINE ALIGN MODE SWITCH.

 0208                            07,3175  0 0004 0  IMUFINE  INHINT
 0209   REF   4  LAST 1309       07,3176  0 3672 1           TC       CAGETSTJ          SEE IF IMU BEING CAGED.

 0210   REF   1                  07,3177  4 3763 1           CS       BITS4-5           RESET ZERO AND COARSE
 0211                            07,3200  0 0006 1           EXTEND
 0212   REF  59  LAST 1312       07,3201  03 012 1           WAND     CHAN12

 0213   REF  49  LAST 1312       07,3202  4 4737 1           CS       BIT6              INSURE DAP AUTO AND HOLD MODES ENABLED
 0214   REF  44  LAST 1312       07,3203  7 1300 1           MASK     IMODES33
 0215   REF  45  LAST 1313       07,3204  551300 1           TS       IMODES33

 0216   REF   4  LAST 1307       07,3205  0 3253 0           TC       NOATTOFF

 0217   REF  38  LAST 1312       07,3206  3 4733 1           CAF      BIT10             IMU FAIL WAS INHIBITED DURING THE
 0218   REF  35  LAST 1309       07,3207  0 5205 0           TC       WAITLIST          PRESUMABLY PRECEDING COARSE ALIGN. LEAVE
 0219   REF  17  LAST 1311       E3,1474                     EBANK=   CDUIND
 0220   REF   1                  07,3210   03221 0           2CADR    IFAILOK           IT ON FOR THE FIRST 5 SECS OF FINE ALIGN
 0220   REF   1                  07,3211   16103 1

 0221   REF   5  LAST  964       07,3212  3 4771 1           CAF      2SECS
 0222   REF  36  LAST 1313       07,3213  0 5205 0           TC       WAITLIST
 0223   REF  18  LAST 1313       E3,1474                     EBANK=   CDUIND
 0224   REF   1                  07,3214   03217 0           2CADR    IMUFINED
 0224   REF   1                  07,3215   16103 1

 0225   REF   3  LAST 1309       07,3216  1 2742 0           TCF      MODEEXIT

 0226   REF   5  LAST 1310       07,3217  0 3660 1  IMUFINED TC       CAGETEST          SEE THAT NO ONE HAS CAGED THE IMU.
 0227   REF   3  LAST 1311       07,3220  1 3633 0           TCF      ENDIMU
```

```
0228  REF   1               07,3221  0 3665 1  IFAILOK  TC      CAGETSTQ          ENABLE IMU FIAL UNLESS IMU BEING CAGED.
0229  REF  69  LAST 1311    07,3222  1 5263 1           TCF     TASKOVER          IT IS.

0230  REF  51  LAST 1312    07,3223  3 4741 1           CAF     BIT4              DONT RESET IMU FAIL INHIBIT IF SOMEONE
0231                        07,3224  0 0006 1           EXTEND                    HAS GONE INTO COARSE ALIGN.
0232  REF  60  LAST 1313    07,3225  02 012 0           RAND    CHAN12
0233  REF 401  LAST 1312    07,3226  10 000 0           CCS     A
0234  REF  70  LAST 1314    07,3227  1 5263 1           TCF     TASKOVER

0235  REF  55  LAST 1312    07,3230  4 1277 0           CS      IMODES30          RESET IMUFAIL.
0236  REF  41  LAST 1309    07,3231  7 4730 0           MASK    BIT13
0237  REF  56  LAST 1314    07,3232  27'277 0           ADS     IMODES30
0238  REF  52  LAST 1314    07,3233  4 4741 0           CS      BIT4
0239  REF  57  LAST 1314    07,3234  7 1277 0  PFAILOK2 MASK    IMODES30
0240  REF  58  LAST 1314    07,3235  55'277 0           TS      IMODES30
0241  REF  51  LAST 1308    07,3236  0 4665 0           TC      IBNKCALL          THE ISS WARNING LIGHT MAY COME ON NOW
0242  REF   6  LAST 1308    07,3237   14703 0           CADR    SETISSW           THAT THE INHIBIT HAS BEEN REMOVED.
0243  REF  71  LAST 1314    07,3240  1 5263 1           TCF     TASKOVER

0244  REF   2  LAST 1314    07,3241  0 3665 1  PFAILOK  TC      CAGETSTQ          ENABLE PIP FAIL PROG ALARM.
0245  REF  72  LAST 1314    07,3242  1 5263 1           TCF     TASKOVER

0246  REF  59  LAST 1314    07,3243  4 1277 0           CS      IMODES30          RESET IMU AND PIPA FAIL BITS.
0247  REF  39  LAST 1313    07,3244  7 4733 0           MASK    BIT10
0248  REF  60  LAST 1314    07,3245  27'277 0           ADS     IMODES30

0249  REF  46  LAST 1313    07,3246  4 1300 1           CS      IMODES33
0250  REF  42  LAST 1314    07,3247  7 4730 0           MASK    BIT13
0251  REF  47  LAST 1314    07,3250  27'300 1           ADS     IMODES33

0252  REF  42  LAST 1308    07,3251  4 4740 1           CS      BIT5
0253  REF   1               07,3252  1 3234 0           TCF     PFAILOK2

0254  REF   2  LAST 1312    07,3253  4 3174 1  NOATTOFF CS      OCT40010          SUBROUTINE TO TURN OFF NO ATT LAMP.
0255  REF  52  LAST 1312    07,3254  7 1035 1           MASK    DSPTAB +11D
0256  REF  45  LAST 1295    07,3255  6 4726 0           AD      BIT15
0257  REF  53  LAST 1314    07,3256  55'035 1           TS      DSPTAB +11D
0258  REF 343  LAST 1312    07,3257  0 0002 0           TC      Q
```

```
P0259              ROUITNES TO INITIATE AND TERMINATE PROGRAM USE OF THE PIPAS. NO IMUSTALL REQUIRED IN EITHER CASE.

 0261    REF 239   LAST 1312    07,3260   4 4746 1   PIPUSE     CS       ZERO
 0262    REF  17   LAST  949    07,3261   54 037 1              TS       PIPAX
 0263    REF   8   LAST  949    07,3262   54 040 1              TS       PIPAY
 0264    REF  11   LAST  949    07,3263   54 041 0              TS       PIPAZ

 0265    REF   3   LAST 1314    07,3264   0 3665 1   PIPUSE1    TC       CAGETSTQ          DO NOT ENABLE PIPA FAIL IF IMU IS CAGED
 0266    REF   9   LAST 1308    07,3265   1 4622 1              TCF      SWRETURN

 0267                           07,3266   0 0004 0              INHINT
 0268    REF  55   LAST 1282    07,3267   4 4744 0              CS       BIT1              IF PIPA FAILS FROM NOW ON (UNTIL
 0269    REF  61   LAST 1314    07,3270   7 1277 0              MASK     IMODES30          PIPFREE), LIGHT ISS WARNING.
 0270    REF  62   LAST 1315    07,3271   55'277 0              TS       IMODES30

 0271    REF  52   LAST 1314    07,3272   0 4665 0   PIPFREE2   TC       IBNKCALL          ISS WARNING MIGHT COME ON NOW.
 0272    REF   7   LAST 1314    07,3273    14703 0              CADR     SETISSW           (OR GO OFF ON PIPFREE).

 0273    REF   4   LAST 1313    07,3274   1 2742 0              TCF      MODEEXIT

 0274                           07,3275   0 0004 0   PIPFREE    INHINT                     PROGRAM DONE WITH PIPAS. DONT LIGHT
 0275    REF  63   LAST 1315    07,3276   4 1277 0              CS       IMODES30          ISS WARNING.
 0276    REF  56   LAST 1315    07,3277   7 4744 0              MASK     BIT1
 0277    REF  64   LAST 1315    07,3300   27'277 0              ADS      IMODES30

 0278    REF  40   LAST 1314    07,3301   7 4733 0              MASK     BIT10             IF PIP FAIL ON, DO PROG ALSRM AND RESET
 0279    REF 402   LAST 1314    07,3302   10 000 0              CCS      A                 ISS WARNING.
 0280    REF   5   LAST 1315    07,3303   1 2742 0              TCF      MODEEXIT

 0281    REF  46   LAST 1311    07,3304   0 5571 1              TC       ALARM
 0282                           07,3305    00212 0              OCT      212

 0283                           07,3306   0 0004 0              INHINT

 0284    REF   1                07,3307   1 3272 1              TCF      PIPFREE2
```

```
L        IMU MODE SWITCHING ROUTINES                                                          USER'S PAGE NO.  11       E3 S4

P0285              THE FOLLOWING ROUTINE TORQUES THE IRIGS ACCORDING TO DOUBLE PRECISION INPUTS IN THE SIX REGISTERS
R0287    BEGINNING AT THE ECADR ARRIVING IN A. THE MINIMUM SIZE OF ANY PULSE TRAIN IS 16 PULSES (.25 CDU COUNTS). THE
R0289    UNSENT PORTION OF THE COMMAND IS LEFT INTACT IN THE INPUT COMMAND REGISTERS.

 0291                             E3,1400                              EBANK= 1400              VARIABLE, ACTUALLY.

 0292    REF 774  LAST 1305       07,3310   54 161 0  IMUPULSE TS       MPAC +5                 SAVE ARRIVING ECADR.
 0293    REF   5  LAST 1313       07,3311   0 3672 1           TC       CAGETSTJ                DONT PROCEED IF IMU BEING CAGED.

 0294    REF   2  LAST  233       07,3312   11'311 1           CCS      LGYRO                   SEE IF GYROS BUSY.
 0295    REF   1                  07,3313   0 3354 0           TC       GYROBUSY                SLEEP.

 0296    REF 775  LAST 1316       07,3314   54 156 1           TS       MPAC +2
 0297    REF  50  LAST 1313       07,3315   3 4737 0           CAF      BIT6                    ENABLE THE POWER SUPPLY.
 0298                             07,3316   0 0006 1           EXTEND
 0299    REF  19  LAST 1312       07,3317   05 014 1           WOR      CHAN14

 0300    REF  29  LAST 1282       07,3320   3 4742 1           CAF      FOUR
 0301    REF  37  LAST 1313       07,3321   0 5205 0  GWAKE2   TC       WAITLIST                (IF A JOB WAS PUT TO SLEEP, THE POWER
 0302    REF  19  LAST 1313       E3,1474                      EBANK=   CDUIND                  SUPPLY IS LEFT ON BY THE WAKING JOB).
 0303    REF   1                  07,3322    03372 1           2CADR    STRTGYRO
 0303    REF   1                  07,3323    16103 1

 0304    REF 776  LAST 1316       07,3324   3 0161 1           CA       MPAC +5                 SET UP EBANK, SAVING CALLER'S EBANK FOR
 0305    REF  79  LAST 1286       07,3325   56 003 1           XCH      EBANK                   RESTORATION ON RETURN.
 0306    REF 777  LAST 1316       07,3326   56 161 1           XCH      MPAC +5
 0307    REF   3  LAST 1316       07,3327   55'311 1           TS       LGYRO                   RESERVES GYROS.
 0308    REF  17  LAST 1283       07,3330   7 4350 1           MASK     LOW8
 0309    REF  46  LAST 1311       07,3331   54 061 1           TS       ITEMP1

 0310    REF  81  LAST 1310       07,3332   3 4743 0           CAF      TWO                     FORCE SIGN AGREEMENT ON INPUTS.
 0311    REF 778  LAST 1316       07,3333   54 157 0  GYROAGRE TS       MPAC +3
 0312                             07,3334   6 0000 1           DOUBLE
 0313    REF  47  LAST 1316       07,3335   6 0061 0           AD       ITEMP1
 0314    REF 779  LAST 1316       07,3336   54 160 1           TS       MPAC +4
 0315                             07,3337   0 0006 1           EXTEND
 0316    REF 403  LAST 1315       07,3340   5 0000 1           INDEX    A
 0317                             07,3341   3 1401 0           DCA      1400
 0318    REF 780  LAST 1316       07,3342   52 155 1           DXCH     MPAC
 0319    REF  15  LAST 1221       07,3343   0 7300 0           TC       TPAGREE
 0320    REF 781  LAST 1316       07,3344   52 155 1           DXCH     MPAC
 0321    REF 782  LAST 1316       07,3345   50 160 0           INDEX    MPAC +4
 0322                             07,3346   53'401 1           DXCH     1400

 0323    REF 783  LAST 1316       07,3347   10 157 0           CCS      MPAC +3
 0324    REF   1                  07,3350   1 3333 0           TCF      GYROAGRE

 0325    REF 784  LAST 1316       07,3351   3 0161 1           CA       MPAC +5                 RESTORE CALLER'S EBANK.
 0326    REF  80  LAST 1316       07,3352   54 003 0           TS       EBANK
 0327    REF   6  LAST 1315       07,3353   1 2742 0           TCF      MODEEXIT
```

```
P0328              ROUTINES TO ALLOW TORQUING BY ONLY ONE JOB AT A TIME.

 0329                              07,3354  0 0006 1  GYROBUSY EXTEND                       SAVE RETURN 2FCADR.
 0330   REF  22  LAST 1083         07,3355  3 0134 1           DCA     BUF2
 0331   REF 785  LAST 1316         07,3356  52 155 1           DXCH    MPAC
 0332   REF   1                    07,3357  3 3371 1  REGSLEEP CAF     LGWAKE
 0333   REF   5  LAST 1216         07,3360  1 5124 1           TCF     JOBSLEEP

 0334   REF   4  LAST 1316         07,3361  11'311 1  GWAKE    CCS     LGYRO                WHEN AWAKENED, SEE IF GYROS STILL BUSY.
 0335   REF   1                    07,3362  1 3357 1           TCF     REGSLEEP             IF SO, SLEEP SOME MORE.

 0336   REF 786  LAST 1317         C7,3363  54 156 1           TS      MPAC +2
 0337                              07,3364  0 0006 1           EXTEND
 0338   REF 787  LAST 1317         C7,3365  3 0155 0           DCA     MPAC
 0339   REF  23  LAST 1317         07,3366  52 134 0           DXCH    BUF2                 RESTORE SWRETURN INFO.
 0340   REF 117  LAST 1302         C7,3367  3 4744 1           CAF     ONE
 0341   REF   1                    07,3370  1 3321 0           TCF     GWAKE2

 0342   REF   1                    07,3371   17361 0  LGWAKE   CADR    GWAKE
```

```
P0343                GYRO-TORQUING WAITLIST TASKS.

 0344    REF    1                  07,3372   4 3630 0  STRTGYRO CS      GDESELCT         DE-SELECT LAST GYRO.
 0345                              07,3373   0 0006 1           EXTEND
 0346    REF   20   LAST 1316      07,3374   03 014 1           WAND     CHAN14

 0347    REF    1                  07,3375   0 3646 0           TC       CAGETSTG

 0348    REF    5   LAST 1317      07,3376   3 1311 0  STRTGYR2 CA       LGYRO            JUMP ON PHASE COUNTER IN BITS 13-14.
 0349                              07,3377   0 0006 1           EXTEND
 0350    REF   53   LAST 1314      07,3400   7 4741 0           MP       BIT4
 0351    REF  404   LAST 1316      07,3401   50 000 1           INDEX    A
 0352                              07,3402   1 3403 1           TCF      +1
 0353    REF    1                  07,3403   0 3420 1           TC       GSELECT          =0. DO Y GYRO.
 0354                              07,3404    00202 1           OCT      00202

 0355    REF    2   LAST 1318      07,3405   0 3420 1           TC       GSELECT          =1. DO Z GYRO.
 0356                              07,3406    00302 0           OCT      00302

 0357    REF    3   LAST 1318      07,3407   0 3416 1           TC       GSELECT -2       =2. DO X GYRO.
 0358                              07,3410    00100 0           OCT      00100

 0359    REF  240   LAST 1315      07,3411   3 4746 0           CAF      ZERO             =3. DONE
 0360    REF    6   LAST 1318      07,3412   55'311 1           TS       LGYRO
 0361    REF    2   LAST 1317      07,3413   3 3371 1           CAF      LGWAKE           WAKE A POSSIBLE SLEEPING JOB.
 0362    REF    6   LAST 1217      07,3414   0 5130 0           TC       JOBWAKE

 0363    REF    2   LAST 1313      07,3415   1 3217 1  NORESET  TCF      IMUFINED         DO NOT RESET POWER SUPPLY
```

```
0364   REF  30  LAST 1316   07,3416   4 4742 0   -2         CS      FOUR           SPECIAL ENTRY TO REGRESS LGYRO FOR X.
0365   REF   7  LAST 1318   07,3417   27'311 1              ADS     LGYRO

0366   REF 344  LAST 1314   07,3420   50 002 0   GSELECT    INDEX   Q              SELECT GYRO.
0367                        07,3421   3 0000 1              CAF     0              PACKED WORD CONTAINS GYRO SELECT BITS
0368   REF  10  LAST 1297   07,3422   54 064 1              TS      ITEMP4         AND INCREMENT TO LGYRO.
0369   REF  22  LAST 1290   07,3423   7 4750 0              MASK    SEVEN
0370   REF  43  LAST 1314   07,3424   6 4730 1              AD      BIT13
0371   REF   8  LAST 1319   07,3425   27'311 1              ADS     LGYRO
0372   REF  81  LAST 1316   07,3426   54 003 0              TS      EBANK
0373   REF  18  LAST 1316   07,3427   7 4350 1              MASK    LOW8
0374   REF  48  LAST 1316   07,3430   54 061 1              TS      ITEMP1

0375   REF  23  LAST 1319   07,3431   4 4750 0              CS      SEVEN
0376   REF  11  LAST 1319   07,3432   7 0064 1              MASK    ITEMP4
0377   REF  12  LAST 1319   07,3433   54 064 1              TS      ITEMP4

0378                        07,3434   0 0006 1              EXTEND                 MOVE DP COMMAND TO RUPTREGS FOR TESTING.
0379   REF  49  LAST 1319   07,3435   5 0061 0              INDEX   ITEMP1
0380                        07,3436   3 1401 0              DCA     1400
0381   REF  27  LAST 1297   07,3437   52 071 0              DXCH    RUPTREG1

0382   REF  28  LAST 1319   07,3440   10 070 1              CCS     RUPTREG1
0383   REF   1              07,3441   1 3454 0              TCF     MAJ+
0384                        07,3442   1 3444 1              TCF     +2
0385   REF   1              07,3443   1 3611 0              TCF     MAJ-

0386   REF   8  LAST 1297   07,3444   10 071 0              CCS     RUPTREG2
0387   REF   1              07,3445   1 3451 0              TCF     MIN+
0388   REF   1              07,3446   1 3376 1              TCF     STRTGYR2
0389   REF   1              07,3447   1 3606 0              TCF     MIN-
0390   REF   2  LAST 1319   07,3450   1 3376 1              TCF     STRTGYR2
```

```
 0391    REF    1              07,3451   6 3505 1   MIN+      AD       -GYROMIN          SMALL POSITIVE COMMAND. SEE IE AT LEAST
 0392                          07,3452   0 0006 1             EXTEND                     16 GYRO PULSES.
 0393    REF    3   LAST 1319  07,3453   6 3376 0             BZMF     STRTGYR2

 0394                          07,3454   0 0006 1   MAJ+      EXTEND                     DEFINITE POSITIVE OUTPUT.
 0395    REF    1              07,3455   3 3632 0             DCA      GYROFRAC
 0396    REF   29   LAST 1319  07,3456  20 071  0             DAS      RUPTREG1

 0397    REF   13   LAST 1319  07,3457   3 0064 0             CA       ITEMP4            SELECT POSITIVE TORQUING FOR THIS GYRO.
 0398                          07,3460   0 0006 1             EXTEND
 0399    REF   21   LAST 1318  07,3461  05 014  1             WOR      CHAN14

 0400    REF   10   LAST 1305  07,3462   3 6115 1             CAF      LOW7              LEAVE NUMBER OF POSSIBLE 8192 AUGMENTS
 0401    REF    9   LAST 1319  07,3463   7 0071 0             MASK     RUPTREG2          TO INITIAL COMMAND IN MAJOR PART OF LONG
 0402    REF   10   LAST 1320  07,3464  56 071  1             XCH      RUPTREG2          TERM STORAGE AND TRUNCATED FRACTION
 0403                          07,3465   0 0006 1   GMERGE    EXTEND                     IN MINOR PART. THE MAJOR PART WILL BE
 0404    REF   42   LAST 1296  07,3466   7 4735 0             MP       BIT8              COUNTED DOWN TO ZERO IN THE COURSE OF
 0405    REF   25   LAST 1297  07,3467  54 062  1             TS       ITEMP2            PUTTING OUT THE ENTIRE COMMAND.
 0406    REF   30   LAST 1320  07,3470   3 0070 0             CA       RUPTREG1
 0407                          07,3471   0 0006 1             EXTEND
 0408    REF   27   LAST 1307  07,3472   7 4734 1             MP       BIT9
 0409    REF   31   LAST 1320  07,3473  54 070  1             TS       RUPTREG1
 0410    REF  249   LAST 1309  07,3474   3 0001 0             CA       L
 0411                          07,3475   0 0006 1             EXTEND
 0412    REF   71   LAST 1282  07,3476   7 4727 0             MP       BIT14
 0413    REF   26   LAST 1320  07,3477  26 062  1             ADS      ITEMP2            INITIAL COMMAND.

 0414                          07,3500   0 0006 1             EXTEND                     SEE IF MORE THAN ONE PULSE TRAIN NEEDED
 0415    REF   32   LAST 1320  07,3501   3 0071 1             DCA      RUPTREG1          (MORE THAN 16383 PULSES).
 0416    REF    1              07,3502   6 7770 0             AD       MINUS1
 0417    REF  405   LAST 1318  07,3503  10 000  0             CCS      A
 0418    REF    1              07,3504   1 3552 1             TCF      LONGGYRO
 0419                          07,3505    77601 0   -GYROMIN  OCT      -176              MAY BE ADJUSTED TO SPECIFY MINIMUM CMD
 0420                          07,3506   1 3512 0             TCF      +4

 0421    REF   72   LAST 1320  07,3507   3 4727 1             CAF      BIT14
 0422    REF   27   LAST 1320  07,3510  26 062  1             ADS      ITEMP2
 0423    REF  241   LAST 1318  07,3511   3 4746 0             CAF      ZERO

 0424    REF   50   LAST 1319  07,3512  50 061  0    +4       INDEX    ITEMP1
 0425                          07,3513  53'401  1             DXCH     1400
```

```
L        IMU MODE SWITCHING ROUTINES                                                         USER'S PAGE NO.  16      E3 S4

 0426    REF  28  LAST 1320    07,3514   3 0062 0             CA       ITEMP2             ENTIRE COMMAND.
 0427    REF   3  LAST 1312    07,3515  54 047 0   LASTSEG   TS       GYROCMD
 0428    REF   1               07,3516   0 3641 1             TC       COARSTST

 0429    REF   4  LAST 1321    07,3517   3 0047 1             CA       GYROCMD
 0430                          07,3520   0 0006 1             EXTEND
 0431    REF  41  LAST 1315    07,3521   7 4733 0             MP       BIT10              WAITLIST DT
 0432    REF  37  LAST 1305    07,3522   6 6266 0             AD       THREE              TRUNCATION AND PHASE UNCERTAINTIES.
 0433    REF  38  LAST 1316    07,3523   0 5205 0             TC       WAITLIST
 0434    REF  20  LAST 1316    E3,1474                        EBANK=   CDUIND
 0435    REF   1               07,3524    03536 1             2CADR    TWOPULSE
 0435    REF   1               07,3525    16103 1
 0436    REF   1               07,3526   0 3532 0   EXITGYRO TC       GYROEXIT
 0437    REF  73  LAST 1314    07,3527   1 5263 1             TCF      TASKOVER
 0438    REF  49  LAST 1282    07,3530   3 4743 0   OUTPULSE CA       BIT2
 0439    REF   5  LAST 1321    07,3531  54 047 0             TS       GYROCMD
 0440    REF  42  LAST 1321    07,3532   3 4733 1   GYROEXIT CAF      BIT10
 0441                          07,3533   0 0006 1             EXTEND
 0442    REF  22  LAST 1320    07,3534  05 014 1             WOR      CHAN14
 0443    REF 345  LAST 1319    07,3535   0 0002 0             TC       Q
 0444    REF  28  LAST 1320    07,3536   4 4734 1   TWOPULSE CS       BIT9
 0445                          07,3537   0 0006 1             EXTEND
 0446    REF  23  LAST 1321    07,3540  03 014 1             WAND     CHAN14
 0447    REF   1               07,3541   0 3530 1             TC       OUTPULSE
 0448    REF  57  LAST 1315    07,3542   3 4744 1             CA       BIT1
 0449    REF  29  LAST 1130    07,3543   0 5175 1             TC       TWIDDLE
 0450    REF   2  LAST 1316    07,3544    03372 1             ADRES    STRTGYRO
 0451    REF  29  LAST 1321    07,3545   3 4734 0             CA       BIT9
 0452                          07,3546   0 0006 1             EXTEND
 0453    REF  24  LAST 1321    07,3547  05 014 1             WOR      CHAN14
 0454    REF   2  LAST 1321    07,3550   0 3530 1             TC       OUTPULSE
 0455    REF  74  LAST 1321    07,3551   1 5263 1             TCF      TASKOVER
 0456    REF  51  LAST 1320    07,3552  50 061 0   LONGGYRO INDEX    ITEMP1
 0457                          07,3553  53 401 1             DXCH     1400
 0458    REF  73  LAST 1320    07,3554   3 4727 1             CAF      BIT14              8192. INITIAL COMMAND IS AT LEAST 8192.
 0459    REF  29  LAST 1321    07,3555   6 0062 0             AD       ITEMP2
 0460    REF   6  LAST 1321    07,3556  54 047 0             TS       GYROCMD

 0461                          07,3557   0 0006 1   AUG3     EXTEND                      GET WAITLIST DT TO TIME WHEN TRAIN IS
 0462    REF  43  LAST 1321    07,3560   7 4733 0             MP       BIT10              ALMOST OUT.
 0463    REF   5  LAST 1283    07,3561   6 7766 1             AD       NEG3
 0464    REF  39  LAST 1321    07,3562   0 5205 0             TC       WAITLIST
 0465    REF  21  LAST 1321    E3,1474                        EBANK=   CDUIND
 0466    REF   1               07,3563    03566 1             2CADR    8192AUG
 0466    REF   1               07,3564    16103 1
 0467    REF   1               07,3565   1 3526 1             TCF      EXITGYRO
 0468    REF   2  LAST 1321    07,3566   0 3641 1   8192AUG  TC       COARSTST

 0469    REF   9  LAST 1319    07,3567   3 1311 0             CA       LGYRO              ADD 8192 PULSES TO GYROCMD
 0470    REF  82  LAST 1319    07,3570  54 003 0             TS       EBANK
 0471    REF  19  LAST 1319   07,3571  7 4350 1             MASK    LOW8
 0472    REF  52  LAST 1321   07,3572  54 061 1             TS      ITEMP1

 0473    REF  53  LAST 1322   07,3573  50 061 0             INDEX   ITEMP1              SEE IF THIS IS THE LAST AUG.
 0474                         07,3574  11'400 0             CCS     1400
 0475    REF   1              07,3575  1 3601 1             TCF     AUG2                MORE TO COME.

 0476    REF  74  LAST 1321   07,3576  3 4727 1             CAF     BIT14
 0477    REF   7  LAST 1321   07,3577  26 047 0             ADS     GYROCMD
 0478    REF   1              07,3600  1 3516 1             TCF     LASTSEG +1

 0479    REF  54  LAST 1322   07,3601  50 061 0  AUG2       INDEX   ITEMP1
 0480                         07,3602  55'400 0             TS      1400
 0481    REF  75  LAST 1322   07,3603  3 4727 1             CAF     BIT14
 0482    REF   8  LAST 1322   07,3604  26 047 0             ADS     GYROCMD
 0483    REF   1              07,3605  1 3557 1             TCF     AUG3                COMPUTE DT.
 0484   REF    2  LAST 1320   07,3606   6 3505 1  MIN-       AD       -GYROMIN          POSSIBLE NEGATIVE OUTPUT.
 0485                         07,3607   0 0006 1             EXTEND
 0486   REF    4  LAST 1320   07,3610   6 3376 0             BZMF     STRTGYR2

 0487                         07,3611   0 0006 1  MAJ-       EXTEND                     DEFINITE NEGATIVE OUTPUT.
 0488   REF    2  LAST 1320   07,3612   4 3632 1             DCS      GYROFRAC
 0489   REF   33  LAST 1320   07,3613  20 071 0              DAS      RUPTREG1

 0490   REF   14  LAST 1320   07,3614   3 0064 0             CA       ITEMP4            SELECT NEGATIVE TORQUING FOR THIS GYRO.
 0491   REF   30  LAST 1321   07,3615   6 4734 0             AD       BIT9
 0492                         07,3616   0 0006 1             EXTEND
 0493   REF   25  LAST 1321   07,3617  05 014 1              WOR      CHAN14

 0494   REF   34  LAST 1323   07,3620   4 0070 1             CS       RUPTREG1          SET UP RUPTREGS TO FALL INTO GMERGE.
 0495   REF   35  LAST 1323   07,3621  54 070 1              TS       RUPTREG1          ALL NUMBERS PUT INTO GYROCMD ARE
 0496   REF   11  LAST 1320   07,3622   4 0071 0             CS       RUPTREG2          POSITIVE - BIT9 OF CHAN 14 DETERMINES
 0497   REF   11  LAST 1320   07,3623   7 6115 0             MASK     LOW7              THE SIGN OF THE COMMAND.
 0498                         07,3624   4 0000 0             COM
 0499   REF   12  LAST 1323   07,3625  56 071 1              XCH      RUPTREG2
 0500                         07,3626   4 0000 0             COM
 0501   REF    1              07,3627   1 3465 1             TCF      GMERGE

 0502                         07,3630    01700 1  GDESFLCT OCT      1700              TURN OFF SELECT AND ACTIVITY BITS.

 0503                         07,3631    00000 1  GYROFRAC 2DEC     .215 B -21
 0503                         07,3632    00034 0
```

```
P0504               IMU MODE SWITCHING RCUTINES CCME HERE WHEN ACTION COMPLETE.

 0505                        07,3633  0 0006 1  ENDIMU   EXTEND                    MODE IS BAD IF CAGE HAS OCCURED OR IF
 0506  REF  33  LAST 1114    07,3634  00 011 1           READ     DSALMOUT         ISS WARNING IS ON.
 0507  REF  58  LAST 1321    07,3635  7 4744 0           MASK     BIT1
 0508  REF 4C6  LAST 1320    07,3636  10 C00 0           CCS      A
 0509  REF   3  LAST 1311    07,3637  1 3656 0           TCF      IMUBAD

 0510  REF   3  LAST  581    07,3640  1 3704 0  IMUGOOD  TCF      GOODEND          WITH C(A) = 0.

 0511  REF  54  LAST 1318    07,3641  3 4741 1  COARSTST CAF      BIT4
 0512                        07,3642  0 0006 1           EXTEND
 0513  REF  61  LAST 1314    07,3643  02 012 0           RAND     CHAN12
 0514  REF 4C7  LAST 1324    07,3644  10 000 0           CCS      A
 0515  REF   1               07,3645  1 3652 1           TCF      DONTPULS

 0516  REF  65  LAST 1315    07,3646  4 1277 0  CAGETSTG CS       IMODES30
 0517  REF  51  LAST 1316    07,3647  7 4737 1           MASK     BIT6
 0518  REF 4C8  LAST 1324    07,3650  10 C00 0           CCS      A
 0519  REF 346  LAST 1321    07,3651  0 0002 0           TC       Q

 0520  REF 242  LAST 1320    07,3652  3 4746 0  DONTPULS CAF      ZERO
 0521  REF  10  LAST 1321    07,3653  55'311 1           TS       LGYRO

 0522  REF   3  LAST 1318    07,3654  3 3371 1           CAF      LGWAKE
 0523  REF   7  LAST 1318    07,3655  0 5130 0           TC       JOBWAKE

 0524  REF 243  LAST 1324    C7,3656  3 4746 0  IMUBAD   CAF      ZERO
 0525  REF   2  LAST  581    07,3657  1 3701 0           TCF      BADEND

 0526  REF  52  LAST 1324    07,3660  3 4737 0  CAGETEST CAF      BIT6             SUBROUTINE TO TERMINATE IMU MODE
 0527  REF  66  LAST 1324    07,3661  7 1277 0           MASK     IMODES30         SWITCH IF IMU HAS BEEN CAGED.
 0528  REF 4C9  LAST 1324    07,3662  10 000 0           CCS      A
 0529  REF   4  LAST 1324    07,3663  1 3656 0           TCF      IMUBAD           DIRECTLY.
 0530  REF 347  LAST 1324    07,3664  0 0002 0           TC       Q                WITH C(A) = +0.

 0531  REF  67  LAST 1324    07,3665  4 1277 0  CAGETSTQ CS       IMODES30         SKIP IF IMU NOT BEING CAGED.
 0532  REF  53  LAST 1324    07,3666  7 4737 1           MASK     BIT6
 0533  REF 410  LAST 1324    07,3667  10 000 0           CCS      A
 0534  REF 348  LAST 1324    C7,3670  24 002 0           INCR     Q
 0535  REF 349  LAST 1324    07,3671  0 0002 0           TC       Q

 0536  REF  68  LAST 1324    07,3672  4 1277 0  CAGETSTJ CS       IMODES30         IF DURING MODE SWITCH INITIALIZATION
 0537  REF  54  LAST 1324    07,3673  7 4737 1           MASK     BIT6             IT IS FOUND THAT THE IMU IS BEING CAGED,
 0538  REF 411  LAST 1324    07,3674  10 000 0           CCS      A                SET IMUCADR TO -0 TO INDICATF OPERATION
 0539  REF 350  LAST 1324    07,3675  0 0002 0           TC       Q                COMPLETE BUT FAILED. RETURN IMMEDIATELY

 0540  REF 244  LAST 1324    C7,3676  4 4746 1           CS       ZERO             TO SWRFTURN.
 0541  REF   4  LAST 1119    C7,3677  55'301 0           TS       IMUCADR
 0542  REF   7  LAST 1316    07,3700  1 2742 0           TCF      MODEEXIT
```

```
P0543             GENERALIZED MODE SWITCHING TERMINATION. ENTER AT GOODEND FOR SUCCESSFUL COMPLETION OF AN I/O OPERATION
R0545      OR AT BADEND FOR AN UNSUCCESSFUL ONE. C(A) OR ARRIVAL =0 FOR IMU, 1 FOR OPTICS.

 0547      REF  13  LAST 1323   07,3701  54 071 0  BADEND   TS      RUPTREG2         DEVICE INDEX.
 0548      REF 245  LAST 1324   07,3702  4 4746 1           CS      ZERO             FOR FAILURE.
 0549      REF   4  LAST 1324   07,3703  1 3706 1           TCF     GOODEND +2

 0550      REF  14  LAST 1325   07,3704  54 071 0  GOODEND  TS      RUPTREG2
 0551      REF 118  LAST 1317   07,3705  4 4744 0           CS      ONE              FOR SUCCESS.

 0552      REF   9  LAST 1297   07,3706  54 072 0           TS      RUPTREG3
 0553      REF  15  LAST 1325   07,3707  50 071 1           INDEX   RUPTREG2         SEE IF USING PROGRAM ASLEEP.
 0554      REF   6  LAST  949   07,3710  11'301 0           CCS     MODECADR
 0555                           07,3711  1 3715 0           TCF     +4               YES - WAKE IT UP.
 0556      REF   1              07,3712  1 3725 0           TCF     ENDMODE          IF 0, PROGRAM NOT IN YET.

 0557                           07,3713  0 0006 1           EXTEND
 0558      REF   2  LAST 1325   07,3714  1 3726 0           BZF     ENDMODE +1       BZF = TCF IF MODECADR = -0.

 0559      REF 246  LAST 1325   07,3715  3 4746 0           CAF     ZERO             WAKE SLEEPING PROGRAM.
 0560      REF  16  LAST 1325   07,3716  50 071 1           INDEX   RUPTREG2
 0561      REF   7  LAST 1325   07,3717  57'301 1           XCH     MODECADR
 0562      REF   8  LAST 1324   07,3720  0 5130 0           TC      JOBWAKE

 0563      REF  10  LAST 1325   07,3721  4 0072 0           CS      RUPTREG3         ADVANCE LOC IF SUCCESSFUL.
 0564      REF  23  LAST 1217   07,3722  50 064 0           INDEX   LOCCTR
 0565      REF  44  LAST 1264   07,3723  26 164 0           ADS     LOC

 0566      REF  75  LAST 1321   07,3724  1 5263 1           TCF     TASKOVER

 0567      REF  11  LAST 1325   07,3725  3 0072 1  ENDMODE  CA      RUPTREG3         -0 INDICATES OPERATION COMPLETE BUT
 0568      REF  17  LAST 1325   07,3726  50 071 1     +1    INDEX   RUPTREG2         UNSUCCESSFUL: -1 INDICATES COMPLETE AND
 0569      REF   8  LAST 1325   07,3727  55'301 0           TS      MODECADR         SUCCESSFUL.
 0570      REF  76  LAST 1325   07,3730  1 5263 1           TCF     TASKOVER
```

```
P0571          GENERAL STALLING ROUTINE. USING PROGRAMS COME HERE TO WAIT FOR I/O COMPLETION.

R0573   PROGRAM DESCRIPTION                                     DATE- 21 FEB 1967
R0574                                                 LOG SECTION IMU MODE SWITCHING
R0575   MOD BY- R.MELANSON TO ADD DOCUMENTATION          ASSEMBLY SUNDISK  REV.  82

R0576   FUNCTIONAL DESCRIPTION-
R0577     TO DELAY FURTHER EXECUTION OF THE CALLING ROUTINE UNTIL ITS SELECTED
R0578     I/O FUNCTION IS COMPLETE.THE FOLLOWING CHECKS ON THE CALLING ROUTINE:S
R0579     MODECADR ARE MADE AND ACTED UPON.
R0580       1) +0 INDICATES INCOMPLETE I/O OPERATION.CALLING ROUTINE IS PUT TO
R0581          SLEEP.
R0582       2) -1 INDICATES COMPLETED I/O OPERATION. STALL BYPASSES JOBSLEEP
R0583          CALL AND RETURNS TO CALLING ROUTINE AT L+3
R0584       3) -0 INDICATES COMPLETED I/O WITH FAILURE. STALL CLEARS MODECADR
R0585          AND RETURNS TO CALLING ROUTINE AT L+2.
R0586       4) VALUE GREATER THAN 0 INDICATES TWO ROUTINES CALLING FOR USE OF
R0587          SAME DEVICE. STALL EXITS TO ABORT WHICH EXECUTES A PROGRAM
R0588          RESTART WHICH IN TURN CLEARS ALL MODECADR REGISTERS.

R0589    CALLING SEQUENCE-
R0590     L    TC    BANKCALL
R0591     L+1  CADR (ONE OF 5 STALL ADDRESSES I.E. IMUSTALL,OPTSTALL,RADSTALL,
R0592                AOTSTALL,OR ATTSTALL)

R0593    NORMAL-EXIT MODE-
R0594     TCF    JOBSLEEP OR TCF   MODEXIT

R0595   ALARM OR ABORT EXIT MODE-
R0596     TC    ABORT

R0597   OUTPUT-
R0598     MODECADR= CADR IF JOBSLEEP
R0599     MODECADR=+0     IF I/O COMPLETE
R0600     BUF2=L+3        IF I/O COMPLETE AND GOOD.
R0601     BUF2=L+2 IF I/O COMPLETE BUT FAILED.

R0602   ERASABLE INITIALIZATION-
R0603     BUF2 CONTAINS RETURN ADDRESS PLUS 1,(L+2)
R0604     BUF2+1 CONTAINS FBANK VALUE OF CALLING ROUTINE.
R0605     MODECADR OF CALLING ROUTINE CONTAINS +0,-1,-0 OR  CADR RETURN ADDRESS.

R0606   DEBRIS-
R0607     RUPTREG2 AND CALLING ROUTINE MODECADR.

 0608   REF 119  LAST 1325   07,3731  3 4744 1  AOTSTALL CAF     ONE              AOT.
 0609   REF   1              07,3732  0 3736 0           TC      STALL

 0610   REF  82  LAST 1316   07,3733  3 4743 0  RADSTALL CAF     TWO
 0611   REF   2  LAST 1326   07,3734  1 3736 1           TCF     STALL
```

```
0612   REF   3  LAST  958   07,3731               OPTSTALL EQUALS AOTSTALL

0613   REF 247  LAST 1325   07,3735  3 4746 0   IMUSTALL CAF     ZERO              IMU.

0614                        07,3736  0 0004 0   STALL    INHINT
0615   REF  18  LAST 1325   C7,3737  54 C71 0            TS      RUPTREG2          SAVE DEVICE INDEX.
0616   REF 412  LAST 1324   07,3740  50 000 1            INDEX   A                 SEE IF OPERATION COMPLETF.
0617   REF   9  LAST 1325   07,3741  11'301 0            CCS     MODECADR
0618   REF   1              C7,3742  1 3760 1            TCF     MODABORT          ALLUWABLE STATES ARE +0, -1, AND -0.
0619   REF   1              C7,3743  1 3754 0            TCF     MODESLP           OPERATION INCOMPLETE.
0620   REF   1              07,3744  1 3750 1            TCF     MODEGOOD          COMPLETE AND GOOD IF = -1.

0621   REF  19  LAST 1327   07,3745  50 071 1   MG2      INDEX   RUPTREG2          COMPLETE AND FAILED IF -0. RESET TO +0.
0622   REF  10  LAST 1327   07,3746  55'301 0            TS      MODECADR          RETURN TO CALLER.
0623   REF   8  LAST 1324   07,3747  1 2742 0            TCF     MODEEXIT

0624   REF 413  LAST 1327   07,3750  10 000 0   MODEGOOD CCS     A                 MAKE SURF INITIAL STATE -1.
0625   REF   2  LAST 1327   C7,3751  1 3760 1            TCF     MODABORT

0626   REF  24  LAST 1317   C7,3752  24 133 0            INCR    BUF2              IF SO, INCREMENT RETURN ADDRESS AND
0627   REF   1              07,3753  1 3745 0            TCF     MG2               RETURN IMMEDIATELY, SETTING CADR = +0.

0628   REF  12  LAST  934   07,3754  0 4636 0   MODESLP  TC      MAKECADR          CALL FROM SWITCHABLE FIXFD ONLY.
0629   REF  20  LAST 1327   C7,3755  5C C71 1            INDEX   RUPTREG2
0630   REF  11  LAST 1327   C7,3756  55'301 0            TS      MODECADR
0631   REF   6  LAST 1317   07,3757  1 5124 1            TCF     JOBSLEEP

0632   REF  25  LAST 1327   07,3760  52 134 0   MODABORT DXCH    BUF2
0633   REF   6  LAST 1124   07,3761  0 5712 0            TC      BAILOUT1          TWO PROGRAMS USING THE SAME DEVICE.
0634                        07,3762   31210 0            OCT     31210
```

```
P0635           CONSTANTS FOR MODE SWITCHING ROUTINES

 0636    REF   4  LAST  970      5745                  BITS3&4   =        OCT14
 0637    REF   4  LAST 1283      4762                  BITS4&6   =        OCT50
 0638                         07,3763    00030 1  BITS4-5   OCT      00030
 0639    REF  43  LAST 1320      4735                  IMUSEFLG  EQUALS   BIT8                INTERPRETER SWITCH 7.
 0640                         07,3764    77500 1  -COMMAX   DEC      -191
 0641                         07,3765    77477 0  -COMMAX-  DEC      -192
 0642                         07,3766    00074 1  600MS     DEC      60
 0643    REF   4  LAST  949   07,3175             IMUFIN20  =        IMUFINE
 06435   REF   1              21,2000                       SETLOC   MANUR
 06436                        21,2764                       BANK

 0644    REF   4  LAST  381   21,2764  3 1304 1  GOMANUR   CA       ATTCADR             IS KALCMANU FREE
 0645                         21,2765  0 0006 1            EXTEND
 0646    REF   1              21,2766  1 2771 0            BZF      OKMANUR
 0647    REF  59  LAST 1284   21,2767  0 4626 1            TC       POSTJUMP
 06475   REF   3  LAST 1327   21,2770   17760 0            CADR     MODABORT
 0648                         21,2771  0 0006 1  OKMANUR   EXTEND
 0649    REF  26  LAST 1327   21,2772  3 0134 1            DCA      BUF2
 0650    REF   5  LAST 1328   21,2773  53'305 1            DXCH     ATTCADR             SAVE FINAL RETURN FOR KALCMAN3

 0651    REF  44  LAST 1297   21,2774  3 0006 1            CA       BBANK
 0652    REF  24  LAST 1319   21,2775  7 4750 0            MASK     SEVEN
 0653    REF   6  LAST 1328   21,2776  27'305 1            ADS      ATTCADR +1

 0654    REF  34  LAST 1111   21,2777  3 0167 1            CA       PRIORITY
 0655    REF   3  LAST 1103   21,3000  7 7746 1            MASK     PRIO37
 0656    REF   2  LAST  381   21,3001  55'306 1            TS       ATTPRIO             SAVE USERS PRIO

 0657    REF   1              21,3002  3 3006 1            CAF      KALEBCON            SET EBANK FOR KALCMAN3
 0658    REF  83  LAST 1321   21,3003  54 003 0            TS       EBANK
 0659    REF  60  LAST 1328   21,3004  0 4626 1            TC       POSTJUMP
 0660    REF   1              21,3005   44004 0            CADR     KALCMAN3
 0661    REF  13  LAST  500   21,3006   03275 1  KALEBCON  ECADR    BCDU
```

```
P0662   PROGRAM DESCRIPTION
R0663   IMU STATUS CHECK ROUTINE R02  (SUBROUTINE UTILITY)
R0664   MOD NO - 1
R0665   MOD BY - N.BRODEUR
R0666   FUNCTIONAL DESCRIPTION
R0667
R0668   TO CHECK WHETHER IMU IS ON AND IF ON WHETHER IT IS ALIGNED TO AN
R0669   ORIENTATION KNOWN BY THE CMC. TO REQUEST SELECTION OF THE APPROPRIATE
R0670   PROGRAM IF THE IMU IS OFF OR NOT ALIGNED TO AN ORIENTATION KNOWN 8Y THE
R0671   CMC. CALLED THROUGH BANKCALL
R0672   CALLING SEQUENCE-
R0673
R0674   L        TC     BANKCALL
R0675   L+1      CADR   R02BCTH
R0676   SUBROUTINES CALLED
R0677
R0678         VARALARM
R0679         FLAGUP
R0680   NORMAL EXIT MODES
R0681
R0682   AT L+2 OF CALLING SEQUENCE
R0683   ALARM OR ABORT EXIT MODES
R0684         GOTOPOOH, WITH ALARM
R0685   ERASABLE INITIALIZATION REQUIRED
R0686
R0687   NONE
R0688   DE8RIS
R0689
R0690   CENTRALS-A,Q,L
 0692   REF   1              C4,2000                     SETLOC R02
 0693                        04,3256                     8ANK
 0694   REF   1                                          COUNT* $$/R02
 0695                        04,3256   00063 1  DEC51    DEC    51
A06955

 06956  REF   1              15,2000                     SETLOC R02BNK15
 06957                       15,3757                     8ANK

 0696   REF   7  LAST 1312   15,3757  3 4730 1  R02BOTH  CAF    REFSMBIT
 0697   REF  14  LAST 1312   15,3760  7 0C77 0           MASK   FLAGWRD3
 0698   RFF 414  LAST 1327   15,3761  10 C00 0           CCS    A
 0699   REF   1              15,3762  0 3773 1           TC     R02ZERO         ZERO IMUS

 0700   REF  69  LAST 1324   15,3763  3 1277 1           CA     IMODES30
 0701   REF  31  LAST 1323   15,3764  7 4734 1           MASK   BIT9            IS ISS INITIALIZED
 0702                        15,3765  0 C006 1           EXTEND
 0703                        15,3766  1 3770 0           BZF    +2
 0704   REF  55  LAST 1324   15,3767  4 4741 0           CS     BIT4            SEND IMU ALARM CODE 210
 0705   REF   1              15,3770  6 3776 1           AD     OCT220          SEND REFSMM ALARM
 0706   REF   4  LAST  627   15,3771  0 5740 1           TC     VARALARM
 0707    REF  63  LAST  981   15,3772  0 6001 0             TC      GOTOPOOH

 0708    REF  75  LAST 1251   15,3773  0 5506 1  RO2ZERO    TC      UPFLAG
 0709    REF   6  LAST  981   15,3774   00007 0             ADRES   IMUSE
 0710    REF  10  LAST 1315   15,3775  1 4622 1             TCF     SWRETURN
 0711                         15,3776   00220 1  OCT220     OCT     220
```

```
P0712   PROGRAM DESCRIPTION   P06   10FEB67

R0713   TRANSFER THE ISS/CMC FROM THE OPERATE TO THE STANDBY CONDITION.

R0714   THE NORMAL CONDITION OF READINESS OF THE GNCS WHEN NOT IN USE IS STANDBY. IN THIS CONDITION THE IMU
R0716   HEATER POWER IS ON. THE IMU OPERATE POWER IS OFF. THE COMPUTER POWER IS ON. THE OPTICS POWER IS OFF. THE
R0718   CMC  STANDBY ON THE MAIN AND LEB DISKYS IS ON.

R0719   CALLING SEQUENCE:
R0720             ASTRONAUT REQUEST THROUGH DSKY     V37E 06E.

R0721   SUBROUTINES CALLED:
R0722             GOPERF1
R0723             BANKCALL
R0724             FLAGDOWN
```

```
P0725   PRESTAND PREPARES FOR STANDBY BY SNAPSHOTTING THE SCALER AND TIME1 TIME2
R0726   THE LOW 5 BITS OF THE SCALER ARE INSPECTED TO INSURE COMPATABILITY
R0727   BETWEEN THE SCALER READING AND THE TIME1 TIME2 READING.

 0728   REF    1                37,2000                      SETLOC P05P06
 0729                           37,3654                      BANK

 0730   REF    2  LAST  101       0314                       EBANK= TIME2SAV
 0731   REF    1                                             COUNT* $$/P06

 0732   REF   76  LAST 1330     37,3654  0 5506 1  P06       TC     UPFLAG        SET NODOV37 BIT
 0733   REF    5  LAST 1207     37,3655   00054 0            ADRES  NODOFLAG

 0734                           37,3656  0 0004 0  PRESTAND  INHINT
 0735                           37,3657  0 0006 1            EXTEND
 0736   REF   33  LAST 1304     37,3660  3 0025 0            DCA    TIME2         SNAPSHOT TIME1TIME2
 0737   REF    3  LAST 1332     37,3661  52 315 1            DXCH   TIME2SAV
 0738   REF    1                37,3662  0 3713 1            TC     SCALPREP
 0739   REF    1                37,3663  0 3656 1            TC     PRESTAND      T1,T2,SCALER NOT COMPATIBLE
 0740   REF  788  LAST 1317     37,3664  52 155 1            DXCH   MPAC          T1,T2 AND SCALER OK
 0741   REF    1                37,3665  52 317 0            DXCH   SCALSAVE      STORE SCALER
 0742                           37,3666  0 0004 0            INHINT
 0743   REF  296  LAST 1262     37,3667  0 4607 1            TC     BANKCALL
 0744   REF    3  LAST  186     37,3670   17162 1            CADR   RNDREFDR      REFSMM, DRIFT, TRACK FLAGS DOWN

 0745   REF   95  LAST 1207     37,3671  0 5520 0            TC     DOWNFLAG
 0746   REF    7  LAST 1330     37,3672   00007 0            ADRES  IMUSE         IMUSE DOWN
 0747   REF   96  LAST 1332     37,3673  0 5520 0            TC     DOWNFLAG
 0748   REF    6  LAST  839     37,3674   00010 0            ADRES  RNDVZFLG      RNDVZFLG DOWN

 0749   REF   29  LAST 1308     37,3675  3 4732 0            CAF    BIT11
 0750                           37,3676  0 0006 1            EXTEND
 0751   REF   18  LAST  991     37,3677  05 013 0            WOR    CHAN13        SET STANDBY ENABLE BIT

 0752   REF  116  LAST 1240     37,3700  0 5355 1            TC     PHASCHNG      SET RESTART TO POSTAND WHEN STANDBY
 0753                           37,3701   07024 0            OCT    07024           RECOVERS
 0754                           37,3702   20000 0            OCT    20000
 0755   REF    2  LAST 1332       0316                       EBANK= SCALSAVE
 0756   REF    1                37,3703   03733 0            2CADR  POSTAND
 0756   REF    1                37,3704   76060 0
 0757   REF    1                37,3705  3 4765 1            CAF    OCT62
 0758   REF  297  LAST 1332     37,3706  0 4607 1            TC     BANKCALL
 0759   REF   10  LAST  970     37,3707   20635 0            CADR   GOPERF1
 0760                           37,3710  1 3705 1            TCF    -3
 0761                           37,3711  1 3705 1            TCF    -4
 0762                           37,3712  1 3705 1            TCF    -5

 0763   REF    2  LAST  531       4765             OCT62     EQUALS .5SEC         DEC 50 = OCT 62

R0764   THE LOW 5 BITS OF THE SCALER READS 10000 FOR THE FIRST INTERVAL AFTER A
```

```
R0765    T1 INCREMENT. IF SCALPREP DETECTS THIS INTERVAL THE T1,T2 AND SCALER
R0766    DATA ARE NOT COMPATABLE AND RETURN IS TO L+1 FOR ANOTHER READING OF THE
R0767    DATA. OTHERWISE, THE RETURN IS TO L+2 TO PROCEED. ROUTINE ALSO PREPARES
R0768    THE SCALER READING FOR COMPUTATION OF THE INCREMENT TO UPDATE T1T2. (THE
R0769    10 MS BIT (BIT 6) OF THE SCALER IS INCREMENTED 5 MS OUT OF PHASE FROM
R0770    T1.) ADDITION OF 5 MS (BIT 5) TO THE SCALER READING HAS THE EFFECT OF
R0771    ADJUSTING BIT 6 IN THE SCALER TO BE IN PHASE WITH BIT 1 OF T1. THE LOW 5
R0772    BITS OF THE SCALER READING ARE THEN SET TO ZERO, TO TRUNCATE THE SCALER
R0773    DATA TO 10 MS. RESULTS ARE STORED IN MPAC, +1.

 0774                          37,3713  0 0006 1  SCALPREP EXTEND
 0775    REF 789  LAST 1332   37,3714  22 156 0           QXCH    MPAC    +2
 0776    REF   3  LAST  393   37,3715  0 4103 1           TC      FINETIME +1
 0777                          37,3716  0 0003 1           RELINT
 0778    REF 790  LAST 1333   37,3717  52 155 1           DXCH    MPAC
 0779    REF  43  LAST 1314   37,3720  3 4740 0           CA      BIT5              ADD 5 MS TO THE SCALER READING.
 0780    REF 250  LAST 1320   37,3721  54 001 1           TS      L
 0781    REF 248  LAST 1327   37,3722  3 4746 0           CA      ZERO
 0782    REF 791  LAST 1333   37,3723  20 155 1           DAS     MPAC
 0783    REF  11  LAST  739   37,3724  4 4337 0           CS      LOW5              SET LOW 5 BITS OF (SCALER+5MS) TO ZERO
 0784    REF 792  LAST 1333   37,3725  7 0155 1           MASK    MPAC      +1      AND STORE RESULTS IN MPAC,+1.
 0785    REF 793  LAST 1333   37,3726  56 155 0           XCH     MPAC      +1
 0786    REF  12  LAST 1333   37,3727  7 4337 0           MASK    LOW5              TEST LOW 5 BITS OF SCALER FOR THE FIRST
A0787                                                                               INTERVAL AFTER THE T1 INCREMENT
A0788                                                                               (NOW = 00000, SINCE BIT 5 ADDED).
 0789    REF 415  LAST 1329   37,3730  10 000 0           CCS     A                 IS IT 1ST INTERVAL AFTER T1 INCREMENT
 0790    REF 794  LAST 1333   37,3731  24 156 0           INCR    MPAC +2           NO
 0791    REF 795  LAST 1333   37,3732  0 0156 0           TC      MPAC +2           YES

R0792    POSTAND RECOVERS TIME AFTER STANDBY.THE SCALER IS SNAPSHOTTED AND THE
R0793    TIME1 TIME2 COUNTER IS SET TO ZERO. THE LOW 5 BITS OF THE SCALER ARE
R0794    INSPECTED TO INSURE COMPATABILITY BETWEEN THE SCALER READING AND THE
R0795    CLEARING OF THE TIME COUNTER. IT THEN COMPUTES THE DIFFERENCE IN SCALER
R0796    VALUES (IN DP) AND ADDS THIS TO THE PREVIOUSLY SNAPSHOTTED VALUES OF
R0797    TIME1 TIME2 AND PLACES THIS NEW TIME INTO THE TIME1 TIME2 COUNTER.

 0798    REF   1                                          COUNT*  $$/P05

 0799    REF  30  LAST 1332   37,3733  4 4732 1  POSTAND  CS      BIT11             RECOVER TIME AFTER STANDBY.
 0800                          37,3734  0 0006 1           EXTEND
 0801    REF  19  LAST 1332   37,3735  03 013 0           WAND    CHAN13            CLEAR STANDBY ENABLE BIT
 0802                          37,3736  0 0004 0           INHINT
 0803    REF 249  LAST 1333   37,3737  3 4746 0           CA      ZERO
 0804    REF 251  LAST 1333   37,3740  54 001 1           TS      L
 0805    REF  34  LAST 1332   37,3741  52 025 1           DXCH    TIME2             CLEAR TIME1TIME2
 0806    REF   2  LAST 1332   37,3742  0 3713 1           TC      SCALPREP          STORE SCALER IN MPAC, MPAC+1
 0807    REF   2  LAST 1332   37,3743  0 3736 0           TC      POSTAND +3        T1,T2,SCALER NOT COMPATIBLE
 0808                          37,3744  0 0006 1           EXTEND                    T1,T2 AND SCALER OK
 0809    REF   3  LAST 1332   37,3745  4 0317 0           DCS     SCALSAVE
 0810    REF 796  LAST 1333   37,3746  20 155 1           DAS     MPAC              FORM DP DIFFERENCE OF POSTSTANDBY SCALER
```

```
0811   REF  44  LAST 1321   37,3747  3 4733 1              CAF     BIT10              MINUS PRESTANDBY SCALER AND SHIFT RIGHT
0812   REF  10  LAST  859   37,3750  0 7330 0              TC      SHORTMP            5 TO ALIGN BITS WITH TIME1TIME2.
0813   REF 250  LAST 1333   37,3751  3 4746 0              CAF     ZERO
0814   REF 797  LAST 1333   37,3752  54 156 1              TS      MPAC     +2        NEEDED FOR TP AGREE
0815   REF  16  LAST 1316   37,3753  0 7300 0              TC      TPAGREE            MAKE DP DIFF AGREE
0816   REF 798  LAST 1334   37,3754  10 154 0              CCS     MPAC
0817   REF   1              37,3755  0 3762 1              TC      POSTCOM            IF DP DIFF NET +, NO SCALER OVERFLOW
0818   REF   2  LAST 1334   37,3756  0 3762 1              TC      POSTCOM            BETWEEN PRE AND POST STANDBY.
0819                        37,3757  0 3760 0              TC      +1                 IF DP DIFF NET -, SCALER OVERFLOWED. ADD
0820   REF  45  LAST 1334   37,3760  3 4733 1              CAF     BIT10              BIT 10 TO HIGH DIFF TO CORRECT.
0821   REF 799  LAST 1334   37,3761  26 154 0              ADS     MPAC
0822                        37,3762  0 0006 1    POSTCOM   EXTEND                     C(MPAC,+1) IS MAGNITUDE OF DELTA SCALER.
0823   REF   4  LAST 1332   37,3763  3 0315 0              DCA     TIME2SAV           PRESTANDBY TIME1TIME2
0824   REF 800  LAST 1334   37,3764  20 155 1              DAS     MPAC
0825   REF  17  LAST 1334   37,3765  0 7300 0              TC      TPAGREE            FORCE SIGN AGREEMENT
0826   REF 801  LAST 1334   37,3766  52 155 1              DXCH    MPAC               UPDATED VALUE FOR T1,T2.
0827   REF  35  LAST 1333   37,3767  20 025 1              DAS     TIME2              LOAD UPDATED VALUE INTO T1,T2, WITH
0828   REF  97  LAST 1332   37,3770  0 5520 0              TC      DOWNFLAG           CLEAR NODOFLAG
0829   REF   6  LAST 1332   37,3771   00054 0              ADRES   NODOFLAG

0830   REF  64  LAST 1330   37,3772  0 6001 0              TC      GOTOPOOH
```

```
0001                          14,3765                     BANK     14
0002     REF    1             04,2000                     SETLOC KEYRUPT
0003                          04,3257                     BANK
0004     REF    1                                         COUNT* $$/KEYUP

0005     REF    9  LAST 1127  04,3257  54 016 1 KEYRUPT1  TS       BANKRUPT
0006     REF  351  LAST 1324  04,3260  56 002 0           XCH      Q
0007     REF    8  LAST 1127  04,3261  54 012 0           TS       QRUPT
0008     REF    2  LAST  453  04,3262  0 4371 0           TC       LODSAMPT        TIME IS SNATCHED IN RUPT FOR NOUN 65.
0009     REF   13  LAST 1333  04,3263  3 4337 1           CAF      LOW5
0010                          04,3264  0 0006 1           EXTEND
0011     REF    2  LAST  229  04,3265  02 015 1           RAND     MNKEYIN         CHECK IF KEYS 5M-1M ON
0012     REF    6  LAST 1297  04,3266  54 073 1 KEYCOM    TS       RUPTREG4
0013     REF   29  LAST  912  04,3267  4 0101 0           CS       FLAGWRD5
0014     REF    1             04,3270  7 4726 1           MASK     DSKYFBIT
0015     REF   30  LAST 1335  04,3271  26 101 0           ADS      FLAGWRD5

0016     REF    6  LAST 1097  04,3272  3 4346 1 ACCEPTUP  CAF      CHRPRIO         (NOTE: RUPTREG4 = KEYTEMP1)
0017     REF   26  LAST 1291  04,3273  0 5063 1           TC       NOVAC
0018     REF   66  LAST  473     0776                     EBANK=   DSPCOUNT
0019     REF    1             04,3274   02057 1           2CADR    CHARIN
0019     REF    1             04,3275   60101 1
0020     REF    7  LAST 1335  04,3276  3 0073 0           CA       RUPTREG4
0021     REF   24  LAST 1325  04,3277  50 064 0           INDEX    LOCCTR
0022     REF  802  LAST 1334  04,3300  54 154 0           TS       MPAC            LEAVE 5 BIT KEY CDE IN MPAC FOR CHARIN
0023     REF   20  LAST  993  04,3301  0 5272 0           TC       RESUME
```

```
P0024    UPRUPT PROGRAM

 0025    REF  10   LAST 1335    04,3302   54 016 1   UPRUPT    TS        BANKRUPT
 0026    REF 352   LAST 1335    04,3303   56 002 0             XCH       Q
 0027    REF   9   LAST 1335    04,3304   54 012 0             TS        QRUPT
 0028    REF   3   LAST 1335    04,3305   0 4371 0             TC        LODSAMPT          TIME IS SNATCHED IN RUPT FOR NOUN 65.
 0029    REF 251   LAST 1334    04,3306   3 4746 0             CAF       ZERO
 0030    REF   2   LAST  233    04,3307   56 045 0             XCH       INLINK
 0031    REF   2   LAST  164    04,3310   54 073 1             TS        KEYTEMP1
 00312   REF  15   LAST 1329    04,3311   3 0077 1             CA        FLAGWRD3          AFTER EARTH LAUNCH?
 00313   REF   5   LAST  302    04,3312   7 4732 1             MASK      NOPO7BIT
 00314   REF 416   LAST 1333    04,3313   10 000 0             CCS       A
 00315   REF   1                04,3314   1 3320 1             TCF       UPRPT1            YES
 00316   REF   3   LAST 1336    04,3315   3 0073 0             CA        KEYTEMP1          NO: SUM UPLINK DATA
 00317   REF   2   LAST  109    04,3316   27'245 1             ADS       UPSUM
 00318   REF   3   LAST 1336    04,3317   25'246 0             INCR      UPSUM +1
 0032    REF  37   LAST 1282    04,3320   3 4742 1   UPRPT1    CAF       BIT3              TURN ON UPACT LIGHT
 0033                           04,3321   0 0006 1             EXTEND                      (BIT 3 OF CHANNEL 11)
 0034    REF  34   LAST 1324    04,3322   05 011 1             WOR       DSALMOUT
 0035    REF  14   LAST 1335    04,3323   3 4337 1             CAF       LOW5              TEST FOR TRIPLE CHAR REDUNDANCY
 0036    REF   4   LAST 1336    04,3324   7 0073 1             MASK      KEYTEMP1          LOW5 OF WORD
 0037    REF   5   LAST 1336    04,3325   56 073 0             XCH       KEYTEMP1          LOW5 INTO KEYTEMP1
 0038                           04,3326   0 0006 1             EXTEND
 0039    REF  46   LAST 1334    04,3327   7 4733 0             MP        BIT10             SHIFT RIGHT 5
 0040    REF   1                04,3330   54 332 1             TS        KEYTEMP2
 0041    REF  15   LAST 1336    04,3331   7 4337 0             MASK      LOW5              MID 5
 0042    REF   1                04,3332   6 3366 1             AD        HI10
 0043    REF   1                04,3333   0 3363 1             TC        UPTEST
 0044    REF  47   LAST 1336    04,3334   3 4733 1             CAF       BIT10
 0045                           04,3335   0 0006 1             EXTEND
 0046    REF   2   LAST 1336    04,3336   7 0332 1             MP        KEYTEMP2          SHIFT RIGHT 5
 0047    REF  16   LAST 1336    04,3337   7 4337 0             MASK      LOW5              HIGH 5
 0048                           04,3340   4 0000 0             COM
 0049    REF   2   LAST 1336    04,3341   0 3363 1             TC        UPTEST

 0050    REF   1                04,3342   4 3371 0   UPOK      CS        ELRCODE           CODE IS GOOD. IF CODE = 'ERROR RESET',
 0051    REF   6   LAST 1336    04,3343   6 0073 0             AD        KEYTEMP1          CLEAR UPLOCKFL(SET BIT4 OF FLAGWRD7 = 0)
 0052                           04,3344   0 0006 1             EXTEND                      IF CODE DOES NOT = 'ERROR RESET', ACCEPT
 0053    REF   1                04,3345   1 3353 0             BZF       CLUPLOCK          CODE ONLY IF UPLOCKFL IS CLEAR (=0).

 0054    REF   1                04,3346   3 4741 1             CAF       UPLOCBIT          TEST UPLOCKFL FOR 0 OR 1
 0055    REF  27   LAST  895    04,3347   7 0103 1             MASK      FLAGWRD7
 0056    REF 417   LAST 1336    04,3350   10 000 0             CCS       A
 0057    REF  21   LAST 1335    04,3351   0 5272 0             TC        RESUME            UPLOCKFL = 1
 0058    REF   1                04,3352   0 3272 0             TC        ACCEPTUP          UPLOCKFL = 0

 0059    REF   2   LAST 1336    04,3353   4 4741 0   CLUPLOCK  CS        UPLOCBIT          CLEAR UPLOCKFL (I.E.,SET BIT 4 OF )
 0060    REF  28   LAST 1336    04,3354   7 0103 1             MASK      FLAGWRD7          FLAGWRD7 = 0)
 0061    REF  29   LAST 1336    04,3355   54 103 1             TS        FLAGWRD7
 0062    REF   2   LAST 1336    04,3356   0 3272 0             TC        ACCEPTUP
```

```
A0063                                                                                CODE IS BAD
 0064   REF  30  LAST 1336   04,3357  4 0103 1  TMFAIL2   CS      FLAGWRD7          LOCK OUT FURTHER UPLINK ACTIVITY
 0065   REF   3  LAST 1336   04,3360  7 4741 0            MASK    UPLOCBIT          (BY SETTING UPLOCKFL = 1) UNTIL
 0066   REF  31  LAST 1337   04,3361  26 103 1            ADS     FLAGWRD7          'ERROR RESET' IS SENT VIA UPLINK.
 0067   REF  22  LAST 1336   04,3362  0 5272 0            TC      RESUME
 0069   REF   7  LAST 1336   04,3363  6 0073 0  UPTEST    AD      KEYTEMP1
 0070   REF 418  LAST 1336   04,3364  10 000 0            CCS     A
 0071   REF   1              04,3365  0 3357 0            TC      TMFAIL2
 0072                        04,3366   77740 1  HI10      OCT     77740
 0073   REF   2  LAST 1337   04,3367  0 3357 0            TC      TMFAIL2
 0074   REF 353  LAST 1336   04,3370  0 0002 0            TC      Q

 0075                        04,3371   00022 1  ERRCODE   OCT     22

R0076   'UPLINK ACTIVITY LIGHT' IS TURNED OFF BY .....
R0077             1.     VBRELDSP
R0078             2.     ERROR RESET
R0079             3.     UPDATE PROGRAM(P27) ENTERED BY V70,V71,V72,AND V73.


R0080                                              -
R0081   THE RECEPTION OF A BAD CODE(I.E  CCC FAILURE) LOCKS OUT FURTHER UPLINK ACTIVITY BY SETTING BIT4 OF FLAGWRD7 = 1.
R0083   THIS INDICATION WILL BE TRANSFERRED TO THE GROUND BY THE DOWNLINK WHICH DOWNLINKS ALL FLAGWORDS.
R0085   WHEN UPLINK ACTIVITY IS LOCKED OUT ,IT CAN BE ALLOWED WHEN THE GROUND UPLINKS AND 'ERROR RESET' CODE.
R0087   (IT IS RECOMMENDED THAT THE 'ERROR LIGHT RESET' CODE IS PRECEEDED BY 16 BITS THE FIRST OF WHICH IS 1 FOLLOWED
R0089   BY 15 ZEROES. THIS WILL ELIMINATE EXTRANEOUS BITS FROM INLINK WHICH MAY HAVE BEEN LEFT OVER FROM THE ORIGINAL
R0091   FAILURE)
R0092   UPLINK ACTIVITY IS ALSO ALLOWED(UNLOCKED) DURING FRESH START WHEN FRESH START SETS BIT4 OF FLAGWRD7 = 0.
```

```
R0001    DISPLAYS CAN BE CLASSIFIED INTO THE FOLLOWING CATEGORIES-

R0002        1. PRIORITY DISPLAYS- DISPLAYS WHICH TAKE PRIORITY OVER ALL OTHER DISPLAYS. USUALLY THESE DISPLAYS ARE SENT
R0004           OUT UNDER CRITICAL ALARM CONDITIONS.
R0005        2. EXTENDED VERB DISPLAYS- ALL EXTENDED VERBS AND MARK ROUTINES SHOULD USE EXTENDED VERB (MARK) DISPLAYS.
R0007        3. NORMAL DISPLAYS- ALL MISSION PROGRAM DISPLAYS WHICH INTERFACE WITH THE ASTRONAUT DURING THE NORMAL
R0009           SEQUENCE OF EVENTS.
R0010        4. MISC. DISPLAYS- ALL DISPLAYS NOT HANDLED BY THE DISPLAY INTERFACEROUTINES. THESE INCLUDE SUCH DISPLAYS AS
R0012           MM DISPLAYS AND SPECIAL PURPOSE DISPLAYS HANDLED BY PINBALL.


R0013        5. ASTRONAUT INITIATED DISPLAYS- ALL DISPLAYS INITIATED EXTERNALLY.
R0014    THE FOLLOWING TERMS ARE USED TO DESCRIBE THE STATUS OF DISPLAYS-

R0015        I. ACTIVE-THE DISPLAY WHICH IS (1) BEING DISPLAYED TO THE ASTRONAUT AND WAITING FOR A RESPONSE OR
R0017           (2) WAITING FIRST IN LINE FOR THE ASTRONAUT TO FINISH USING THE DSKY OR (3) BEING DISPLAYED ON THE DSKY
R0019           BUT NOT WAITING FOR A RESPONSE.
R0020        2. INACTIVE -A DISPLAY WHICH HAS (1) BEEN ACTIVE BUT WAS INTERRUPTEDBY A DISPLAY OF HIGHER PRIORITY,
R0022           (2) BEEN PUT INTO THE WAITING LIST AT TIME IT WAS REQUESTED DUE TO THE FACT A HIGHER PRIORITY DISPLAY
R0024           WAS ALREADY GOING, (3) BEEN INTERRUPTED BY THE ASTRONAUT (CALLED A PINBRANCH CONDITION, SINCE THIS TYPE
R0026           OF INACTIVE DISPLAY IS USUALLY REACTIVATED ONLY BY PINBALL) OR (4) A DISPLAY WHICH HAS FINISHED BUT STILL
R0028           HAS INFO SAVED FOR RESTART PURPOSES.


R0029    DISPLAY PRIORITIES WORK AS FOLLOWS-

R0030      INTERRUPTS-
R0031        1. THE ASTRONAUT CAN INTERRUPT ANY DISPLAY WITH AN EXTERNAL DISPLAY REQUEST.
R0033        2. INTERNAL DISPLAYS CAN NOT BE SENT OUT WHEN THE ASTRONAUT IS USING THE DSKY.
R0035        3. PRIORITY DISPLAYS INTERRUPT ALL OTHER TYPES OF INTERNAL DISPLAYS. A PRIORITY DISPLAY INTERRUPTING ANOTHER
R0037           PRIORITY DISPLAY WILL CAUSE AN ABORT UNLESS BIT14 IS SET FOR THE LINUS ROUTINE.
R0039        4. A MARK DISPLAY INTERRUPTS ANY NORMAL DISPLAY.
R0040        5. A MARK THAT INTERRUPTS A MARK COMPLETELY REPLACES IT.

R0041      ORDER OF WAITING DISPLAYS-
R0042        1. ASTRONAUT EXTERNAL USE
R0043        2. PRIORITY
R0044        3. INTERRUPTED MARK
R0045        4. INTERRUPTED NORMAL

R0046        5. MARK TO BE REQUESTED (SEE DESCRIPTION OF ENDMARK)
R0047        6. MARK WAITING
R0048        7. NORMAL WAITING
```

```
P0049   THE DISPLAY ROUTINES ARE INTENDED TO SERVE AS AN INTERFACE BETWEEN THE USER AND PINBALL.  THE
R0051   FOLLOWING STATEMENTS CAN BE MADE ABOUT NORMAL DISPLAYS AND PRIORITY DISPLAYS (A DESCRIPTION OF MARK ROUTINES
R0053   WILL FOLLOW LATER):

R0054           1.  ALL ROUTINES THAT END IN R HAVE AN IMMEDIATE RETURN TO THE USER.  FOR ALL FLASHING DISPLAYS THIS RETURN
R0056               IS TO THE USERS CALL CADR +4.  FOR THE ONLY NON FLASHING IMMEDIATE RETURN DISPLAY (GODSPR) THIS RETURN
R0058               IS TO THE USERS CALLING LOC +1.
R0059           2.  ALL ROUTINES NOT ENDING IN R DO NOT DO AN IMMEDIATE RETURN TO THE USER.
R0061           3.  ALL ROUTINES THAT END IN R START A SEPARATE JOB (MAKEPLAY) WITH USERS JOB PRIORITY.
R0063           4.  ALL ROUTINES NOT ENDING IN R BRANCH DIRECTLY TO MAKEPLAY WHICH MAKES THESE DISPLAYS A PART OF THE
R0065               USERS JOB.
R0066           5.  ALL DISPLAY ROUTINES ARE CALLED VIA BANKCALL.
R0067           6.  TO RESTART A DISPLAY THE USER WILL GENERALLY USE A PHASE OF ONE WITH DESIRED RESTART GROUP (SEE
R0069               DESCRIPTION OF RESTARTS).
R0070           7.  ALL FLASHING DISPLAYS HAVE 3 RETURNS TO THE USER FROM ASTRONAUT RESPONSES.  A TERMINATE (V34) BRANCHES
R0072               TO THE USERS CALL CADR +1.  A PROCEED (V33) BRANCHES TO THE USERS CALL CADR +2.  AN ENTER OR RECYCLE
R0074               (V32) BRANCHES TO THE USERS CALL CADR +3.
R0075           8.  ALL ROUTINES MUST BE USED UNDER EXECUTIVE CONTROL.

R0076   A DESCRIPTION OF EACH ROUTINE WITH AN EXAMPLE FOLLOWS:

R0077   GODSP IS USED TO DISPLAY A VERB NOUN ARRIVING IN A.  NO RETURN IS MADE TO THE USER.

R0079           1. GODSP IS NOT RESTARTABLE
R0080           2. A VERB PASTE WITH GODSP ALWAYS TURNS ON THE FLASH.
A0081                                                   CAF     VXXNYY
A0082                                                   TC      BANKCALL
A0083                                                   CADR    GODSP

A0084                                           VXXNYY  OCT     0XXYY

R0085   GODSPR IS THE SAME AS GODSP ONLY RETURN IS TO THE USER.

A0086                                                   CAF     VXXNYY
A0087                                                   TC      BANKCALL
A0088                                                   CADR    GODSPR

A0089                                                   ...     ...                 IMMEDIATE RETURN OF GODSPR

R0090   GOFLASH DISPLAYS A FLASHING VERB NOUN WITH NO IMMEDIATE RETURN TO THE USER. 3 RETURNS ARE POSSIBLE FROM
R0092   THE ASTRONAUT (SEE NO. 7 ABOVE).

A0093                                                   CAF     VXXNYY              VXX NYY WILL BE A FLASHING VERB NOUN.
A0094                                                   TC      BANKCALL
A0095                                                   CADR    GOFLASH
A0096                                                   ...     ...                 TERMINATE RETURN
A0097                                                   ...     ...                 PROCEED RETURN
A0098                                                   ...     ...                 ENTER OR RECYCLE RETURN

R0099   GOPERF1 IS ENTERED WITH DESIRED CHECKLIST VALUE IN A.  GOPERF1 WILL DISPLAY THIS VALUE IN R1 BY MEANS OF A
```

```
R0101   V01 N25.A FLASHING PLEASE PERFORM ON CHECKLIST ( V50 N25) IS THEN DISPLAYED.  NO IMMEDIATE RETURN IS MADE TO
R0103   USER (SEE NO. 7 ABOVE).

R0104   GOPERF1 BLANKS REGISTERS R2 AND R3

A0105                                           CAF     OCTXX           CODE FOR CHECKLIST VALUE XX
A0106                                           TC      BANKCALL
A0107                                           CADR    GOPERF1
A0108                                           ...     ...             TERMINATE RETURN
A0109                                           ...     ...             PROCEED RETURN
A0110                                           ...     ...             ENTER RETURN

R0111   GOPERF2 IS ENTERED WITH A VARIABLE NOUN AND V01 ( V00 FOR N10 OR N11) IN A.  GOPERF2 WILL FIRST DISPLAY THE
R0113   REQUESTED NOUN BY MEANS OF A V01NYY OR A V00NYY. PLEASE PERFORM ON NOUN (V50 NYY) THEN BECOMES A FLASHING
R0115   DISPLAY.  NO IMMEDIATE RETURN IS MADE TO THE USER (SEE NO. 7 ABOVE).

R0116   GOPERF2 DOES NOT BLANK ANY REGISTERS

A0117                                           CAF     VXXNYY          VARIABLE NOUN YY. XX=00 OR 01.
A0118                                           TC      BANKCALL
A0119                                           CADR    GOPERF2
A0120                                           ...     ...             TERMINATE RETURN
A0121                                           ...     ...             PROCEED RETURN
A0122                                           ...     ...             ENTER RETURN

R0123   GOPERF3 IS USED FOR A PLEASE PERFORM ON A PROGRAM NUMBER.  THE DESIRED PROGRAM NO. IS ENTERED IN A.  GOPERF3
R0125   DISPLAYS THE NO. BY MEANS OF A V06 N07 FOLLOWED BY A FLASHING V50 N07 FOR A PLEASE PERFORM. NO IMMEDIATE RETURN
R0127   IS MADE TO THE USER (SEE NO. 7 ABOVE).

R0128   GOPERF3 BLANKS REGISTERS R2 AND R3

A0129                                           CAF     DECXX           REQUEST PERFORM ON PXX
A0130                                           TC      BANKCALL
A0131                                           CADR    GOPERF3
A0132                                           ...     ...             TERMINATE RETURN
A0133                                           ...     ...             PROCEED RETURN
A0134                                           ...     ...             ENTER RETURN

R0135   GOPERF4 IS USED FOR A PLEASE PERFORM ON AN OPTION. THE DESIRED OPTION ISENTERED IN A AND STORED IN OPTION1.
R0137   GOPERF4 DISPLAYS R1 AND R2 BY MEANS OF A V04N06 FOLLOWED BY A FLASHING  V50N06 FOR A PLEASE PERFORM. NO
R0139   IMMEDIATE RETURN IS MADE TO THE USER (SEE NO. 7 ABOVE).

A0140                                           CAF     OCTXX           REQUEST PERFORM ON OPTION XX
A0141                                           TC      BANKCALL
A0142                                           CADR    GOPERF4
A0143                                           ...     ...             TERMINATE RETURN
A0144                                           ...     ...             PROCEED RETURN
A0145                                           ...     ...             ENTER RETURN

R0146   GOPERF4 BLANKS REGISTER R3
```

```
R0147   GODSPRET IS USED TO DISPLAY A VERB NOUN ARRIVING IN A WITH A RETURN TO THE USER AFTER THE DISPLAY HAS BEEN SENT
R0149   OUT.

A0150                                                    CAF     VXXNYY
A0151                                                    TC      BANKCALL
A0152                                                    CADR    GODSPRET

A0153                                                    ...     ...               RETURN TO USER

R0154   REGODSP IS USED TO DISPLAY A VERB NOUN ARRIVING IN A.  REGODSP IS THE SAME AS GODSP ONLY REGODSP REPLACES ANY
R0156   ACTIVE NORMAL DISPLAY IF ONE WAS ACTIVE.

A0157                                                    CAF     VXXNYY
A0158                                                    TC      BANKCALL
A0159                                                    CADR    REGODSP

R0160   REFLASH IS THE SAME AS GOFLASH ONLY REFLASH REPLACES ANY ACTIVE NORMAL DISPLAY IF ONE WAS ACTIVE.

A0162                                                    CAF     VXXNYY            VXX NYY WILL BE A FLASHING VERB NOUN
A0163                                                    TC      BANKCALL
A0164                                                    CADR    REFLASH
A0165                                                    ...     ...               TERMINATE RETURN
A0166                                                    ...     ...               PROCEED RETURN
A0167                                                    ...     ...               ENTER RETURN

R0168   GOFLASHR IS SAME AS GOFLASH ONLY AN IMMEDIATE RETURN IS MADE TO THE USERS CALL CADR +4.

A0170                                                    CAF     VXXNYY
A0171                                                    TC      BANKCALL
A0172                                                    CADR    GOFLASHR
A0173                                                    ...     ...               TERMINATE RETURN
A0174                                                    ...     ...               PROCEED RETURN
A0175                                                    ...     ...               ENTER OR RECYCLE RETURN

A0176                                                    ...     ...               IMMEDIATE RETURN FROM GOFLASHR

R0177   GOPERF1R IS THE SAME AS GOPERF1 CNLY GOPERF1R HAS AN IMMEDIATE RETURN TOUSERS CALL CADR +4.

R0179   GOPERF1R BLANKS REGISTERS R2 AND R3

A0180                                                    CAF     OCTXX             CODE FOR CHECKLIST VALUE XX.
A0181                                                    TC      BANKCALL
A0182                                                    CADR    GOPERF1R
A0183                                                    ...     ...               TERMINATE RETURN
A0184                                                    ...     ...               PROCEED RETURN
A0185                                                    ...     ...               ENTER RETURN

A0186                                                    ...     ...               IMMEDIATE RETURN FROM GOPERF1R

R0187   GOPERF2R IS THE SAME AS GOPERF2 CNLY AN IMMEDIATE RETURN IS MADE TO USERS CALL CADR +4.
```

```
R0189   GOPERF2R DOES NOT BLANK ANY REGISTERS

A0190                                                    CAF    VXXNYY          VARIABLE NOUN YY REQUESTED.  XX=00 OR 01
A0191                                                    TC     BANKCALL
A0192                                                    CADR   GOPERF2R
A0193                                                    ...    ...             TERMINATE RETURN
A0194                                                    ...    ...             PROCEED RETURN
A0195                                                    ...    ...             ENTER RFTURN

A0196                                                    ...    ...             IMMEDIATE RETURN HERE FROM GOPERF2R

R0197   GOPERF3R IS THE SAME AS GOPERF3 CNLY AN IMMEDIATE RETURN IS MADE TO USERS CALL CADR +4.

R0199   GOPERF3R BLANKS REGISTERS R2 AND R3

A0200                                                    CAF    PROGXX          PERFORM PROGRAM XX
A0201                                                    TC     BANKCALL
A0202                                                    CADR   GOPERF3R
A0203                                                    ...    ...             TERMINATE RETURN
A0204                                                    ...    ...             PROCEED RETURN
A0205                                                    ...    ...             ENTER RETURN

A0206                                                    ...    ...             GOPERF3R IMMEDIATELY RETURNS HERE

R0207   GOPERF4R IS THE SAME AS GOPERF4 CNLY AN IMMEDIATF RETURN IS MADE TO USERS CALL CADR +4.

A0209                                                    CAF    OCTXX           REQUEST PERFORM ON OPTIONXX
A0210                                                    TC     BANKCALL
A0211                                                    CADR   GOPERF4R
A0212                                                    ...    ...             TERMINATF RETURN
A0213                                                    ...    ...             PROCEED RETURN
A0214                                                    ...    ...             ENTER RETURN

A0215                                                    ...    ...             IMMFDIATF RETURN TO USER

R0216   GOPERF4R BLANKS REGISTEP R3

R0217   REFLASHR IS THE SAME AS REFLASH CNLY AN IMMEDIATE RETURN IS MADE TO THE USERS CALL CADR +4.

A0219                                                    CAF    VXXNYY          VXX NYY WILL BE A FLASHING VERB NOUN
A0220                                                    TC     BANKCALL
A0221                                                    CADR   REFLASHR
A0222                                                    ...    ...             TERMINATE RETURN
A0223                                                    ...    ...             PROCEED RETURN
A0224                                                    ...    ...             ENTER RETURN

A0225                                                    ...    ...             IMMFDIATE RETURN TO USER

R0226   REGODSPR IS THE SAME AS REGODSP CNLY A RETURN (IMMEDIATE) IS MADE TO THE USER.
```

```
A0228                                  CAF     VXXNYY
A0229                                  TC      BANKCALL
A0230                                  CADR    REGODSPR

A0231                                  ...     ...              IMMEDIATE RETURN TO USER
```

```
P0232   GOMARK IS USED TO DISPLAY A MARK VERB NOUN ARRIVING IN A. NO RETURN IS MADE TO THE USER.

R0234   GOXDSP = GOMARK

A0235                                                   CAF     VXXNYY          VXXNYY CONTAINS VERB AND NOUN
A0236                                                   TC      BANKCALL
A0237                                                   CADR    GOMARK          OTHER EXTENDED VERBS USE CADR GOXDSP

R0238   GOMARKR IS THE SAME AS GOMARK ONLY RETURN IS TO THE USER.

R0239   GOXDSPR = GOMARKR

A0240                                                   CAF     VXXNYY
A0241                                                   TC      BANKCALL
A0242                                                   CADR    GOMARKR         OTHER EXTENDED VERBS USE CADR GOXDSPR

A0243                                                   ...     ...             IMMEDIATE RETURN OF GOMARKR

R0244   GOMARKF DISPLAYS A FLASHING MARK VERB NOUN WITH NO IMMEDIATE RETURN TO THE USER. 3 RETURNS ARE POSSIBLE FROM
R0246   THE ASTRONAUT (SEE NO. 7 ABOVE ).

R0247   GOXDSPF = GOMARKF

A0248                                                   CAF     VXXNYY          VXXNYY WILL BE A FLASHING MARK VERB NOUN
A0249                                                   TC      BANKCALL
A0250                                                   CADR    GOMARKF         OTHER EXTENDED VERBS USE CADR GOXDSPF
A0251                                                   ...     ...             TERMINATE RETURN
A0252                                                   ...     ...             PROCEED RETURN
A0253                                                   ...     ...             ENTER OR RECYCLE RETURN

R0254   GOMARKFR IS THE SAME AS GOMARKF ONLY AN IMMEDIATE RETURN IS MADE TO THE USER CALL CADR +4.

R0256   GOXDSPFR = GOMARKFR

A0257                                                   CAF     VXXNYY          FLASHING MARK VERB NOUN
A0258                                                   TC      BANKCALL
A0259                                                   CADR    GOMARKFR        OTHER EXTENDED VERBS USE CADR GOXDSPFR
A0260                                                   ...     ...             TERMINATE RETURN
A0261                                                   ...     ...             PROCEED RETURN
A0262                                                   ...     ...             ENTER OR RECYCLE RETURN

A0263                                                   ...     ...             IMMEDIATE RETURN TO THE USER

R0264   GOMARK1 IS USED FOR A PLEASE PERFORM ON A MARK REQUEST WITH ONLY 1 ASTRONAUT RETURN TO THE USER. NO IMMEDIATE
R0266   RETURN IS MADE. THE DESIRED MARK PLEASE PERFORM VERB AND DESIRED NOUN ISENTERED IN A. GOMARK1 DISPLAYS R1, R2, R
R0268   MEANS OF A V05NYY FOLLOWED BY A FLASHING V5XNYY FOR A PLEASE PERFORM. THE ASTRONAUT WILL RESPOND WITH A MARK
R0270   OR MARK REJECT OR AN ENTER. THE ENTER IS THE ONLY ASTRONAUT RESPONSE THAT WILL COME BACK TO THE USER.

A0272                                                   CAF     V5XNYY          X=1,2,3,4    Y= NOUN
A0273                                                   TC      BANKCALL
```

```
A0274                                                    CADR   GOMARK1

A0275                                                    ...    ...             ENTER RETURN

R0276   *** IF BLANKING DESIRED ON NON R ROUTINES, NOTIFY DISPLAYER.

R0277   GOMARK1R IS THE SAME AS A GOMARK1 ONLY AN IMMEDIATE RETURN IS MADE TO THE USERS CALL CADR +2.
A0279                                                    CAF    V5XNYY          X=1,2,3,4    YY = NOUN
A0280                                                    TC     BANKCALL
A0281                                                    CADR   GOMARK1R

A0282                                                    ...    ...             ASTRONAUT ENTER RETURN
A0283                                                    ...    ...             IMMEDIATE RETURN TO USER

R0284   GOMARK2 IS THE SAME AS GOMARK1 ONLY 3 RETURNS ARE MADE TO THE USER FROM THE ASTRONAUT.
A0286                                                    CAF    V5XNYY          X=1,2,3,4   YY=NOUN
A0287                                                    TC     BANKCALL
A0288                                                    CADR   GOMARK2
A0289                                                    ...    ...             TERMINATE RETURN
A0290                                                    ...    ...             PROCEED RETURN
A0291                                                    ...    ...             ENTER RETURN
R0292   GOMARK2R IS THE SAME AS GOMARK1R ONLY 3 ASTRONAUT RETURNS ARE MADE TO THE USER.

A0294                                                    CAF    V5XNYY          X=0,1,2,3,4   YY=NOUN
A0295                                                    TC     BANKCALL
A0296                                                    CADR   GOMARK2R
A0297                                                    ...    ...             TERMINATE RETURN
A0298                                                    ...    ...             PROCEED RETURN
A0299                                                    ...    ...             ENTER RETURN

A0300                                                    ...    ...             IMMEDIATE RETURN TO THE USER

R0301   GOMARK3 IS USED FOR A PLEASE PERFORM ON A MARK REQUEST WITH A 3 COMP. DEC DISPLAY. THE DESIRED MARK PLEASE
R0303   PERFORM VERB AND NOUN ARE ENTERED IN A. GOMARK3 DISPLAYS R1, R2, R3 BY MEANS OF A V06NYY FOLLOWED BY A FLASHING
R0305   V5XNYY FOR A PLEASE PERFORM. GOMARK3 HAS 3 ASTRONAUT RETURNS TO THE USER WITH NO IMMEDIATE RETURN.

A0307                                                    CAF    V5XNYY          X=1, 2,3,4 YY=NOUN
A0308                                                    TC     BANKCALL
A0309                                                    CADR   GOMARK3
A0310                                                    ...    ...             TERMINATE RETURN
A0311                                                    ...    ...             PROCEED RETURN
A0312                                                    ...    ...             ENTER RETURN

R0313   GOMARK4 IS THE SAME AS GOMARK3 ONLY R2 AND R3 ARE BLANKED AND R1 IS DISPLAYED IN OCTAL.

A0315                                                    CAF    V5XNYY          X=1,2,3,4 YY=NOUN
A0316                                                    TC     BANKCALL
A0317                                                    CADR   GOMARK4
A0318                                                    ...    ...             TERMINATE RETURN
A0319                                                    ...    ...             PROCEED RETURN
```

```
A0320                                                  ...     ...              ENTER RETURN

R0321   EXDSPRET IS USED TO DISPLAY A VERB NOUN ARRIVING IN A WITH A RETURN MADE TO THE USER AFTER THE DISPLAY HAS BEEN
R0323   SENT OUT.

A0324                                                  CAF     VXXNYY
A0325                                                  TC      BANKCALL
A0326                                                  CADR    EXDSPRET

A0327                                                  ...     ...              RETURN TO USER

R0328   KLEENEX CLEANS OUT ALL MARK DISPLAYS (ACTIVE AND INACTIVE). A RETURN IS MADE TO THE USER AFTER THE MARK DISPLAYS
R0330   HAVE BEEN CLEANED OUT.

A0331                                                  TC      BANKCALL
A0332                                                  CADR    KLEENEX

A0333                                                  ...     ...              RETURN TO USER

R0334   MARKBRAN IS A SPECIAL PURPOSE ROUTINE USED FOR SAVING JOB VAC AREAS (SEE DESCRIPTION OF MARKBRAN BELOW).

A0336                                                  TC      BANKCALL
A0337                                                  CADR    MARKBRAN

A0338                                                  ...     ...              BAD RETURN IF MARK DISPLAY NOT ACTIVE

A0339                                                                           (GOOD RETURN TO IMMEDIATE RETURN LOC OF
A0340                                                                           LAST FLASHING MARK R ROUTINE)

R0341   PINBRNCH REESTABLISHES THE LAST ACTIVE FLASHING DISPLAY. IF THERE IS NO ACTIVE FLASHING DISPLAY, THE DSKY IS
R0343   BLANKED AND CONTROL IS SENT TO ENDOFJOB.

A0344                                                  TC      POSTJUMP
A0345                                                  CADR    PINBRNCH

R0346   PRIODSP IS USED AS A PRIORITY DISPLAY.  IT WILL DISPLAY A GOFLASH TYPE DISPLAY WITH THREE POSSIBLE RETURNS FROM
R0348   THE ASTRONAUT(SEE NO.7 ABOVE).

R0349        THE MAIN PURPOSE OF PRIODSP IS TO REPLACE THE PRESENT DISPLAY WITH A DISPLAY OF HIGHER PRIORITY AND TO
R0351   PROVIDE A MEANS FOR RESTORING THE OLD DISPLAY WHEN THE PRIORITY DISPLAY
R0352   IS RESPONDED TO BY THE ASTRONAUT.

R0353        THE FORMER DISPLAY IS RESTORED BY AN AUTOMATIC BRANCH TO WAKE UP THE DISPLAY THAT WAS INTERRUPTED BY THE
R0355   PRIO DISPLAY.

A0356                                                  CAF     VXXNYY           VXXNYY WILL BE A FLASHING VERB NOUN
A0357                                                  TC      BANKCALL
A0358                                                  CADR    PRIODSP
A0359                                                  ...     ...              TERMINATE RETURN
A0360                                                  ...     ...              PROCEED RETURN
```

```
A0361                                                   ...     ...          ENTER OR RECYCLE RETURN

R0362   PRIODSPR IS THE SAME AS PRIODSPONLY AN IMMEDIATE RETURN IS MADE TO THE  USERS CALL CADR +4.

A0364                                                   CAF     VXXNYY       VXXNYY WILL BE A FLASHING VERB NOUN
A0365                                                   TC      BANKCALL
A0366                                                   CADR    PRIODSPR
A0367                                                   ...     ...          TERMINATE RETURN
A0368                                                   ...     ...          PROCEED RETURN
A0369                                                   ...     ...          ENTER OR RECYCLE RETURN

A0370                                                   ...     ...          IMMEDIATE RETURN

R0371   PRIOLARM DOES A V05N09 PRIODSPR.
R0372   CLEANDSP CLEANS OUT ALL NORMAL DISPLAYS (ACTIVE AND INACTIVE). A RETURN IS MADE TO THE USER AFTER NORMAL
R0374   DISPLAYS ARE CLEANED OUT.

A0375                                                   TC      BANKCALL
A0376                                                   CADR    CLEANDSP

A0377                                                   ...     ...          RETURN TO USER
```

```
P0378    GENERAL INFORMATION
R0379    ------- -----------


R0380    ALARM OR ABORT EXIT MODES--

A0381                                                     PRIOBORT TC      ABORT
A0382                                                              OCT     1502

R0383    PRIOBORT IS BRANCED TO WHEN (1)  A NORMAL DISPLAY IS REQUESTED AND  ANOTHER NORMAL DISPLAY IS ALREADY ACTIVE
R0385    (REFLASH AND REGODSP ARE EXCEPTIONS) OR (2) A PRIORITY DISPLAY IS REQUESTED WHEN ANOTHER PRIORITY DISPLAY IS
R0387    ALREADY ACTIVE (A PRIORITY WITH LINUS BIT14 IS AN EXCEPTION).


R0388    ERASABLE INITIALIZATION REQUIRED--

R0389         ACCOMPLISHED BY FRESH START- 1. FLAGWRD4 (USED EXCLUSIVELY BY DISPLAY INTERFACE ROUTINES)
R0391                                      2. NVSAVE = NORMAL VERB AND NOUN      REGISTER.
R0393                                      3. EBANKTEM = NORMAL INACTIVE FLAGWORD(ALSO CONTAINS NORMALS EBANK).


R0395                 '                    5. R1SAVE = MARKBRAN CONTROL WORD
R0396                                      4. RESTREG = PRIORITY 30 AND SUPERBANK 3.
R0398    OUTPUT--

R0399         NVWORD = PRIO VERB AND NOUN
R0400         NVWORD +1(MARKNV) = MARK VERB AND NOUN
R0401         NVWORD +2(NVSAVE) = NORMAL VERB AND NOUN

R0402         DSPFLG(EBANKSAV) = PRIO FLAGWORD (INCLUDING EBANK)
R0403         DSPFLG +1(MARKEBAN) = MARK FLAGWORD (INCLUDING EBANK)
R0404         DSPFLG +2(EBANKTEM) = NORMAL FLAGWORD (INCLUDIG EBANK)

R0405         CADRFLSH = PRIO USERS CALL CADR +1 LOCATION
R0406         CADRFLSH +1(MARKFLSH) = MARK USERS CALL CADR +1 LOCATION
R0407         CADRFLSH +2(TEMPFLSH) = NORMAL USERS CALL CADR +1 LOCATION

R0408         PRIOTIME = TIME EACH PRIO REQUEST FIRST SENT OUT
R0409         OPTION1 = DESIRED OPTION FROM GOPERF4
R0410         FLAGWRD4 = BIT INFO FOR CONTROL OF ALL DISPLAY ROUTINES
R0411         DSPTEM1 = R1 INFO FOR ASTRONAUT FROM PERFORM DISPLAYS(NORMAL)
R0412    SUBROUTINES USED-- NVSUB, FLAGUP, FLAGDOWN, ENDOFJOB, BLANKSUB, ABORT, JOBWAKE, JOBSLEEP, FINDVAC, PRIOCHNG,
R0414    JAMTERM, NVSUBUSY, FLASHON, ENDIDLE, CHANG1, BANKJUMP, MAKECADR, NOVAC,
R0415    DEBRIS-- (STORED INTO)

R0416         TEMPORARY TEMPORARIES- A, Q, L, MPAC +2, MPAC +3, MPAC +4, MPAC +5, MPAC +6, RUPTREG2, RUPTREG3, CYL,
R0418    EBANK, RUPTREG4, LOC, BANKSET, MODE, MPAC, MPAC +1                      4, FACEREG
R0420         ERASABES(SHARED AND USED WITH OTHER PROGRAMS) CADRSTOR, DSPLIST, LOC, DSPTEM1, OPTION1

R0422         ERASABLES(USED ONLY BY DISPLAY ROUTINES)- NVWORD,+1,+2, DSPFLG,+1,+2, CADRFLSH,+1,+2, PRIOTIME, FLAGWRD4,
R0424   R1SAVE, MAPK2PAC,


R0425   DEBRIS-- (USED BUT NOT STORED INTO)- NOUNREG, VERBREG, LOCCTR, MONSAVE1
R0426   FLAGWORD DESCRIPTIONS--
R0427       FLAGWRD4- SEE DESCRIPTION UNDER LOG SECTION ERASABLE ASSIGNMENTS

R0428       DSPFLG, DSPFLG+1, DSPFLG +2-
R0429       ----------------------------
R0430   BITS 1 BLANK P1
R0431        2 BLANK R2
R0432        3 BLANK R3
R0433        4 FLASHING DISPLAY REQUESTED
R0434        5 PERFORM DISPLAY REQUESTED
R0435        6 -----           FXDSPRET           GODSPRET
R0436        7 PRIO DISPLAY    -----               -----
R0437        8 MONITOR-PASTE   DEC PERFORM        -----
R0438        9 EBANK
R0439       10 EBANK
R0440       11 EBANK
R0441       12 -----          -----       V99PASTE
R0442       13 2ND PART OF PERFORM
R0443       14 REPLASH OR REDO  -----            REPLASH OR REDO
R0444       15 -----         MARK REQUEST          -----
R0445   RESTARTING DISPLAYS--

R0446   RULES FOR THE DSKY OPERATOR--

R0447        1. PROCEED AND TERMINATE SERVE AS RESPONSES TO REQUESTS FOR OPERATOR RESPONSE (FLASHING V/N).  AS LONG
R0449           AS THERE IS ANY REQUEST AWAITING OPERATOR RESPONSE, ANY USE OF PROCEED OR TERMINATE WILL SERVE AS
R0451           RESPONSES TO THAT REQUEST.  CARE SHOULD BE EXERCISED IN ATTEMPTING TO KILL AN OPERATOR INITIATED MONITOR
R0453           WITH PROCEED AND TERMINATE FOR THIS REASON.
R0454        2. THE ASTRONAUT MUST RESPOND TO A PRIORITY DISPLAY NO             SOONER THAN 2 SECONDS FROM THE TIME THE
R0456           PROGRAM SENT OUT THE REQUEST FOR OPERATOR RESPONSE (THE ASTRONAUT WOULD SEE THIS DISPLAY FOR LESS TIME
R0458           DUE TO TIME IT TAKES TO GET DISPLAY SENT OUT.) IF THE ASTRONAUT RESPONDS TOO SOON, THE PRIORITY DISPLAY
R0460            IS SENT OUT AGAIN -- AND AGAIN UNTIL AN ACCUMULATED 2 SECS     FROM THE TIME THE FIRST PRIORITY DISPLAY
R0462           OUT. THE SAME 2 SEC. DELAY WILL OCCUR AT 163.84 SECS OR IN ANY  MULTIPLE OF THAT TIME DUE TO PROGRAM
R0464           CONSIDERATION.
R0465        3. KEY RELEASE BUTTON-
R0466           A) IF THE KEY RELEASE LIGHT IS ON, IT SIMPLY RELEASES THE KEYBOARD AND DISPLAY FOR INTERNAL USE.
R0468           B) IF THE KEY RELEASE LIGHT IS OFF, AND IF SOME REQUEST FOR OPERATOR RESPONSE (FLASHING V/N) IS STILL
R0470              AWAITING RESPONSE  THEN IT RE-ESTABLISHES THE DISPLAYS THAT ORIGINALLY REQUESTED RESPONSE.
R0472           IF AN OPERATOR WANTS THEREFORE TO RE-ESTABLISH BUT CONDITION (A) IS ENCOUNTERED, A SECOND DEPRESSION OF
R0474           KEY RELEASE BUTTON MAY BE NECESSARY.
R0475        4. IT IS IMPORTANT TO ANSWER ALL REQUESTS FOR OPERATOR RESPONSE.
R0476        5. IT IS ALWAYS GOOD PRACTICE TO TERMINATE AN EXTENDED VERB BEFORE ASKING FOR ANOTHER ONE OR THE SAME ONE
R0478           OVER AGAIN.


R0479   SPECIAL CONSIDERATIONS--
```

```
R0480         1. MPAC +2  SAVED ONLY IN MARK DISPLAYS
R0481         2. GODSP(R),REGODSP(R),GOMARK(R) ALWAYS TURN ON THE FLASH IF ENTERED WITH A PASTE VERB REQUEST.
R0483         3. ALL NORMAL DISPLAYS ARE RESTARTABLE EXCEPT GODSP(R), REGODSP(R)
R0484         4. ALL EXTENDED VERBS WITH DISPLAYS SHOULD START WITH A TC TESTXACT AND FINISH WITH A TC ENDEXT.
R0486         5. GODSP(R) AND REGODSP(R) MUST BE IN THE SAME EBANK AND SUPERBANK AS THE LAST NORMAL DISPLAY RESTARTED
R0488            BY A .1 RESTART PHASE CHANGE.
R0489         6. IN ORDER TO SET UP A NON DISPLAY .1 RESTART POINT, THE USER MUST MAKE CERTAIN THAT RESTREG CONTAINS THE
R0491            CORRECT PRIORITY AND SUPERBANK AND THAT EBANKTEM CONTAINS THE CO
R04911        7. IF CLEANDSP IS RESTARTED VIA A .1 PHASE CHANGE, CAF ZERO SHOULD BE EXECUTED  BEFORE THE TC BANKCALL.
```

```
P0492   CALLING SEQUENCE FOR BLANKING
A0493                                                         CAF     BITX              X=1,2,3 BLANK R1,R2,R3 RESPECTIVELY
A0494                                                         TC      BLANKET
A0495                                                         ...     ...               RETURN TO USER HERE

R0496   IN ORDER TO USE BLANKET CORRECTLY THE USER MUST USE A DISPLAY ROUTINE THAT ENDS IN R FIRST FOLLOWED BY THE CALL
R0498   TO BLANKET AT THE IMMEDIATE RETURN LOC.

 0499                          5466                           BLOCK   02
 0500   REF    1               4000                           SETLOC  FFTAG4
 0501                          5466                           BANK

 0502   REF    1                                              COUNT*  $$/DSPLA
 0503   REF 803   LAST 1335    5466  54 162 0   BLANKET       TS      MPAC +6
 0504   REF    1               5467   4 0160 1                CS      PLAYTEM4
 0505   REF 804   LAST 1351    5470   7 0162 0                MASK    MPAC +6
 0506   REF 805   LAST 1351    5471  50 161 1                 INDEX   MPAC +5
 0507   REF    2  LAST 1351    5472  26 160 1                 ADS     PLAYTEM4

 0508   REF 354   LAST 1337    5473   0 0002 0                TC      Q

 0511   REF   61  LAST 1328    5474   0 4626 1  ENDMARK       TC      POSTJUMP
 0512   REF    1               5475    20315 1                CADR    MARKEND

 05121  REF 252   LAST 1336    5476   3 4746 0  CLEARMRK      CAF     ZERO
 05122  REF   16  LAST  721    5477  55 043 0                 TS      EXTVBACT

 05123                         5500   0 0004 0     +2         INHINT
 05124  REF    1               5501   4 4744 0                CS      XDSPBIT
 05125  REF    3  LAST  276    5502   7 0100 1                MASK    FLAGWRD4
 05126  REF    4  LAST 1351    5503  54 100 1                 TS      FLAGWRD4

 05127                         5504   0 0003 1                RELINT
 05128  REF 355   LAST 1351    5505   0 0002 0                TC      Q
R0513   ***ALL EXTENDED VERB ROUTINES THAT HAVE AT LEAST ONE FLASHING DISPLAY MUST TCF ENDMARK OR TCF ENDEXT WHEN
R0515   FINISHED.

 0516                       10,2315                           BANK    10
 0517   REF    1            10,2000                           SETLOC  DISPLAYS
 0518                       10,2315                           BANK

 0519   REF    1                                              COUNT*  $$/DSPLA
R0520   NTERONLY IS USED TO DIFFERENTIATE THE MARK ROUTINE WITH ONLY ONE RETURN TO THE USER FROM THE MARKING ROUTINE WIT
R0522   3 RETURNS TO THE USER. THIS ROUTINE IS ONLY USED BY GOMARK1 AND GOMARK1R.

 05291  REF    2  LAST  236 10,2315   0 5476 1  MARKEND       TC      CLEARMRK
 05297  REF    1            10,2316   1 3427 1                TCF     MARKOVER

 0530   REF    1            10,2317  54 155 1   GOMARK        TS      PLAYTEM1          ENTRANCE FOR MARK GODSP
```

```
0531    REF  46  LAST 1314   10,2320  3 4726 0  GOMARKS   CAF      BIT15         BIT15 SET FOR ALL MARK REQUESTS
0532    REF   1              10,2321  1 2473 1            TCF      GOFLASH2

0533    REF 253  LAST 1351   10,2322  3 4746 0  KLEENEX   CAF      ZERO          CLEAN OUT EXTENDED VERBS
0534    REF   2  LAST 1351   10,2323  54 155 1  GOMARKF   TS       PLAYTEM1      ENTRANCE FOR MARK GOFLASH

0535    REF   1              10,2324  3 3043 0            CAF      MARKFMSK      MARK,FLASH
0536    REF   2  LAST 1352   10,2325  1 2473 1            TCF      GOFLASH2

0537    REF   3  LAST 1352   10,2326  54 155 1  PRIOMONR  TS       PLAYTEM1
05375   REF   1              10,2327  3 3553 1            CAF      PRIMNMSK      PRIORITY,MONITOR,FLASHING DISPLAY
0538    REF   3  LAST 1352   10,2330  1 2473 1            TCF      GOFLASH2

0539    REF   4  LAST 1352   10,2331  54 155 1  GOMARK2   TS       PLAYTEM1      MARK GOPERFS-3 AST. RETURNS
0540    REF   1              10,2332  3 3526 0  MARKFORM  CAF      MPERFMSK      MARK, PERFORM, FLASH
0541    REF   4  LAST 1352   10,2333  1 2473 1            TCF      GOFLASH2
0542    REF   5  LAST 1352   10,2334  54 155 1  GOMARK3   TS       PLAYTEM1      USED FOR 3COMP DECIMAL PERFORM
0543    REF   1              10,2335  3 3513 0            CAF      MARK3MSK
0544    REF   5  LAST 1352   10,2336  1 2473 1            TCF      GOFLASH2

0545    REF   6  LAST 1352   10,2337  54 155 1  GOMARK4   TS       PLAYTEM1
0546    REF   1              10,2340  3 3514 1            CAF      MARK4MSK      MARK,PERFORM,FLASH,BLANK
0547    REF   6  LAST 1352   10,2341  1 2473 1            TCF      GOFLASH2

0548    REF   7  LAST 1352   10,2342  54 155 1  GOMARKR   TS       PLAYTEM1      ENTR+NCE FOR MARK GODSPR

0549    REF  47  LAST 1352   10,2343  3 4726 0            CAF      BIT15
0550    REF   1              10,2344  1 2446 1            TCF      GODSPR2

0551    REF   8  LAST 1352   10,2345  54 155 1  GOMARKFR  TS       PLAYTEM1      ENTRANCE FOR MARK GOFLASHR

0552    REF   2  LAST 1352   10,2346  3 3043 0            CAF      MARKFMSK
0553    REF   1              10,2347  1 2651 0            TCF      GODSPRS

0559    REF   9  LAST 1352   10,2350  54 155 1  GOMARK2R  TS       PLAYTEM1      MARK GOPERFS-3 AST. RETS+ IMMEDIATE RET.
0560    REF   2  LAST 1352   10,2351  3 3526 0            CAF      MPERFMSK      MARK, PERFORM, FLASH
0561    REF   2  LAST 1352   10,2352  1 2651 0            TCF      GODSPRS
056105  REF   3  LAST  964   10,2353  6 5014 1  -1        AD       PRIO13
05611   REF  10  LAST 1352   10,2354  54 155 1  GOMARK3R  TS       PLAYTEM1
05612   REF   2  LAST 1352   10,2355  3 3513 0            CAF      MARK3MSK
05613   REF   3  LAST 1352   10,2356  1 2651 0            TCF      GODSPRS

0562    REF 120  LAST 1326   10,2357  3 4744 1  MAKEMARK  CAF      ONE
0563    REF   1              10,2360  0 2747 1            TC       COPIES

0564    REF   5  LAST 1351   10,2361  3 0100 0            CA       FLAGWRD4      IS NORM OR PRIO BUSY OR WAITING
0565    REF   1              10,2362  7 3527 0            MASK     OCT34300
0566    REF 419  LAST 1337   10,2363  10 0000 0           CCS      A
0567    REF   1              10,2364  1 2422 0            TCF      CHKPRIO
```

```
 0568   REF   6  LAST 1352   10,2365  3 0100 0             CA     FLAGWRD4          IS MARK SLEEPING DUE TO ASTRO BUSY
 0569   REF   1              10,2366  7 4734 1             MASK   MRKNVBIT
 0570                        10,2367  0 0006 1             EXTEND
 0571   REF   1              10,2370  1 2372 1             BZF    MARKPLAY          NO

 0572   REF 138  LAST 1207   10,2371  1 5146 0             TCF    ENDOFJOB

 0594                        10,2372  0 0004 0    MARKPLAY INHINT
 0595   REF  19  LAST 1282   10,2373  4 4747 0             CS     FIVE              RESET MARK OVER NORM, SET MARK
 0596   REF   7  LAST 1353   10,2374  7 0100 1             MASK   FLAGWRD4
 05965  REF 121  LAST 1352   10,2375  6 4744 1             AD     ONE
 0597   REF   8  LAST 1353   10,2376  54 100 1             TS     FLAGWRD4
 0598                        10,2377  0 0003 1             RELINT

 0599   REF   1              10,2400  4 1070 0    GOGOMARK CS     MARKFLAG          PERFORM
 0600   REF  44  LAST 1333   10,2401  7 4740 1             MASK   BIT5
 0601   REF 420  LAST 1352   10,2402  10 000 0             CCS    A
 0602   REF   1              10,2403  1 2406 0             TCF    MARKCOP
 0603   REF   1              10,2404  4 0367 1             CS     MARKNV
 0604   REF   2  LAST 1353   10,2405  54 367 1             TS     MARKNV

 0605   REF 122  LAST 1353   10,2406  3 4744 1    MARKCOP  CAF    ONE               MARK INDEX
 0606   REF   1              10,2407  1 2630 1             TCF    PRIOPLAY

 0607   REF   1              10,2410  3 0165 0    COPYTOGO CA     MPAC2SAV
 0608   REF 806  LAST 1351   10,2411  54 156 1             TS     MPAC +2

 0609   REF   1              10,2412  50 164 1    COPYPACS INDEX  COPINDEX
 0610   REF   1              10,2413  3 3537 0             CAF    PRIOOCT
 0611   REF   1              10,2414  54 162 0             TS     GENMASK

 0612   REF   2  LAST 1353   10,2415  50 164 1             INDEX  COPINDEX
 0613   REF   2  LAST  105   10,2416  3 1067 1             CAF    EBANKSAV
 0614   REF   1              10,2417  54 160 1             TS     TEMPOR2           ACTIVE EBANK AND FLAG

 0615   REF  84  LAST 1328   10,2420  54 003 0             TS     EBANK

 0616   REF 356  LAST 1351   10,2421  0 0002 0             TC     Q

R0617   PINCHEK CHECKS TO SEE IF THE CURRENT MARK REQUEST IS MADE BY THE ASTRONAUT WHILE INTERRUPTING A GOPLAY DISPLAY
R0619   (A NORMAL OR A PRIO). IF THE ASTRONAUT TRIES TO MARK DURING A PRIO, THE CHECK FAIL LIGHT GOES ON AND THE MARK
R0621   REQUEST IS ENDED. IF HE TRIES TO MARK DURING A NORM, THE MARK IS ALLOWED. IN THIS CASE THE NORM IS PUT TO SLEEP
R0623   UNTIL ALL MARKING IS FINISHED.

R0624         IF THE MARK REQUEST COMES FROM THE PROGRAM DURING A TIME THE ASTRONAUT IS NOT INTERRUPTING A NORMAL OR A
R0626   PRIO, THE MARK REQUEST IS PUT TO SLEEP UNTIL THE PRESENT ACTIVE DISPLAY IS RESPONDED TO BY THE ASTRONAUT.

 0628   REF   9  LAST 1353   10,2422  3 0100 0    CHKPRIO  CA     FLAGWRD4          MARK ATTEMPT DURING PRIO
 0629   REF   1              10,2423  7 3274 1             MASK   OCT24100
 0630   REF 421  LAST 1353   10,2424  10 000 0             CCS    A
 0631   REF    1                10,2425  1 3462 0           TCF     MARSLEEP

 0632   REF   10  LAST 1353     10,2426  4 0100 1           CS      FLAGWRD4
 0633   REF    1                10,2427  7 4742 0           MASK    MKOVBIT          SET MARK OVER NORM
 0634                           10,2430  0 0004 0           INHINT
 0635   REF   11  LAST 1354     10,2431  26 100 1           ADS     FLAGWRD4

 0636   REF    1                10,2432  1 2534 0           TCF     SETNORM

 0637   REF    3  LAST 1353     10,2433  3 0367 0  MARKPERF CA      MARKNV
 0638   REF    1                10,2434  7 4144 0           MASK    VERBMASK
 0639   REF    1                10,2435  1 3140 0           TCF     NV50DSP

 0640   REF   11  LAST 1352     10,2436  54 155 1  GODSP    TS      PLAYTEM1

 0641   REF  254  LAST 1352     10,2437  3 4746 0  GODSP2   CAF     ZERO
 0642   REF    7  LAST 1352     10,2440  1 2473 1           TCF     GOFLASH2

 0643   REF   12  LAST 1354     10,2441  54 155 1  GODSPRET TS      PLAYTEM1         ENTRANCE FOR A GODSP WITH A PASTE

 0644   REF   55  LAST 1324     10,2442  3 4737 0           CAF     BIT6             SET BIT6 TO GO BACK TO USER AFTER NVSUB
 0645   REF    8  LAST 1354     10,2443  1 2473 1           TCF     GOFLASH2

 0646   REF   13  LAST 1354     10,2444  54 155 1  GODSPR   TS      PLAYTEM1

 0647   REF  255  LAST 1354     10,2445  3 4746 0  GODSPR1  CAF     ZERO
 0648   REF    3  LAST 1351     10,2446  54 160 1  GODSPR2  TS      PLAYTEM4

 0649   REF  256  LAST 1354     10,2447  3 4746 0           CAF     ZERO             * DONT MOVE
 0650   REF    1                10,2450  1 2653 1           TCF     GODSPRS1

R0651         CLEANDSP IS USED FOR CLEARING OUT A NORMAL DISPLAY THAT IS PRESENTLY ACTIVE OR A NORMAL DISPLAY THAT IS
R0653   SET UP TO BE STARTED OR RESTARTED.

R0654         NORMALLY THE USER WILL NOT NEED TO USE THIS ROUTINE SINCE A NEW NORMAL DISPLAY AUTOMATICALLY CLEARS OUT AN
R0656   OLD DISPLAY.

R0657         CALLING SEQUENCE FOR CLEANDSP-

A0658                                                       TC      BANKCALL
A0659                                                       CADR    CLEANDSP

 0660   REF  257  LAST 1354     10,2451  3 4746 0  CLEANDSP CAF     ZERO
 0661   REF   14  LAST 1354     10,2452  54 155 1  REFLASH  TS      PLAYTEM1

 0662   REF    1                10,2453  3 3512 1           CAF     REDOMASK         FLASH AND PERMIT
 0663   REF    9  LAST 1354     10,2454  1 2473 1           TCF     GOFLASH2

 0664   REF   15  LAST 1354     10,2455  54 155 1  REFLASHR TS      PLAYTEM1
```

```
0665   REF   2  LAST 1354   10,2456   3 3512 1            CAF      REDOMASK          FLASH AND PERMIT
0666   REF   4  LAST 1352   10,2457   1 2651 0            TCF      GODSPRS

0667   REF  16  LAST 1354   10,2460  54  155 1  REGODSP   TS       PLAYTEM1

0668   REF  76  LAST 1322   10,2461   3 4727 1            CAF      BIT14
0669   REF  10  LAST 1354   10,2462   1 2473 1            TCF      GOFLASH2

0670   REF  17  LAST 1355   10,2463  54  155 1  REGODSPR  TS       PLAYTEM1

0671   REF  77  LAST 1355   10,2464   3 4727 1            CAF      BIT14
0672   REF   2  LAST 1352   10,2465   1 2446 1            TCF      GODSPR2

06721  REF  18  LAST 1355   10,2466  54  155 1  CLOCPLAY  TS       PLAYTEM1
06722  REF   1              10,2467   3 3551 0            CAF      CLOCKCON
06723  REF  11  LAST 1355   10,2470   1 2473 1            TCF      GOFLASH2

0673   REF  19  LAST 1355   10,2471  54  155 1  GOFLASH   TS       PLAYTEM1

0674   REF  56  LAST 1329   10,2472   3 4741 1            CAF      BIT4              LEAVE ONLY FLASH BIT SET
0675   REF   4  LAST 1354   10,2473  54  160 1  GOFLASH2  TS       PLAYTEM4

0676   REF   1              10,2474   0 2734 0            TC       SAVELOCS

0677                        10,2475   0 0003 1            RELINT

0678   REF   1              10,2476   1 2560 1            TCF      MAKEPLAY          BRANCH DIRECT WITH NO SEPARATE JOB CALL

0679   REF  20  LAST 1355   10,2477  54  155 1  PRIODSPR  TS       PLAYTEM1

0680   REF   1              10,2500   3 3531 0            CAF      BITS7+4
0681   REF   5  LAST 1355   10,2501   1 2651 0            TCF      GODSPRS

0682   REF  21  LAST 1355   10,2502  54  155 1  PRIODSP   TS       PLAYTEM1

0683   REF   2  LAST 1355   10,2503   3 3531 0  SETPRIO   CAF      BITS7+4
0684   REF  12  LAST 1355   10,2504   1 2473 1            TCF      GOFLASH2

0685   REF 258  LAST 1354   10,2505   3 4746 0  MAKEPRIO  CAF      ZERO
0686   REF   3  LAST 1353   10,2506  54  164 0            TS       COPINDEX

0687   REF   1              10,2507   0 3402 1            TC       LINUSCHR
0688   REF   1              10,2510   1 2515 0            TCF      HIPRIO            LINUS RETURN
0689   REF  12  LAST 1354   10,2511   3 0100 0            CA       FLAGWRD4
0690   REF   1              10,2512   7 3550 0            MASK     OCT20100          IS PRIO IN ENDIDLE OR BUSY
0691   REF 422  LAST 1353   10,2513  10  000 0            CCS      A
0692   REF   1              10,2514   1 2607 0            TCF      PRIOBORT          YES, ABORT

06924                       10,2515   0 0004 0  HIPRIO    INHINT
06925  REF  54  LAST 1314   10,2516   4 1035 1            CS       DSPTAB +11D       SET BITS 15 AND 1
```

```
 06926  REF   4  LAST 1120    10,2517  7 6130 1             MASK    OCT40001          (WHATEVER THEIR PREVIOUS STATE)
 06927  REF  55  LAST 1355    10,2520  27'035 1             ADS     DSPTAB +11D         TO TURN ON SUPER-KEYRELEASE LIGHT

 069273                       10,2521  0 0003 1             RELINT
 0693   REF  13  LAST 1355    10,2522  3 0100 0             CA      FLAGWRD4         MARK ACTIVE
 0694   REF   1               10,2523  7 5634 1             MASK    OCT40400
 0695                         10,2524  0 0006 1             EXTEND
 0696   REF   1               10,2525  1 2530 1             BZF     ASKIFNRM         NO

 0697   REF 259  LAST 1355    10,2526  3 4746 0  SETMARK    CAF     ZERO
 0698   REF   1               10,2527  1 3006 0             TCF     JOBXCHS

 0699   REF  14  LAST 1356    10,2530  3 0100 0  ASKIFNRM   CA      FLAGWRD4         NORMAL ACTIVE
 0700   REF   1               10,2531  7 3546 1             MASK    OCT10200         BITS 13+8
 0701                         10,2532  0 0006 1             EXTEND
 0702   REF   1               10,2533  1 2536 1             BZF     OKTOCOPY         NO

 0703   REF 123  LAST 1353    10,2534  3 4744 1  SETNORM    CAF     ONE
 0704   REF   2  LAST 1356    10,2535  1 3006 0             TCF     JOBXCHS

 0705   REF   1               10,2536  0 2746 0  OKTOCOPY   TC      COPYNORM
 0706   REF   1               10,2537  0 3225 1             TC      WITCHONE

 0707   REF   9  LAST 1325    10,2540  0 5130 0             TC      JOBWAKE

 0708   REF   1               10,2541  0 3242 0             TC      XCHTOEND

 0709   REF  27  LAST 1301    10,2542  3 0025 0  REDOPRIO   CA      TIME1            SAVE TIME PRIODSP SENT OUT
 0710   REF   1               10,2543  55'164 1             TS      PRIOTIME

 0711   REF 260  LAST 1356    10,2544  3 4746 0  KEEPPRIO   CAF     ZERO             START UP PRIO DISPLAY
 071105 REF   4  LAST 1355    10,2545  54 164 0             TS      COPINDEX
 07111  REF   1               10,2546  4 1067 0             CS      DSPFLG
 07112  REF  44  LAST 1328    10,2547  7 4735 0             MASK    BIT8
 07113  REF 423  LAST 1355    10,2550  10 000 0             CCS     A
 07114  REF   1               10,2551  1 3102 0             TCF     NVDSP
 07115  REF   2  LAST  740    10,2552  3 0366 1             CA      NVWORD
 07116  REF   4  LAST  467    10,2553  7 4144 0             MASK    MID7
 07117  REF 252  LAST 1333    10,2554  54 001 1             TS      L
 07118  REF   3  LAST 1356    10,2555  4 0366 0             CS      NVWORD
 07119  REF   4  LAST 1356    10,2556  54 366 0             TS      NVWORD
 0712   REF   2  LAST 1356    10,2557  1 3103 1             TCF     NVDSP +1

 0713   REF  35  LAST 1328    10,2560  3 0167 1  MAKEPLAY   CA      PRIORITY         SAVE USERS PRIORITY
 07131  REF   4  LAST 1328    10,2561  7 7746 1             MASK    PRIO37
 07132  REF   1               10,2562  54 163 1             TS      USERPRIO

 07133  REF   1               10,2563  3 7742 1             CAF     PRIO33           RAISE PRIORITY FOR FAST JOBS AFTER WAKE
 07134  REF  18  LAST  836    10,2564  0 5137 1             TC      PRIOCHNG
 07135  REF   5  LAST 1355   10,2565  3 0160 0            CA      PLAYTEM4      IS IT MARK OR PRIO OR NORM
 0714   REF   1              10,2566  7 3530 0            MASK    BITS15+7
 0715   REF 424  LAST 1356   10,2567  10 000 0            CCS     A
 0716   REF   1              10,2570  1 2505 1            TCF     MAKEPRIO      ITS PRIO
 0717   REF   1              10,2571  1 2573 0            TCF     IFLEGAL
 0718   REF   1              10,2572  1 2357 0            TCF     MAKEMARK      ITS MARK

 0719   REF  83  LAST 1326   10,2573  3 4743 0  IFLEGAL   CAF     TWO
 0720   REF   5  LAST 1356   10,2574  54 164 0            TS      COPINDEX

 0721   REF   2  LAST 1355   10,2575  0 3402 1            TC      LINUSCHR

 0722   REF   1              10,2576  1 2611 1            TCF     OKTOPLAY      LINUS RETURN
 0723   REF   3  LAST  241   10,2577  4 1071 1            CS      EBANKTEM
 0724   REF  57  LAST 1355   10,2600  7 4741 0            MASK    BIT4
 0725   REF 425  LAST 1357   10,2601  10 000 0            CCS     A
 0726   REF   2  LAST 1357   10,2602  1 2611 1            TCF     OKTOPLAY      NO

 0727   REF  15  LAST 1356   10,2603  3 0100 0            CA      FLAGWRD4      WAS NORM ASLEEP
 0728   REF   1              10,2604  7 3521 0            MASK    NBUSMASK      ARE ANY NORMS ASLEEP
 0729                        10,2605  0 0006 1            EXTEND
 0730   REF   3  LAST 1357   10,2606  1 2611 1            BZF     OKTOPLAY      NO

 0731   REF   2  LAST  470   10,2607  0 5626 0  PRIOBORT  TC      BAILOUT
 0732                        10,2610   31502 1            OCT     31502

 0733   REF   1              10,2611  0 2750 1  OKTOPLAY  TC      COPIFS2

 07331  REF   2  LAST 1356   10,2612  3 0163 0            CA      USERPRIO
 07332                       10,2613  0 0006 1            EXTEND
 07333  REF  25  LAST 1296   10,2614  04 007 1            ROR     SUPERBNK
 07334  REF   3  LAST  238   10,2615  55'264 1            TS      RESTREG

 0737   REF  16  LAST 1357   10,2616  3 0100 0            CA      FLAGWRD4      PRIO OR MARK GOING
 0738   REF   1              10,2617  7 3522 0            MASK    PMMASK
 0739   REF 426  LAST 1357   10,2620  10 000 0            CCS     A
 0740   REF   1              10,2621  1 2766 0            TCF     GOSLEEPS      YES

 0741                        10,2622  1 2624 1            TCF     +2
 0742   REF   2  LAST 1357   10,2623  1 2766 0            TCF     GOSLEEPS      MARK GOING

R0743   COULD PUT NORM BUSY CHECK HERE TO SAVE TIME
 0744   REF   2  LAST 1356   10,2624  0 3225 1            TC      WITCHONE      IS IT NVSUB BUSY, ENDIDLE OR NOONE
 0745   REF  10  LAST 1356   10,2625  0 5130 0            TC      JOBWAKE

 0746   REF   2  LAST 1356   10,2626  0 3242 0            TC      XCHTOEND

 0747   REF  84  LAST 1357   10,2627  3 4743 0  PLAYJUM1  CAF     TWO
 0748   REF   6  LAST 1357   10,2630  54 164 0  PRIOPLAY  TS      COPINDEX
 0749   REF   1               10,2631  1 3102 0            TCF      GOPLAY

 0750   REF  22  LAST 1355    10,2632  54 155 1  EXDSPRET  TS       PLAYTEM1

 0751   REF   1               10,2633  3 7755 1            CAF      BIT15+6
 0752   REF  13  LAST 1355    10,2634  1 2473 1            TCF      GOFLASH2

 0753   REF   2  LAST  943    10,2635  55 044 1  GOPERF1   TS       NORMTEM1       STORE DESIRED CHECKLIST VALUE
 0754   REF   1               10,2636  3 3504 0            CAF      V01N25         USED TO DISPLAY CHECKLIST VALUE IN R1

 0755   REF  23  LAST 1358    10,2637  54 155 1  GOPERFS   TS       PLAYTEM1

 0756   REF   1               10,2640  3 3503 1            CAF      PERFMASK       LEAVE ONLY FLASH, PERFORM, BLANKING
 0757   REF  14  LAST 1358    10,2641  1 2473 1            TCF      GOFLASH2

 0758   REF  24  LAST 1358    10,2642  54 155 1  GOPERF2   TS       PLAYTEM1       DESIRED VERB-NOUN TO DISPLAY R1,R2,R3

 0759   REF   1               10,2643  3 3507 0            CAF      PERF2MSK
 0760   REF  15  LAST 1358    10,2644  1 2473 1            TCF      GOFLASH2

 0764   REF   1               10,2645  0 2727 1  GOPERF4   TC       PURRS4

 0765   REF  16  LAST 1358    10,2646  1 2473 1            TCF      GOFLASH2

 0766   REF  25  LAST 1358    10,2647  54 155 1  GOFLASHR  TS       PLAYTEM1

 0767   REF  58  LAST 1357    10,2650  3 4741 1            CAF      BIT4           LEAVE ONLY FLASH BIT SET
 0768   REF   6  LAST 1357    10,2651  54 160 1  GODSPRS   TS       PLAYTEM4

 0769   REF  38  LAST 1321    10,2652  3 6266 0            CAF      THREE

 0770                         10,2653  0 0004 0  GODSPRS1  INHINT                  IMMEDIATE RETURN IS CALL CADR +4
 0771   REF  12  LAST 1325    10,2654  54 072 0            TS       RUPTREG3

 0772   REF  36  LAST 1356    10,2655  3 0167 1            CA       PRIORITY       MAKE DISPLAY ONE HIGHER THAN USER
 0773   REF   5  LAST 1356    10,2656  7 7746 1            MASK     PRIO37
 0774   REF  11  LAST 1110    10,2657  54 063 0            TS       NEWPRIO

 07741  REF   7  LAST 1358    10,2660  3 0160 0            CA       PLAYTEM4       IS THIS A FLASHING R DISPLAY
 07742  REF  59  LAST 1358    10,2661  7 4741 0            MASK     BIT4
 07743  REF 427  LAST 1357    10,2662  10 000 0            CCS      A
 07744  REF   1               10,2663  1 2671 1            TCF      VACDSP         YES, MAKE DSPLAY JOB A VAC
 07745  REF  12  LAST 1358    10,2664  3 0063 1            CA       NEWPRIO        NO, MAKE DSPLAY JOB A NOVAC
 07746  REF  27  LAST 1335    10,2665  0 5063 1            TC       NOVAC
 07747  REF   5  LAST  777    E7,1471                      FBANK=   WHOCARES
 07748  REF   2  LAST 1355    10,2666   02560 0            2CADR    MAKEPLAY
 07748                        10,2667   20067 1
 07749  REF   1               10,2670  1 2677 1            TCF      BOTHJOBS

 0775   REF  45  LAST 1328    10,2671  3 0006 1  VACDSP    CA       BBANK
```

```
0776                           10,2672  0 0006 1           EXTEND
0777   REF  26  LAST 1357      10,2673  04 007 1           ROR      SUPERBNK
0778   REF 253  LAST 1356      10,2674  54 001 1           TS       L
0779   REF   1                 10,2675  3 3545 0           CAF      MAKEGEN
0780   REF   3  LAST  381      10,2676  0 5107 1           TC       SPVAC

0781   REF   2  LAST 1355      10,2677  0 2734 0  BOTHJOBS TC       SAVELOCS        COPY TEMPS INTO PERMANENT REGISTERS

0782                           10,2700  0 0006 1           EXTEND                   SAVE NVWORD AND USERS MPAC +2
0783   REF 807  LAST 1353      10,2701  3 0156 0           DCA      MPAC +1
0784   REF  25  LAST 1335      10,2702  50 064 0           INDEX    LOCCTR
0785   REF 808  LAST 1359      10,2703  52 156 1           DXCH     MPAC +1

0786                           10,2704  0 0006 1           EXTEND                   SAVE USERS CADR, FLAGS AND EBANK
0787   REF 809  LAST 1359      10,2705  3 0160 0           DCA      MPAC +3
0788   REF  26  LAST 1359      10,2706  50 064 0           INDEX    LOCCTR
0789   REF 810  LAST 1359      10,2707  52 160 1           DXCH     MPAC +3

0790   REF  27  LAST 1359      10,2710  3 0064 0           CA       LOCCTR
0791   REF 811  LAST 1359      10,2711  54 161 0           TS       MPAC +5

0792   REF   1                 10,2712  0 2741 1           TC       SAVELOCR
0793                           10,2713  0 0003 1           RELINT

0794   REF  16  LAST 1291      10,2714  1 4631 0           TCF      BANKJUMP        CALL CADR +4

0795   REF   3  LAST 1358      10,2715  55'044 1  GOPERF1R TS       NORMTEM1        DESIRED CHECKLIST VALUE

0796   REF   2  LAST 1358      10,2716  3 3504 0           CAF      V01N25          DISPLAYS CHECKLIST VALUE IN R1

0797   REF  26  LAST 1358      10,2717  54 155 1  GOPERFRS TS       PLAYTEM1

0798   REF   2  LAST 1358      10,2720  3 3503 1           CAF      PERFMASK        LEAVE ONLY FLASH, PERFORM, BLANKING
0799   REF   6  LAST 1355      10,2721  1 2651 0           TCF      GODSPRS

0800   REF  27  LAST 1359      10,2722  54 155 1  GOPERF2R TS       PLAYTEM1        DESIRED VERB-NOUN TO DISPLAY R1,R2,R3

0801   REF   2  LAST 1358      10,2723  3 3507 0           CAF      PERF2MSK
0802   REF   7  LAST 1359      10,2724  1 2651 0           TCF      GODSPRS

0806   REF   2  LAST 1358      10,2725  0 2727 1  GOPERF4R TC       PURRS4

0807   REF   8  LAST 1359      10,2726  1 2651 0           TCF      GODSPRS

0808   REF   7  LAST  974      10,2727  55'143 1  PURRS4   TS       OPTION1         DESIRED OPTION CODE

0809   REF   1                 10,2730  3 3510 0           CAF      V04N06
0810   REF  28  LAST 1359      10,2731  54 155 1           TS       PLAYTEM1

0811   REF   1                 10,2732  3 3511 1           CAF      PERF4MSK        FLASH,PERFORM AND BLANK R3
```

```
0812  REF 357  LAST 1353   10,2733  0 0002 0            TC      Q

0813                       10,2734  0 0004 0  SAVELOCS  INHINT

0815  REF   1              10,2735  4 3520 1            CS      OCT3400         EBANK BITS
0816  REF   8  LAST 1358   10,2736  7 0160 1            MASK    PLAYTEM4
0817  REF  85  LAST 1353   10,2737  6 0003 1            AD      EBANK
0818  REF   9  LAST 1360   10,2740  54 160 1            TS      PLAYTEM4

0819  REF 358  LAST 1360   10,2741  22 002 0  SAVELOCR  LXCH    Q

0820  REF  13  LAST 1327   10,2742  0 4636 0            TC      MAKECADR
0821  REF   1              10,2743  54 157 0            TS      PLAYTEM3

0822  REF  13  LAST 1358   10,2744  6 0072 1            AD      RUPTREG3        NOT USED FOR NON R ROUTINES
0823  REF 254  LAST 1359   10,2745  0 0001 0            TC      L

0824  REF 261  LAST 1356   10,2746  3 4746 0  COPYNORM  CAF     ZERO
0825  REF   7  LAST 1357   10,2747  54 164 0  COPIES    TS      COPINDEX
0826                       10,2750  0 0004 0  COPIES2   INHINT
0827  REF  10  LAST 1360   10,2751  3 0160 0            CA      PLAYTEM4        FLAGWORD
0828  REF   8  LAST 1360   10,2752  50 164 1            INDEX   COPINDEX
0829  REF   3  LAST 1353   10,2753  55'067 0            TS      EBANKSAV        EQUIV TO DSPFLG

0830  REF   1              10,2754  7 3536 0            MASK    CADRMASK        FLASH AND GODSPRET
0831                       10,2755  0 0006 1            EXTEND
0832  REF   1              10,2756  1 2762 1            BZF     SKIPADD

0833  REF   2  LAST 1360   10,2757  3 0157 1            CA      PLAYTEM3
0834  REF   9  LAST 1360   10,2760  50 164 1            INDEX   COPINDEX
0835  REF   3  LAST  162   10,2761  54 371 0            TS      CADRFLSH

0836  REF  29  LAST 1359   10,2762  3 0155 0  SKIPADD   CA      PLAYTEM1        VERB NOUN
0837  REF  10  LAST 1360   10,2763  50 164 1            INDEX   COPINDEX
0838  REF   5  LAST 1356   10,2764  54 366 0            TS      NVWORD

0842  REF   1              10,2765  1 3251 0            TCF     RELINTQ

0843  REF  11  LAST 1360   10,2766  50 164 1  GOSLEEPS  INDEX   COPINDEX
0844  REF   2  LAST 1353   10,2767  3 3537 0            CA      PRIOOCT
0845  REF   1              10,2770  7 2772 0            MASK    WAITMASK
0846  REF   1              10,2771  0 3554 0            TC      UPENT2
0847                       10,2772   03004 0  WAITMASK  OCT     3004
0848  REF 124  LAST 1356   10,2773  4 4744 0            CS      ONE
0849  REF  12  LAST 1360   10,2774  6 0164 1            AD      COPINDEX
0850  REF   1              10,2775  54 154 0            TS      FACEREG

0851  REF   2  LAST 1360   10,2776  50 154 1  XCHSLEEP  INDEX   FACEREG
0852  REF   1              10,2777  3 3516 0            CAF     WAKECADR
0853                       10,3000  0 0004 0            INHINT
```

```
0854   REF  11  LAST 1357   10,3001  0 5130 0             TC      JOBWAKE           FIND CADR IN JOB AREA

0855   REF   3  LAST 1357   10,3002  0 3242 0             TC      XCHTOEND          CAUSES AWAKENED JOB TO GO TO ENDOFJOB

0858   REF   3  LAST 1360   10,3003  50 154 1             INDEX   FACEREG           REPLACE SAME CADR BUT NEW JOB AREA
0859   REF   2  LAST 1360   10,3004  3 3516 C             CAF     WAKECADR
0860   REF   7  LAST 1327   10,3005  1 5124 1             TCF     JOBSLEEP

0861   REF   4  LAST 1361   10,3006  54 154 0  JOBXCHS   TS      FACEREG           CONTROLS TYPE OF DISPLAY PUT TO SLEEP
0862   REF   3  LAST 1357   10,3007  0 3225 1             TC      WITCHONE
0863   REF  12  LAST 1361   10,3010  0 5130 0             TC      JOBWAKE
0864   REF   5  LAST 1361   10,3011  3 0154 1             CA      FACEREG
0865   REF  28  LAST 1359   10,3012  50 064 0             INDEX   LOCCTR
0866   REF   6  LAST 1361   10,3013  54 154 0             TS      FACEREG

0867   REF   1              10,3014  3 3027 1             CAF     XCHQADD
0868   REF   1              10,3015  0 3243 1             TC      XCHNYLOC

0869   REF   7  LAST 1361   10,3016  50 154 1             INDEX   FACEREG
0870   REF   1              10,3017  3 3540 0             CA      MARKOCT
0871   REF   1              10,3020  7 3542 0             MASK    IDLESLEP
0872   REF   1              10,3021  0 3564 0             TC      DOWNENT2
0873                        10,3022   74004 0  IDLEMASK  OCT     74004             * DONT MOVE

0874   REF   8  LAST 1361   10,3023  50 154 1             INDEX   FACEREG           BIT SHOWS PRIO INTERRUPTED NORM OR MARK
0875   REF  45  LAST 1353   10,3024  3 4740 0             CA      BIT5              BIT5 FOR MARK, BIT4 FOR NORMAL
0876   REF  31  LAST 1319   10,3025  6 4742 1             AD      FOUR
0877   REF   2  LAST 1360   10,3026  0 3554 0             TC      UPENT2            FLAG ROUTINE DOES RELINT
0878   REF   1              10,3027   02776 0  XCHQADD   GENADR  XCHSLEEP          * DONT MOVE
0879   REF  17  LAST 1357   10,3030  3 0100 0             CA      FLAGWRD4
0880   REF   2  LAST 1354   10,3031  7 4742 0             MASK    MKOVBIT           MARK OVER NORM ?
0881   REF 428  LAST 1358   10,3032  10 000 0             CCS     A
0882   REF   2  LAST 1353   10,3033  0 2372 0  GENMARK   TC      MARKPLAY          USED AS GENADR FOR JOBWAKE
0883   REF   2  LAST 1356   10,3034  1 2536 1             TCF     OKTOCOPY

0884   REF 262  LAST 1360   10,3035  3 4746 0  MARKWAKE  CAF     ZERO
0885   REF   2  LAST 1353   10,3036  54 160 1  WAKEPLAY  TS      TEMPOR2

0886   REF   3  LAST 1361   10,3037  5C 160 0             INDEX   TEMPOR2
0887   REF   1              10,3040  3 3532 0             CA      BITS5+11
0888   REF  32  LAST 1361   10,3041  6 4742 1             AD      FOUR
0889   REF   2  LAST 1361   10,3042  0 3564 0             TC      DOWNENT2
0890                        10,3043   4CC10 1  MARKFMSK  OCT     40010             ***DONT MOVE

0891   REF   4  LAST 1361   10,3044  5C 160 0             INDEX   TEMPOR2
0892   REF   3  LAST 1361   10,3045  3 3516 C             CAF     WAKECADR
0893                        10,3046  0 C004 0             INHINT
0894   REF  13  LAST 1361   10,3047  0 5130 0             TC      JOBWAKE

0895   REF   1              10,3050  1 3355 0             TCF     ENDRET
```

```
R0896        ALL .1 RESTARTS BRANCH DIRECTLY TO INITDSP. NORMAL DISPLAYS ARE THEONLY DISPLAYS ALLOWED TO USE .1 RESTARTS
R0898   INITDSP FIRST RESTORES THE EBANK AND THE SUPERBANK TO THE MOST RECENT NORMAL EBANK AND SUPERBANK.
R0900        IF THE MOST RECENT NORMAL DISPLAY REQUEST WAS NOT FINISHED, CONTROLIS SENT BACK TO THE LAST NORMAL USER.
R0902   OTHERWISE THE NORMAL DISPLAY SET UP IN THE NORMAL DISPLAY REGS IS STARTED UP IMMEDIATELY.

 0904   REF   4  LAST 1357   10,3051  3 1071 0  INITDSP  CA     EBANKTEM         RESTORE MOST RECECT NORMAL EBANK
 0905   REF  86  LAST 1360   10,3052  54 003 0           TS     EBANK

 0906   REF   4  LAST 1357   10,3053  3 1264 0           CA     RESTREG          SUPERBANK AND JOB PRIORITY
 0907   REF   2  LAST  239   10,3054  0 4720 0           TC     SUPERSW          RESTORE SUPERBANK

 0908   REF   6  LAST 1358   10,3055  7 7746 1           MASK   PRIO37
 0909   REF  19  LAST 1356   10,3056  0 5137 1           TC     PRIOCHNG

 0910   REF  39  LAST 1358   10,3057  4 6266 1           CS     THREE
 0911   REF   3  LAST  242   10,3060  6 0373 0           AD     TEMPFLSH
 0912   REF  17  LAST 1359   10,3061  1 4631 0           TCF    BANKJUMP

 0913                        10,3062  0 0003 1  PINBRNCH RELINT                  FOR GOPIN USERS
 09135  REF   1              10,3063  3 1072 0           CA     MARK2PAC         NEEDED TO SAVE MPAC +2 FOR MARK USERS
 0914   REF 812  LAST 1359   10,3064  54 156 1           TS     MPAC +2          ONLY

 0915   REF  18  LAST 1361   10,3065  3 0100 0           CA     FLAGWRD4         PINBRANCH CONDITION
 0916   REF   1              10,3066  7 7761 1           MASK   PINMASK
 0917   REF 429  LAST 1361   10,3067  10 000 0           CCS    A
 0918                        10,3070  1 3073 1           TCF    +3
 0919   REF   1              10,3071  1 3477 1           TCF    ERASER           ** NOTHING IN ENDIDLE
 0920   REF   3  LAST 1361   10,3072  1 2372 1           TCF    MARKPLAY

 0921   REF  77  LAST 1332   10,3073  0 5506 1  NORMBNCH TC     UPFLAG           SET PINBRANCH BIT
 0922   REF   1              10,3074   00105 0           ADRES  PINBRFLG

 0923   REF   1              10,3075  3 4727 1           CAF    PRIODBIT         PRIO INTERRUPTED
 0924   REF  19  LAST 1362   10,3076  7 0100 1           MASK   FLAGWRD4
 0925   REF 430  LAST 1362   10,3077  10 000 0           CCS    A
 0926   REF   1              10,3100  1 2544 1           TCF    KEEPPRIO

 0927   REF   1              10,3101  1 2627 1           TCF    PLAYJUM1

 0928                        10,3102  22 007 0  NVDSP    ZL
 092805 REF   1              10,3103  0 2412 1           TC     COPYPACS

 09281  REF   5  LAST 1361   10,3104  3 0160 0           CA     TEMPOR2          SET UP BLANK BITS FOR NVMONOPT IN CASE
 09282  REF  25  LAST 1328   10,3105  7 4750 0           MASK   SEVEN            USER REQUESTS BLANKING MONITOR
 09283  REF 255  LAST 1360   10,3106  26 001 1           ADS    L

 0929   REF  44  LAST 1319   10,3107  4 4730 0           CS     BIT13
 0930   REF  13  LAST 1360   10,3110  50 164 1           INDEX  COPINDEX
 0931   REF   2  LAST 1356   10,3111  7 1067 0           MASK   DSPFLG
 0932   REF  14  LAST 1362   10,3112  50 164 1           INDEX  COPINDEX
```

```
0933   REF   3  LAST 1362   10,3113  55'067 0            TS      DSPFLG

0934   REF  45  LAST 1356   10,3114   7 4735 0           MASK    BIT8          BIT 8 SET IF PRIO MONITOR OR DEC MARK
09342  REF  15  LAST 1362   10,3115  50  164 1           INDEX   COPINDEX
09344                       10,3116   1 3117 1           TCF     +1
09346  REF   1              10,3117   3 3552 0           CA      OCT2600       CAUSES V16 TO BE IN A AT NVMONOPT
0935   REF  34  LAST 1264   10,3120  54  141 1           TS      TEM1          SET, BIT 8 IN TEM1 IF DEC MARK
0936   REF 813  LAST 1362   10,3121   3 0156 0           CA      MPAC +2
0937   REF   2  LAST 1353   10,3122  54  165 1           TS      MPAC2SAV

0938   REF   2  LAST 1362   10,3123  55'072 1            TS      MARK2PAC      * FOR DISK ONLY *
0939   REF  16  LAST 1363   10,3124  50  164 1           INDEX   COPINDEX
0940   REF   6  LAST 1360   10,3125  10  366 0           CCS     NVWORD
0941   REF   1              10,3126   1 3137 0           TCF     NVDSP1
0942   REF   1              10,3127   1 3253 1           TCF     CLEANEND
0943   REF  17  LAST 1363   10,3130  50  164 1           INDEX   COPINDEX
09435  REF   7  LAST 1363   10,3131   4 0366 0           CS      NVWORD
0944   REF  18  LAST 1363   10,3132  50  164 1           INDEX   COPINDEX
09445  REF   8  LAST 1363   10,3133  54  366 0           TS      NVWORD
0945   REF  12  LAST 1323   10,3134   7 6115 0           MASK    LOW7
0946   REF   1              10,3135   6 3523 0           AD      V05N00M1
0947   REF  35  LAST 1363   10,3136   6 0141 0           AD      TEM1
0948   REF 125  LAST 1360   10,3137   6 4744 1  NVDSP1   AD      ONE
0949   REF   1              10,3140   0 4146 0  NV50DSP  TC      NVMONOPT
0950   REF   1              10,3141   1 3265 1           TCF     REST          IF BUSY
0951   REF   6  LAST  484   10,3142   0 4424 1           TC      FLASHOFF      IN CASE OF EXTENDED VERB NON FLASH

0952   REF   1              10,3143   0 2410 0           TC      COPYTOGO      MPACS DESTROYED BY NVSUB
0953   REF  98  LAST 1334   10,3144   0 5520 0           TC      DOWNFLAG      UNSET SLEEPING BITS
0954   REF   1              10,3145    00102 1           ADRES   MRKNVFLG
09541  REF  99  LAST 1363   10,3146   0 5520 0           TC      DOWNFLAG
09542  REF   1              10,3147    00103 0           ADRES   NRMNVFLG
09543  REF 100  LAST 1363   10,3150   0 5520 0           TC      DOWNFLAG
09544  REF   1              10,3151    00104 1           ADRES   PRONVFLG
0955   REF   6  LAST 1362   10,3152   3 0160 0  BLANKCHK CA      TEMPOR2       BLANK BITS 1,2,3 IF SET
0956   REF   2  LAST  454   10,3153   0 4246 0           TC      BLANKSUB
0957   REF   3  LAST 1356   10,3154   1 3102 0           TCF     NVDSP
0958   REF  46  LAST 1361   10,3155   3 4740 0  PERFCHEK CAF     BIT5          BIT 5 FOR PERFORM
0959   REF   7  LAST 1363   10,3156   7 0160 1           MASK    TEMPOR2
0960   REF 431  LAST 1362   10,3157  10  000 0           CCS     A             IS THIS A GOPERF DISPLAY
0961   REF   1              10,3160   1 3203 1           TCF     1STOR2ND      YES

0962   REF  60  LAST 1358   10,3161   3 4741 1  GOANIDLE CAF     BIT4
0963   REF   8  LAST 1363   10,3162   7 0160 1           MASK    TEMPOR2
0964   REF 432  LAST 1363   10,3163  10  000 0           CCS     A
0965   REF   1              10,3164   1 3300 0           TCF     FLASHSUB      IT IS

0966   REF   9  LAST 1363   10,3165   4 0160 1           CS      TEMPOR2       IS THIS A GODSPRET
0967   REF  56  LAST 1354   10,3166   7 4737 1           MASK    BIT6
0968   REF 433  LAST 1363   10,3167  10  000 0           CCS     A
```

```
 0969    REF   1                 10,3170  1 3175 0            TCF     ISITNOO

 09691   REF  19   LAST 1363     10,3171  50 164 1            INDEX   COPINDEX
 09692   REF   4   LAST 1360     10,3172  3 0371 1            CA      CADRFLSH
 09693   REF 814   LAST 1363     10,3173  54 157 0            TS      MPAC +3
 09694   REF   1                 10,3174  1 3373 1            TCF     ENDIT

 0972    REF  20   LAST 1364     10,3175  50 164 1  ISITNOO   INDEX   COPINDEX         IS THIS A PASTE
 0973    REF   9   LAST 1363     10,3176  3 0366 1            CA      NVWORD
 0974    REF  13   LAST 1363     10,3177  7 6115 0            MASK    LOW7             CHECK MADE FOR PINBRNCH AND PRIO ON MARK
 0975                            10,3200  0 0006 1            EXTEND
 0976    REF   2   LAST 1363     10,3201  1 3300 0            BZF     FLASHSUB         YES, ASSUME PASTE ALWAYS ON FLASH

 0977    REF 139   LAST 1353     10,3202  1 5146 0            TCF     ENDOFJOB         NOT FLASH, NOT GOPERF, THEREFORE EXIT

 0978    REF  10   LAST 1363     10,3203  3 0160 0  ISTOR2ND  CA      TEMPOR2
 0979    REF  45   LAST 1362     10,3204  7 4730 0            MASK    BIT13
 0980    REF 434   LAST 1363     10,3205  10 000 0            CCS     A
 0981    REF   1                 10,3206  1 3161 0            TCF     GOANIDLE         SECOND

 0982    REF  46   LAST 1364     10,3207  3 4730 1            CA      BIT13
 0983    REF  21   LAST 1364     10,3210  50 164 1            INDEX   COPINDEX
 0984    REF   4   LAST 1363     10,3211  27'067 0            ADS     DSPFLG

 09845                           10,3212  22 007 0            ZL
 0985                            10,3213  0 0006 1            EXTEND                   IS IT MARK
 0986    REF   1                 10,3214  6 2433 1            BZMF    MARKPERF         YES

 0987    REF  34   LAST 1299     10,3215  7 4731 1            MASK    BIT12
 09871                           10,3216  0 0006 1            EXTEND
 09872   REF   1                 10,3217  1 3223 0            BZF     V50PASTE
 09874   REF   3   LAST  740     10,3220  4 1066 1            CS      NVWORD1          NVOWRD1= -0 IS V97. NVWORD1= -400 IS V99
 098741  REF   1                 10,3221  6 3547 1            AD      V97N00
 09875   REF   2   LAST 1354     10,3222  1 3140 0            TCF     NV50DSP
 0988    REF   1                 10,3223  3 3506 1  V50PASTE  CAF     V50N00
 0989    REF   3   LAST 1364     10,3224  1 3140 0            TCF     NV50DSP          DISPLAY SECOND PART OF GOPERF

 0990    REF  47   LAST 1363     10,3225  4 4740 1  WITCHONE  CS      BIT5             TURN OFF KEY RELEASE LIGHT
 0991                            10,3226  0 0006 1            EXTEND
 0992    REF  35   LAST 1336     10,3227  03 011 1            WAND    DSALMOUT

 0993    REF  20   LAST 1362     10,3230  3 0100 0            CA      FLAGWRD4
 0994    REF   1                 10,3231  7 3524 0            MASK    NVBUSMSK         IS IT NVSUB ASLEEP
 0995    REF 435   LAST 1364     10,3232  10 000 0            CCS     A
 0996    REF 126   LAST 1363     10,3233  3 4744 1            CAF     ONE
 0997    REF 256   LAST 1362     10,3234  54 001 1            TS      L
 0998    REF 263   LAST 1361     10,3235  3 4746 0            CAF     ZERO
 0999    REF 257   LAST 1364     10,3236  50 001 0            INDEX   L
 1000    REF  11   LAST  473     10,3237  57'041 0            XCH     CADRSTOR
 1001                         10,3240  0 C004 0           INHINT
 1002   RFF 359  LAST 1360    10,3241  0 CC02 0           TC       Q

 1003   RFF   6  LAST  462    10,3242  3 4210 0  XCHTOEND CAF      ENDINST          TC FNDOFJOB REPLACES GENADR IN LOC FOR
 1004   REF  29  LAST 1361    10,3243  56 C64 0  XCHNYLOC XCH      LOCCTR           WAS THIS ADDRESS SLEEPING
 1005                         10,3244  0 0C06 1           EXTEND
 1006   RFF   2  LAST 1360    10,3245  6 3251 1           BZMF     RFLINTQ          NO
 1007   REF  30  LAST 1365    10,3246  56 064 0           XCH      LOCCTR           YES
 1008   REF  31  LAST 1365    10,3247  50 C64 0           INDEX    LOCCTR
 1009   REF  45  LAST 1325    10,3250  54 164 0           TS       LOC

 1010                         10,3251  C C003 1  RFLINTQ  RELINT
 1011   REF 360  LAST 1365    10,3252  0 0002 0           TC       Q                BACK TO USER

 1012   RFF   2  LAST  876    10,3253  3 7741 1  CLFANEND CAF      PRI032           ONE LOWER THAN DISPLAYS SLEFPING
 1014   REF  42  LAST 1300    10,3254  0 5C76 0           TC       FINDVAC
 1015   REF   2  LAST  222       0370                     EBANK=   NVSAVF
 1016   RFF   1               10,3255   C4222 1           2CADR    JAMTERM
 1016   RFF   1               10,3256   04C60 0

 1017   REF   3  LAST 1364    10,3257  1 3301 1           TCF      FLASHSUB +1

 1018   REF  21  LAST 1364    10,3260  3 0100 0  ISITPRIO CA       FLAGWRD4
 1019   RFF   1               10,3261  7 3306 0           MASK     ITISMASK         IS PINBRFLG, MARKIDFLG SFT
 1020                         10,3262  0 C006 1           EXTEND
 1021   REF   2  LAST 1355    10,3263  1 2607 0           BZF      PRIOBORT
 1022   REF 140  LAST 1364    10,3264  1 5146 0           TCF      FNDOFJOB

 1023   REF  12  LAST 1364    10,3265  11'041 1  REST     CCS      CADRSTOR         IS SOMEONE IN ENDIDLE
 1024   REF 141  LAST 1365    10,3266  1 5146 0           TCF      FNDOFJOB         YES
 1025   REF   1               10,3267  1 3271 1           TCF      RESTSLEP

 1026   PEF 142  LAST 1365    10,3270  1 5146 0           TCF      ENDOFJOB

 1027   RFF   2  LAST 1353    10,3271  3 0162 1  RESTSLEP CA       GENMASK          SFT NVSLEEP BITS
 1028   REF   1               10,3272  7 3525 1           MASK     ASTROMSK
 1029   RFF   3  LAST 1361    10,3273  0 3554 0           TC       UPFNT2
 1030                         10,3274   24100 0  OCT24100 OCT      24100            *** DONT MOVE

 1031   RFF  22  LAST 1364    10,3275  50 164 1           INDEX    COPINDEX
 1032   REF   1               10,3276  3 3515 0           CAF      NVCADR
 1033   REF   2  LAST  479    10,3277  0 4433 1           TC       NVSUBUSY         BUSY OR ABORT IF ILLEGAL

 1034   REF   4  LAST  462  ` 10,3300  0 4420 0  FLASHSUB TC       FLASHON

 1035   REF  23  LAST 1365    10,3301  3 0164 1           CA       COPINDEX         COPINDEX DESTROYED BY FNDIDLE
 1036   RFF   1               10,3302  54 157 0           TS       COPMPAC

 1037   REF   3  LAST 1365    10,3303  3 C162 1           CA       GENMASK
 1038   REF   1               10,3304  7 3022 0           MASK     IDLFMASK
 1039    REF    4  LAST 1365   10,3305  0 3554 0              TC       UPENT2
 1040                          10,3306   40040 1  ITISMASK OCT      40040             *** ENDIDLE ALLOW *** DONT MOVE

 1046    REF   13  LAST 1365   10,3307  11'041 1              CCS      CADRSTOR          SEE IF SOMEONE ALREADY IN ENDIDLE
 1047    REF    1              10,3310  1 3260 1              TCF      ISITPRIO
 1048                          10,3311  1 3313 1              TCF      +2
 1049    REF    2  LAST 1366   10,3312  1 3260 1              TCF      ISITPRIO

 1050    REF    1              10,3313  0 4200 1              TC       ENDIDLE
 1051    REF    1              10,3314  1 3400 1  IDLERET1 TCF      TERMATE

 1052    REF    1              10,3315  1 3417 1              TCF      PROCEED           ENDIDLE RETURNS HERE ON PROCEED

 1053    REF    1              10,3316  4 3534 1              CS       LOWLOAD
 1054    REF  815  LAST 1364   10,3317  6 0154 1              AD       MPAC              VERBREG
 1055                          10,3320  0 0006 1              EXTEND
 1056    REF  436  LAST 1364   10,3321  26 000 0              DIM      A
 1057                          10,3322  0 0006 1              EXTEND
 1058    REF    1              10,3323  1 3467 0              BZF      LOADITIS          V21 OR V22 OR V23 ON DSKY
 1059    REF   85  LAST 1357   10,3324  3 4743 0  OKTOENT  CAF      TWO
 1060    REF    1              10,3325  54 161 0  ENDOUT   TS       OUTHERE

 1061    REF   22  LAST 1365   10,3326  3 0100 0              CA       FLAGWRD4          CHECK NATURE OF ENDIDLE RETURN
 1062    REF    2  LAST 1297   10,3327  7 4101 1              MASK     OCT60000
 1063    REF  437  LAST 1366   10,3330  10 000 0              CCS      A
 1064    REF    1              10,3331  1 3334 1              TCF      TIMECHEK          PRIO ENDIDLE RETURN
 1065    REF    1              10,3332  1 3435 1              TCF      NORMRET           NORMAL ENDIDLE RETURN
 1066    REF    1              10,3333  1 3421 1              TCF      MARKRET           MARK ENDIDLE RETURN

 1067    REF   28  LAST 1356   10,3334  4 0025 1  TIMECHEK CS       TIME1
 1068    REF    2  LAST 1356   10,3335  6 1164 0              AD       PRIOTIME
 1069    REF  438  LAST 1366   10,3336  10 000 0              CCS      A
 1070                          10,3337  4 0000 0              COM
 1071    REF    3  LAST 1302   10,3340  6 7752 0              AD       OCT37776
 1072    REF  127  LAST 1364   10,3341  6 4744 1              AD       ONE
 1073    REF    1              10,3342  6 3600 1              AD       -2SEC
 1074                          10,3343  0 0006 1              EXTEND
 1075    REF    2  LAST 1362   10,3344  6 2544 0              BZMF     KEEPPRIO

 1075C1                        10,3345  0 0004 0              INHINT
 10751   REF    5  LAST 1356   10,3346  4 6130 1              CS       OCT40001          TURN OFF SUPER-KEYRELEASE LIGHT
 10752   REF   56  LAST 1356   10,3347  7 1035 1              MASK     DSPTAB +11D
 10753   REF   48  LAST 1352   10,3350  6 4726 0              AD       BIT15
 10754   REF   57  LAST 1366   10,3351  55'035 1              TS       DSPTAB +11D

 1076    REF    2  LAST 1366   10,3352  1 3435 1              TCF      NORMRET

 1084    REF  128  LAST 1366   10,3353  3 4744 1  NORMWAKE CAF      ONE
 1085    REF    1              10,3354  1 3036 0              TCF      WAKEPLAY
 1086    REF   2  LAST 1366    10,3355  10 161 0  ENDRET    CCS      OUTHERE
 1087    REF 129  LAST 1366    10,3356  6 4744 1            AD       ONE
 1088                          10,3357  1 3361 1            TCF      +2               NORMAL ENDIDLE EXIT
 1089    REF 143  LAST 1365    10,3360  1 5146 0            TCF      ENDOFJOB
 1090    REF   2  LAST 1365    10,3361  50 157 1            INDEX    COPMPAC
 1091    REF   5  LAST 1364    10,3362  6 0371 1            AD       CADRFLSH
 1092    REF 816  LAST 1366    10,3363  54 157 0            TS       MPAC +3

 1093    REF   4  LAST 1365    10,3364  3 0162 1            CA       GENMASK          REMOVE ENDIDLE AND PINBRANCH BITS
 1094    REF   1               10,3365  7 3367 1            MASK     PINIOMSK
 1095    REF   3  LAST 1361    10,3366  0 3564 0            TC       DOWNENT2
 1096                          10,3367   74044 1  PINIOMSK OCT      74044            *** DONT MOVE

 1097    REF  40  LAST 1362    10,3370  4 6266 1            CS       THREE            BLANK EVERYTHING EXCEPT MM
 1098    REF   2  LAST  276    10,3371  0 4145 0            TC       NVSUB
 1099                          10,3372  1 3373 1            TCF      +1

 1100    REF   3  LAST 1357    10,3373  3 0163 0  ENDIT     CA       USERPRIO         RETURN TO USERS PRIORITY
 1101    REF   7  LAST 1362    10,3374  7 7746 1            MASK     PRIO37
 1102    REF  20  LAST 1362    10,3375  0 5137 1            TC       PRIOCHNG
 1103    REF 817  LAST 1367    10,3376  3 0157 1            CA       MPAC +3
 1104    REF  18  LAST 1362    10,3377  1 4631 0            TCF      BANKJUMP

 1115    REF 264  LAST 1364    10,3400  3 4746 0  TERMATE   CAF      ZERO             ASTRONAUT TERMINATE (V34) RETURNS TO
 1116    REF   1               10,3401  1 3325 1            TCF      ENDOUT

 1117    REF  11  LAST 1360    10,3402  4 0160 1  LINUSCHR  CS       PLAYTEM4         IS THIS A LINUS
 1118    REF  78  LAST 1355    10,3403  7 4727 0            MASK     BIT14
 1119    REF 439  LAST 1366    10,3404  10 000 0            CCS      A
 1120    REF   6  LAST 1291    10,3405  1 6760 1            TCF      Q+1              NO
 1121    REF   3  LAST 1360    10,3406  4 0157 0            CS       PLAYTEM3         YES, IS IT ALREADY IN ENDIDLE
 1122    REF  24  LAST 1365    10,3407  50 164 1            INDEX    COPINDEX
 1123    REF   6  LAST 1367    10,3410  6 0371 1            AD       CADRFLSH
 1124                          10,3411  0 0006 1            EXTEND
 1125                          10,3412  1 3414 1            BZF      +2               YES

 1126    REF 361  LAST 1365    10,3413  0 0002 0            TC       Q                NO
 1127    REF  12  LAST  485    10,3414  11 011 1            CCS      DSPLOCK          IS THE ASTRONAUT BUSY
 1128    REF 144  LAST 1367    10,3415  0 5146 1            TC       ENDOFJOB         END THE NEW DISPLAY, ITS ALREADY ACTIVE
 1129    REF 362  LAST 1367    10,3416  0 0002 0            TC       Q

R1130    MORE LOGIC COULD BE INCORPORATED HERE TO MAKE SURE A RECYCLE IS A RECYCLAND CONVERSLY THAT A LOAD IS A LOAD.
 1132    REF 130  LAST 1367    10,3417  3 4744 1  PROCEED   CAF      ONE              ASTRONAUT PROCEED (V33) RETURNS
 1133    REF   2  LAST 1367    10,3420  1 3325 1            TCF      ENDOUT

R1138          LASTPLAY CHECKS TO SEE IF (1) THE LAST NORMAL DISPLAY WAS EITHER INTERRUPTED BY A PRIO OR A MARK (MARK
R1140    COULD ONLY HAPPEN DURING PINBRANCH) OR IF (2) THE LAST NORMAL DISPLAY WAS REQUESTED WHILE A HIGHER PRIORITY
R1142    DISPLAY WAS GOING RESULTING IN THE NORMAL BEING PUT TO SLEEP.

R1143          IF EITHER OF THE ABOVE 2 CONDITIONS EXISTS , THE NORMAL DISPLAY IS AWAKENED TO GO TO PLAYJUM1 WHICH STARTS
```

```
R1145    UP THE MOST RECENT VALID NORMAL DISPLAY. IF THESE 2 CONDITIONS DO NOT EXIST, CONTROL GOES TO PLAYJUM1 WHICH IS
R1147    STARTED IMMEDIATELY WITH THE ASSUMPTION THAT THE MOST RECENT NORMAL DISPLAY IS ALREADY IN-ENDIDLE(DURING A
R1149    PINBRANCH) OR THAT A RESTART HAS OCCURRED AND THE DISPLAY CAN BE STARTED AS A .1 RESTART.

 1163    REF  23  LAST 1309    10,3421  4 6263 1  MARKRET  CS       SIX
 1164    REF  23  LAST 1366    10,3422  7 0100 1           MASK     FLAGWRD4
 1165                          10,3423  0 0004 0           INHINT                    *** MAY MOVE DISPLAY FLAGWORD OUT OF
 1166    REF  24  LAST 1368    10,3424  54 100 1           TS       FLAGWRD4

 1167                          10,3425  0 0003 1           RELINT                    INHINT REALM
 1168    REF   2  LAST 1361    10,3426  1 3355 0           TCF      ENDRET

 1169    REF   2  LAST 1320    10,3427  3 7770 0  MARKOVER CAF      MINUS1           RUPTREG2 IS - MEANS ENDOFJOB TO ENDRET
 1170    REF   3  LAST 1367    10,3430  54 161 0           TS       OUTHERE

 1171    REF  25  LAST 1368    10,3431  3 0100 0           CA       FLAGWRD4         IS ENDIDFLG SET
 1172    REF  12  LAST 1291    10,3432  7 4346 0           MASK     PRIO30           IS NORMAL OR PRIO IN ENDIDLE
 1173    REF 440  LAST 1367    10,3433  10 000 0           CCS      A
 1174    REF   1               10,3434  1 3073 1           TCF      NORMBNCH

 1175    REF  26  LAST 1368    10,3435  3 0100 0  NORMRET  CA       FLAGWRD4         IS MARK SLEEPING
 1176    REF   2  LAST 1361    10,3436  7 3532 1           MASK     BITS5+11         OR WAITING
 1177    REF 441  LAST 1368    10,3437  10 000 0           CCS      A
 1178    REF   1               10,3440  1 3035 0           TCF      MARKWAKE

 1179    REF  27  LAST 1368    10,3441  3 0100 0           CA       FLAGWRD4         NO
 1180    REF   1               10,3442  7 3533 0           MASK     BITS4+10         IS NORMAL INTERRUPTED OR WAITING
 1181    REF 442  LAST 1368    10,3443  10 000 0           CCS      A
 1182    REF   1               10,3444  1 3353 0           TCF      NORMWAKE         YES

 1183    REF   5  LAST 1362    10,3445  3 1071 0           CA       EBANKTEM         NO, WAS IT A FLASH REQUEST
 1184    REF   5  LAST 1328    10,3446  7 4762 1           MASK     OCT50            OR A GODSPRET
 1185    REF 443  LAST 1368    10,3447  10 000 0           CCS      A
 1186    REF   3  LAST 1368    10,3450  1 3355 0           TCF      ENDRET           YES
 1187    REF   3  LAST 1365    10,3451  3 0370 0           CA       NVSAVE
 1188                          10,3452  0 0006 1           EXTEND
 1189    REF   4  LAST 1368    10,3453  1 3355 0           BZF      ENDRET

 1190    REF   6  LAST  483    10,3454  3 5016 0           CAF      PRIO15
 1191                          10,3455  0 0004 0           INHINT
 1192    REF  28  LAST 1358    10,3456  0 5063 1           TC       NOVAC
 1193    REF  10  LAST 1364      0366                      EBANK=   NVWORD
 1194    REF   2  LAST 1362    10,3457   02627 0           2CADR    PLAYJUM1
 1194                          10,3460   20060 0

 1195    REF   5  LAST 1368    10,3461  1 3355 0           TCF      ENDRET

 1196    REF  28  LAST 1368    10,3462  3 0100 0  MARSLEEP CA       FLAGWRD4         IS MARK ALREADY IN
 1197    REF   3  LAST 1368    10,3463  7 3532 1           MASK     BITS5+11
 1198    REF 444  LAST 1368    10,3464  10 000 0           CCS      A
 1199   REF 145  LAST 1367   10,3465  1 5146 0            TCF     ENDOFJOB          YES
 11991  REF   3  LAST 1357   10,3466  1 2766 0            TCF     GOSLEEPS

 1200   REF   3  LAST 1367   10,3467  50 157 1  LOADIT1S  INDEX   COPMPAC
 1201   REF  11  LAST 1368   10,3470  3 0366 1            CA      NVWORD
 1202   REF  14  LAST 1364   10,3471  7 6115 0            MASK    LOW7
 1203                        10,3472  4 0000 0            COM
 1204   REF 818  LAST 1367   10,3473  6 0155 0            AD      MPAC +1           NOUNREG
 1205                        10,3474  0 0006 1            EXTEND
 1206   REF   1              10,3475  1 3324 0            BZF     OKTOENT           NO, THEN LOAD IS VALID
 1207   REF   7  LAST  837   10,3476  1 3062 1            TCF     PINBRNCH          YES, ACCEPT LOAD BUT ASK FOR LAST AGAIN

 1208   REF  41  LAST 1367   10,3477  4 6266 1  ERASER    CS      THREE             BLANK EVERYTHINGEXCEPT MM
 1209   REF   3  LAST 1367   10,3500  0 4145 0            TC      NVSUB
 1210   REF 146  LAST 1369   10,3501  1 5146 0            TCF     ENDOFJOB
 1211   REF 147  LAST 1369   10,3502  1 5146 0            TCF     ENDOFJOB

 1212                        10,3503   00036 1  PERFMASK  OCT     0036              FLASH,PERFORM,BLANK R2 AND R3
 1213                        10,3504   00231 1  V01N25    VN      00125
 1214                        10,3505   01407 0  V06N07    VN      00607             GOPERF3 VN DISPLAY BEFORE V50
 1215                        10,3506   14400 0  V50N00    VN      5000
 1216                        10,3507   00030 1  PERF2MSK  OCT     00030             FLASH, PERFORM
 1217                        10,3510   01006 0  V04N06    VN      00406
 1218                        10,3511   00014 1  PERF4MSK  OCT     14                FLASH, BLANK R3
 1219   REF   8  LAST 1369   10,3062            GOAGIN    EQUALS  PINBRNCH
 1220                        10,3512   20010 1  REDOMASK  OCT     20010             BITS 4 AND 14
 1221                        10,3513   40230 1  MARK3MSK  OCT     40230             MARK,DECIMAL NOUN, PERFORM,FLASH
 1222                        10,3514   40036 0  MARK4MSK  OCT     40036             MARK,PERFORM,FLASH,BLANK 2 AND 3
 1223   REF   1              10,3515   20542 0  NVCADR    CADR    REDOPRIO
 1224   REF   4  LAST 1362   10,3516   20372 0  WAKECADR  CADR    MARKPLAY
 1225   REF   3  LAST 1368   10,3517   20627 0            CADR    PLAYJUM1

 1226                        10,3520   03400 0  OCT3400   OCT     3400              EBANK MASK
 1227                        10,3521   11210 1  NBUSMASK  OCT     11210
 1228                        10,3522   66521 1  PMMASK    OCT     66521
 1229   REF   5  LAST 1356     4144             VERBMASK  =       MID7              (OCT 37600)
 1230                        10,3523   01177 1  V05N00M1  OCT     1177              V05 MINUS ONE
 1231   REF   1              10,2317            GOXDSP    EQUALS  GOMARK
 1232   REF   1              10,2342            GOXDSPR   EQUALS  GOMARKR
 1233   REF  11  LAST  706   10,2323            GOXDSPF   EQUALS  GOMARKF
 1234   REF   7  LAST  504   10,2345            GOXDSPFR  EQUALS  GOMARKFR
 1235   REF   2  LAST  267     5474             ENDEXT    EQUALS  ENDMARK
 1236   REF  14  LAST 1109     0165             MPAC2SAV  EQUALS  BANKSET
 1238                        10,3524   00700 0  NVBUSMSK  OCT     700
 12385                       10,3525   00704 1  ASTROMSK  OCT     704
 1239                        10,3526   40030 0  MPERFMSK  OCT     40030             BIT 15,5,4 FOR MARK,PERFORM,FLASH
 1240                        10,3527   34300 0  OCT34300  OCT     34300
 1241                        10,3530   40100 1  BITS15+7  OCT     40100
 1242                        10,3531   00110 1  BITS7+4   OCT     110
 1246                        10,3532   02020 1  BITS5+11  OCT     2020              * DONT MOVE
 1247                          10,3533   01010 1  BITS4+10 OCT      1010          * DONT MOVE
 1249                          10,3534   00026 0  LOWLOAD  DEC     22
 1250                          10,3535   77730 0  BUSYMASK OCT     77730
 1252                          10,3536   00050 1  CADRMASK OCT     50
 1253   REF   4  LAST 1311        7761             PINMASK  EQUALS 13,14,15
 1254   REF   4  LAST 1363     10,3102             GOPLAY   EQUALS NVDSP
A1255                                             PRIOSAVE EQUALS R1SAVE
 1256   REF 819  LAST 1369        0157             COPMPAC  EQUALS MPAC +3
 1257   REF 820  LAST 1370        0160             TEMPOR2  EQUALS MPAC +4
 1258   REF 821  LAST 1370        0161             OUTHERE  EQUALS MPAC +5
 1259   REF  46  LAST 1365        0164             COPINDEX EQUALS LOC
 1260   REF  32  LAST 1075        0163             USERPRIO EQUALS MODE
 1261   REF 822  LAST 1370        0162             GENMASK  EQUALS MPAC +6
 1262                          10,3537   20144 1  PRIOOCT  OCT     20144          PRIO
 1263                          10,3540   42424 0  MARKOCT  OCT     42424          MARK
 1264                          10,3541   11254 1           OCT     11254          NORM

 1265                          10,3542   74704 1  IDLESLEP OCT     74704
 1266                          10,3543   67777 1  OCT67777 OCT     67777
 1267   REF  12  LAST  504        5466             LINUS    EQUALS BLANKET
 1268   REF 823  LAST 1370        0154             FACEREG  EQUALS MPAC
 1269   REF 824  LAST 1370        0155             PLAYTEM1 EQUALS MPAC +1
 1270   REF 825  LAST 1370        0157             PLAYTEM3 EQUALS MPAC +3
 1271   REF 826  LAST 1370        0160             PLAYTEM4 EQUALS MPAC +4
 1273                          10,3544   40420 0  OCT40420 OCT     40420
 1274   REF   3  LAST 1358     10,3545   02560 0  MAKEGEN  GENADR MAKEPLAY
 1275                          10,3546   10200 1  OCT10200 OCT     10200
 1276                          10,3547   30200 0  V97N00   VN      09700          PASTE FOR V97 OR V99
 12761                         10,3550   20100 1  OCT20100 OCT     20100
 12762                         10,3551   24030 1  CLOCKCON OCT     24030          FLASH, PERFORM, V99 OR V97 PASTE,REFLASH
 1277                          10,3552   02600 0  OCT2600  OCT     02600
 1278                          10,3553   00310 0  PRIMNMSK OCT     00310          MONITOR PASTE, PRIO, FLASH
```

```
0001                         10,3554                        BANK    10
0002   REF   2  LAST 1351    10,2000                        SETLOC DISPLAYS
0003                         10,3554                        BANK
0004   REF   2 LAST 1351 TO 1371:   671   671*              COUNT* $$/DSPLA

0005                         10,3554  0 0004 0  UPENT2      INHINT
0006   REF   3  LAST 1283    10,3555  7 5652 1              MASK    OCT77770
0007   REF 258  LAST 1364    10,3556  54 001 1              TS      L
0008   REF  29  LAST 1368    10,3557  4 0100 1              CS      FLAGWRD4
0009   REF 259  LAST 1371    10,3560  7 0001 1              MASK    L
0010   REF  30  LAST 1371    10,3561  26 100 1              ADS     FLAGWRD4
0011                         10,3562  0 0003 1  JOIN        RELINT
0012   REF   7  LAST 1367    10,3563  1 6760 1              TCF     Q+1

0013                         10,3564  0 0004 0  DOWNENT2    INHINT
0014   REF   4  LAST 1371    10,3565  7 5652 1              MASK    OCT77770
0015                         10,3566  4 0000 0              COM
0016   REF  31  LAST 1371    10,3567  7 0100 1              MASK    FLAGWRD4
0017   REF  32  LAST 1371    10,3570  54 100 1              TS      FLAGWRD4
0018   REF   1               10,3571  1 3562 1              TCF     JOIN

0032   REF  26  LAST 1362       4750            OCT7        EQUALS SEVEN
```

```
P0033
R0034        UPFLAG AND DOWNFLAG ARE ENTIRELY GENERAL FLAG SETTING AND CLEARING SUBROUTINES.   USING THEM, WHETHER OR
R0036     NOT IN INTERRUPT, ONE MAY SET OR CLEAR ANY SINGLE, NAMED BIT IN ANY ERASABLE REGISTER, SUBJECT OF COURSE TO
R0038     EBANK SETTING.   A "NAMED" BIT, AS THE WORD IS USED HERE, IS ANY BIT WITH A NAME FORMALLY ASSIGNED BY THE YUL
R0040     ASSEMBLER.

R0041        AT PRESENT THE ONLY NAMED BITS ARE THOSE IN THE FLAGWORDS.   ASSEMBLER CHANGES WILL MAKE IT POSSIBLE TO
R0043     NAME ANY BIT IN ERASABLE MEMORY.

R0044        CALLING SEQUENCES ARE AS FOLLOWS:-

R0045                         TC      UPFLAG                         TC      DOWNFLAG
R0046                         ADRES   NAME OF FLAG                   ADRES   NAME OF FLAG

R0047        RETURN IS TO THE LOCATION FOLLOWING THE "ADRES" ABOUT .58 MS AFTER THE "TC".

R0049        UPON RETURN A CONTAINS THE CURRENT FLAGWRD SETTING.

 0050                              5506                         BLOCK   02
 0051     REF   3  LAST 1291       4000                         SETLOC  FFTAG1
 0052                              5506                         BANK
 0053     REF   1                                               COUNT*  $$/FLAG

 0054     REF 363  LAST 1367       5506  3 0002 0  UPFLAG       CA      Q
 0055     REF   2  LAST  738       5507  0 5524 1               TC      DEBIT
 0056                              5510  4 0000 0               COM                     +(15 - BIT)
 0057                              5511  0 0006 1               EXTEND
 0058     REF  13  LAST 1024       5512  04 001 1               ROR     LCHAN           SET BIT
 0059     REF  55  LAST 1322       5513  50 061 0  COMFLAG      INDEX   ITEMP1
 0060     REF  32  LAST  963       5514  54 074 0               TS      FLAGWRD0
 0061     REF  22  LAST 1297       5515  22 063 1               LXCH    ITEMP3
 0062                              5516  0 0003 1               RELINT
 0063     REF 260  LAST 1371       5517  0 0001 0               TC      L


 0064     REF 364  LAST 1372       5520  3 0002 0  DOWNFLAG     CA      Q
 0065     REF   3  LAST 1372       5521  0 5524 1               TC      DEBIT
 0066     REF 261  LAST 1372       5522  7 0001 1               MASK    L               RESET BIT
 0067     REF   2  LAST  738       5523  1 5513 1               TCF     COMFLAG


 0068     REF 131  LAST 1367       5524  6 4744 1  DEBIT        AD      ONE             GET DE BITS
 0069                              5525  0 0004 0               INHINT
 0070     REF  23  LAST 1372       5526  54 063 0               TS      ITEMP3
 0071     REF   3  LAST 1090       5527  3 4753 1               CA      LOW4            DEC15
 0072     REF  56  LAST 1372       5530  54 061 1               TS      ITEMP1
 0073     REF  24  LAST 1372       5531  50 063 1               INDEX   ITEMP3
 0074                              5532  2'7777 0               CA      0 -1            ADRES
 0075     REF 262  LAST 1372       5533  54 001 1               TS      L
 0076     REF 265  LAST 1367       5534  3 4746 0               CA      ZERO
 0077                                 5535  0 0006 1          EXTEND
 0078   REF  57  LAST 1372            5536  10 061 1          DV       ITEMP1           A = ELAGWRD, L = (15 - BIT)
 0079   REF  58  LAST 1373            5537  52 062 1          DXCH     ITEMP1
 0080   REF  59  LAST 1373            5540  50 061 0          INDEX    ITEMP1
 0081   REF  33  LAST 1372            5541  3 0074 1          CA       ELAGWRD0
 0082   REF 263  LAST 1372            5542  54 001 1          TS       L                CURRENT STATE
 0083   REF  30  LAST 1321            5543  50 062 0          INDEX    ITEMP2
 0084   REF  49  LAST 1366            5544  4 4726 1          CS       BIT15            -(15 - BIT)
 0085   REF 365  LAST 1372            5545  0 0002 0          TC       Q
```

```
P0086   DELAYJOB- A GENERAL ROUTINE TO DELAY A JOB A SPECIFIC AMOUNT OF TIME BEFORE PICKING UP AGAIN.

R0088   ENTRANCE REQUIREMENTS...
A0089                                                             CAF     DT               DELAY JOB FOR DT CENTISECS
A0090                                                             TC      BANKCALL
A0091                                                             CADR    DELAYJOB

 0092                              06,3776                        BANK    06
 0093   REF    1                   00,2000                        SETLOC  DLAYJOB
 0094                              00,3735                        BANK

R0095   THIS MUST REMAIN IN BANK 0 ****************************************
 0096   REF    1                                                  COUNT*  $$/DELAY
 00965  REF    6  LAST 1313        00,3735  3 4771 1    2SECDELY  CAF     2SECS
 0097                              00,3736  0 0004 0    DELAYJOB  INHINT
 0098   REF 366  LAST 1373         00,3737  54 002 1              TS      Q                STORE DELAY DT IN Q FOR DLY -1 IN

 0099   REF    1                   00,3740  3 4743 0              CAF     DELAYNOM         WAITLIST
 0100   REF   36  LAST 1323        00,3741  54 070 1    DELLOOP   TS      RUPTREG1
 0101   REF 445  LAST 1368         00,3742  50 000 1              INDEX   A
 0102   REF    4  LAST  233        00,3743  3 1323 1              CA      DELAYLOC         IS THIS DELAYLOC AVAILABLE
 0103                              00,3744  0 0006 1              EXTEND
 0104   REF    1                   00,3745  1 3753 1              BZF     OK2DELAY         YES

 0105   REF   37  LAST 1374        00,3746  10 070 1              CCS     RUPTREG1         NO, TRY NEXT DELAYLOC
 0106   REF    1                   00,3747  1 3741 1              TCF     DELLOOP

 0107   REF   27  LAST 1328        00,3750  52 134 0              DXCH    BUF2
 0108   REF    7  LAST 1327        00,3751  0 5712 0              TC      BAILOUT1         NO AVAILABLE LOCS.
 0109                              00,3752   31104 0              OCT'    31104

 0110   REF    1                   00,3753  3 3773 1    OK2DELAY  CA      TCSLEEP          SET WAITLIST IMMEDIATE RETURN
 0111   REF    7  LAST 1130        00,3754  54 061 1              TS      WAITEXIT

 0112   REF   31  LAST 1103        00,3755  3 0004 0              CA      FBANK
 0113   REF   38  LAST 1374        00,3756  6 0070 0              AD      RUPTREG1         STORE BBANK FOR TASK CALL
 0114   REF 264  LAST 1373         00,3757  54 001 1              TS      L

 0115   REF    1                   00,3760  3 3774 0              CAF     WAKECAD          STORE CADR FOR TASK CALL
 0116   REF    2  LAST 1117        00,3761  1 5213 0              TCF     DLY2 -1          DLY IS IN WAITLIST ROUTINE

 0117   REF   14  LAST 1360        00,3762  0 4636 0    TCGETCAD  TC      MAKECADR         GET CALLERS FCADR

 0118   REF   39  LAST 1374        00,3763  50 070 0              INDEX   RUPTREG1
 0119   REF    5  LAST 1374        00,3764  55'323 0              TS      DELAYLOC         SAVE DELAY CADRS

 0120   REF    8  LAST 1361        00,3765  0 5124 0              TC      JOBSLEEP

 0121   REF 266  LAST 1372         00,3766  3 4746 0    WAKER     CAF     ZERO
 0122   REF   46  LAST 1358        00,3767  50 006 1              INDEX   BBANK
 0123   REF   6  LAST 1374   00,3770  57'323 1           XCH     DELAYLOC          MAKE DELAYLOC AVAILABLE
 0124   REF  14  LAST 1361   00,3771  0 5130 0           TC      JOBWAKE

 0125   REF  77  LAST 1325   00,3772  0 5263 0           TC      TASKOVER

 0126   REF   1              00,3773   03760 0  TCSLEEP  GENADR TCGETCAD -2
 0127   REF   1              00,3774   03766 0  WAKECAD  GENADR WAKER
```

```
P0128   GENTRAN, A BLOCK TRANSFER ROUTINE.

R0129   WRITTEN BY D. EYLES
R0130   MOD 1 BY KERNAN                                                            UTILITYM REV 17 11/18/67

R0132   MOD 2 BY SCHULENBERG  (REMOVE RELINT)   SKIPPER REV 4 2/28/68

R0133           THIS ROUTINE IS USEFULL FOR TRANSFERING N CONSECUTIVE ERASABLE OR FIXED QUANTITIES TO SOME OTHER N
R0135   CONSECUTIVE ERASABLE LOCATIONS.  IF BOTH BLOCKS OF DATA ARE IN SWITCHABLE EBANKS, THEY MUST BE IN THE SAME ONE.

R0137           GENTRAN IS CALLABLE IN A JOB AS WELL AS A RUPT.  THE CALLING SEQUENCE IS:

A0139                                        I         CA      N-1             # OF QUANTITIES MINUS ONE.
A0140                                        I +1      TC      GENTRAN         IN FIXED-FIXED.
A0141                                        I +2      ADRES   L               STARTING ADRES OF DATA TO BE MOVED.
A0142                                        I +3      ADRES   M               STARTING ADRES OF DUPLICATION BLOCK.
A0143                                        I +4                              RETURNS HERE.

R0144           GENTRAN TAKES 25 MCT'S (300 MICROSECONDS) PER ITEM + 5 MCT'S (60 MICS) FOR ENTERING AND EXITING.

R0146           A, L AND ITEMP1 ARE NOT PRESERVED.

 0147                           5546                       BLOCK  02
 0148   REF   2  LAST 1351      4000                       SETLOC FETAG4
 0149                           5546                       BANK

 0150   REF  60  LAST 1373      0061                       EBANK= ITEMP1

 0151   REF   1                                            COUNT* $$/TRAN

 0152                           5546  0 0004 0  GENTRAN    INHINT
 0153   REF  61  LAST 1376      5547  54 061 1             TS      ITEMP1          SAVE N-1.
 0154   REF 367  LAST 1374      5550  50 002 0             INDEX   Q               C(Q) = ADRES L.
 0155                           5551  6 0000 1             AD      0               ADRES (L + N - 1).
 0156   REF 446  LAST 1374      5552  50 000 1             INDEX   A
 0157                           5553  3 0000 1             CA      0               C(ABOVE).
 0158   REF 265  LAST 1374      5554  54 001 1             TS      L               SAVE DATA.
 0159   REF  62  LAST 1376      5555  3 0061 0             CA      ITEMP1
 0160   REF 368  LAST 1376      5556  50 002 0             INDEX   Q
 0161                           5557  6 0001 0             AD      1               ADRES (M + N - 1).
 0162   REF 447  LAST 1376      5560  50 000 1             INDEX   A
 0163                           5561  22 000 1             LXCH    0               STUFF IT.
 0164   REF  63  LAST 1376      5562  10 061 1             CCS     ITEMP1          LOOP UNTIL N-1 = 0.
 0165   REF   2  LAST  309      5563  1 5547 0             TCE     GENTRAN +1
 0166   REF   7  LAST 1291      5564  1 6762 0             TCE     Q+2             RETURN TO CALLER.
```

```
P0167   B5OFF   ZERO BIT 5 OF EXTVBACT, WHICH IS SET BY TESTXACT.

R0168             MAY BE USED AS NEEDED BY ANY EXTENDED VERB WHICH HAS DONE TESTXACT

 0170   REF   1                                            COUNT* $$/EXTVB

 0171   REF  48  LAST 1364      5565  4 4740 1  B5OFF      CS      BIT5
 0172   REF  17  LAST 1351      5566  7 1043 0             MASK    EXTVBACT
 0173   REF  18  LAST 1377      5567  55'043 0             TS      EXTVBACT
 0174   REF 148  LAST 1369      5570  0 5146 1             TC      ENDOFJOB
```

```
R0001           THE FOLLOWING SUBROUTINE MAY BE CALLED TO DISPLAY A NON-ABORTIVE ALARM CONDITION. IT MAY BE CALLED
R0003    EITHER IN INTERRUPT OR UNDER EXECUTIVE CONTROL.

R0004           CALLING SEQUENCE IS AS FOLLOWS:

R0005           TC      ALARM
R0006           OCT     AAANN                ALARM NO. NN IN GENERAL AREA AAA.
R0007                                        (RETURNS HERE)

 0008                          5571                          BLOCK   02
 0009    REF   1               4000                          SETLOC  FFTAG7
 0010                          5571                          BANK

 0011    REF   8  LAST  486    0375                          EBANK=  FAILREG

 0012    REF   1                                             COUNT*  $$/ALARM
R0013    ALARM TURNS ON THE PROGRAM ALARM LIGHT, BUT DOES NOT DISPLAY.

 0014                          5571  0 0004 0  ALARM         INHINT

 0015    REF 369  LAST 1376    5572  3 0002 0                CA      Q
 0016    REF   8  LAST 1283    5573  55'363 1  ALARM2        TS      ALMCADR
 0017    REF 370  LAST 1378    5574  50 002 0                INDEX   Q
 0018                          5575  3 0000 1                CA      0
 0019    REF 266  LAST 1376    5576  54 001 1  BORTENT       TS      L

 0020    REF  47  LAST 1374    5577  3 0006 1  PRIOENT       CA      BBANK
 0021                          5600  0 0006 1   +1           EXTEND
 0022    REF  27  LAST 1359    5601  04 007 1                ROR     SUPERBNK        ADD SUPER BITS.
 0023    REF   9  LAST 1378    5602  55'364 0                TS      ALMCADR +1

 0024    REF 371  LAST 1378    5603  3 0002 0  LARMENT       CA      Q               STORE RETURN FOR ALARM
 0025    REF  64  LAST 1376    5604  54 061 1                TS      ITEMP1

 0026    REF   9  LAST 1378    5605  10 375 1  CHKFAIL1 CCS          FAILREG         IS ANYTHING IN FAILREG
 0027    REF   1               5606  1 5612 0                TCF     CHKFAIL2        YES TRY NEXT REG
 0028    REF 267  LAST 1378    5607  3 0001 0                CA      L
 00285   REF  10  LAST 1378    5610  54 375 1                TS      FAILREG
 0029    REF   1               5611  1 5616 1                TCF     PROGLARM        TURN ALARM LIGHT ON FOR FIRST ALARM

 0030    REF  11  LAST 1378    5612  10 376 1  CHKFAIL2 CCS          FAILREG +1
 0031    REF   2  LAST 1378    5613  1 5616 1                TCF     PROGLARM
 0032    REF 268  LAST 1378    5614  3 0001 0                CA      L
 0033    REF  12  LAST 1378    5615  54 376 1                TS      FAILREG +1

 0039    REF  13  LAST 1378    5616  22 377 1  PROGLARM LXCH         FAILREG +2      STORE AS "MOST RECENT" ALARM CODE

 0040    REF  58  LAST 1366    5617  4 1035 1                CS      DSPTAB +11D     TURN ON PROGRAM ALARM IF OFF
 0041    REF   2  LAST 1356    5620  7 5634 1                MASK    OCT40400
 0042    REF  59  LAST 1378    5621  27'035 1                ADS     DSPTAB +11D
 0043   REF  65  LAST 1378        5622  56 061 0  MULTEXIT XCH     ITEMP1          OBTAIN RETURN ADDRESS IN A
 0044                             5623  0 0003 1           RELINT
 0045   REF 448  LAST 1376        5624  50 000 1           INDEX   A
 0046                             5625  0 0001 0           TC      1

R0051   PRIOLARM DISPLAYS V05N09 VIA PRIODSPR WITH 3 RETURNS TO THE USER FROM THE ASTRONAUT AT CALL LOC +1,+2,+3 AND
R0053   AN IMMEDIATE RETURN TO THE USER AT CALL LOC +4. EXAMPLE FOLLOWS,
A0054                                                      CAF     OCTXX           ALARM CODE
A0055                                                      TC      BANKCALL
A0056                                                      CADR    PRIOLARM

A0057                                                      ...     ...
A0058                                                      ...     ...
A0059                                                      ...     ...             ASTRONAUT RETURN
A0060                                                      TC      PHASCHNG        IMMEDIATE RETURN TO USER. RESTART
A0061                                                      OCT     X.1             PHASE CHANGE FOR PRIO DISPLAY

 0062                          10,3572                     BANK    10
 0063   REF   3  LAST 1371     10,2000                     SETLOC  DISPLAYS
 0064                          10,3572                     BANK

 0065   REF   3 LAST 1371 TO 1372:      14    635*         COUNT*  $$/DSPLA
 0066                          10,3572  0 0004 0  PRIOLARM INHINT                  * * * KEEP IN DISPLAY ROUTINES BANK
 0067   REF 269  LAST 1378     10,3573  54 001 1           TS      L               SAVE ALARM CODE

 0068   REF  28  LAST 1374     10,3574  3 0133 0           CA      BUF2            2 CADR OF PRIOLARM USER
 0069   REF  10  LAST 1378     10,3575  55'363 1           TS      ALMCADR
 0070   REF  29  LAST 1379     10,3576  3 0134 1           CA      BUF2 +1
 0071   REF   1                10,3577  0 5600 1           TC      PRIOENT +1      * LEAVE L ALONE
 0072                          10,3600   77467 1  -2SEC    DEC     -200            *** DONT MOVE
 0073   REF   6  LAST  927     10,3601  3 4777 1           CAF     V05N09
 0074   REF   2  LAST  530     10,3602  1 2477 0           TCF     PRIODSPR

 0075                             5626                     BLOCK   02
 0076   REF   2  LAST 1378        4000                     SETLOC  FFTAG7
 0077                             5626                     BANK

 0078   REF   2 LAST 1378 TO 1379:      29     29*         COUNT*  $$/ALARM
 0079                             5626  0 0004 0  BAILOUT  INHINT
 0080   REF 372  LAST 1378        5627  3 0002 0           CA      Q
 0081   REF  11  LAST 1379        5630  55'363 1           TS      ALMCADR

 0082   REF 373  LAST 1379        5631  50 0002 0          INDEX   Q
 0083                             5632  3 0000 1           CAF     0
 0084   REF   1                   5633  0 5576 0           TC      BORTENT
 0085                             5634   40400 1  OCT40400 OCT     40400

 0086                             5635  0 0004 0           INHINT
 0087   REF  86  LAST 1366        5636  3 4743 0  WHIMPER  CA      TWO
 0088   REF  24  LAST 1291        5637  6 0005 1           AD      Z
 0089    REF   2  LAST  833       5640  54 017 0             TS      BRUPT
 0090                             5641  5 0C17 1             RESUME
 0091    REF  62  LAST 1351       5642  0 4626 1             TC      POSTJUMP        RESUME SENDS CONTROL HERE
 C092    REF   2  LAST  834       5643   12767 1             CADR    ENFMA
 0093                             5644  0 0004 0  POODOO     INHINT
 0094    REF 374  LAST 1379       5645  3 0002 0             CA      Q
 0095    REF  12  LAST 1379       5646  55'363 1  ABORT2     TS      ALMCADR
 0096    REF 375  LAST 1380       5647  50 002 0             INDEX   Q
 0097                             5650  3 0000 1             CAF     0
 0098    RFF   2  LAST 1379       5651  0 5576 0             TC      BORTENT
 0099                             5652   77770 1  OCT77770   OCT     77770           DON'T MOVE

 00995 *RFF   19  LAST 1377       5653  11'043 0             CCS     EXTVBACT        DO BAILOUT NOT POODOO IF EXT. V8. ACTIVE
 00996 *REF    2  LAST  869       5654  1 5635 0             TCF     WHIMPER -1

 0100    REE   3  LAST 1094       5655  3 4756 1             CAF     OCT35           4.35SPCT FOR GOPOODOO
 0101    REF 270  LAST 1379       5656  54 001 1             TS      L
 0102                             5657  4 C000 0             COM
 0103    RFF   9  LAST  869       5660  52 760 1             DXCH    -PHASE4
 0104                             5661  0 0004 0  GOPOODOO   INHINT
 01042   REE 298  LAST 1332       5662  0 4607 1             TC      BANKCALL        RESET STATEFLG, REINTFLG, AND NODOFLAG.
A01043                                                                                 ALSO PNOVZFLG, P25FLAG AND TRACKFLG
 01044   REF   1                  5663   43007 1             CADR    FLAGS
 0105    REF  32  LAST 1337       5664  3 0103 0             CA      FLAGWRD7        IS SERVICER CURRENTLY IN OPERATION?
 0106    REF   4  LAST  296       5665  7 4737 1             MASK    V37FLBIT
 0107    REF 449  LAST 1379       5666  10 C00 0             CCS     A
 0108    REF   1                  5667  1 5675 1             TCF     STRTIDLE
 0109    REF 299  LAST 1380       5670  0 4607 1             TC      BANKCALL        TERMINATE GRPS 1, 3, 5, AND 6
 0110    RFF   2  LAST  241       5671   12654 0             CADR    V37KLEAN
 01102   REF 3CC  LAST 1380       5672  0 4607 1             TC      BANKCALL        TERMINATE GRPS 2, 4, 1, 3, 5, AND 6
 01104   RFF   2  LAST  223       5673   12645 0             CADR    MR.KLEAN              (I.E., GRP 4 LAST)
 0111    REE   3  LAST 1380       5674  1 5636 0             TCF     WHIMPER
 0112    REF   1                  5675  3 5737 1  STRTIDLE   CAF     BBSERVDL
 01122   REF   3  LAST 1362       5676  0 4720 0             TC      SUPERSW
 01124   REF 301  LAST 1380       5677  0 4607 1             TC      BANKCALL        PUT SERVICER INTO ITS "GROUND" STATE
 01125   REF   1                  5700   57324 0             CADR    SERVIDLE        AND PROCEED TO GOTOPOOH.
 0114                             5701  0 C004 0  CCSHOLE    INHINT
 0115    REF 376  LAST 1380       5702  3 0002 0             CA      Q
 0116    REF   1                  5703  0 5646 0             TC      ABORT2
 0117                             5704   21103 0  OCT21103   OCT     21103
 0118                             5705  0 0004 0  CURTAINS   INHINT
 0119    REF 377  LAST 1380       5706  3 0002 0             CA      Q
 0120    REF   2  LAST 1283       5707  0 5573 0             TC      ALARM2
 0121                             5710   00217 0  OCT217     OCT     00217
 0122    REF  13  LAST 1380       5711  0 1363 0             TC      ALMCADR         RETURN TO USER

 0123                             5712  0 0004 0  BAILOUT1   INHINT
 0124    REF  14  LAST 1380       5713  53'364 0             DXCH    ALMCADR
 0125    PFF   1                  5714  3 5736 0             CAF     ADR40400
 0126    REF  66  LAST 1379       5715  54 061 1  BOTHABRT   TS      ITEMP1
```

```
L       ALARM AND ABORT                                                                          USER'S PAGE NO.   4      EO S3

 0127   REF 378  LAST 1380       5716  50 002 0              INDEX  Q
 0128                            5717  3 0000 1              CAF    0
 0129   REF 271  LAST 1380       5720  54 001 1              TS     L
 0130   REF   1                  5721  1 5605 0              TCF    CHKFAIL1
 0131                            5722  0 0004 0   POODOO1    INHINT
 0132   REF  15  LAST 1380       5723  53'364 0              DXCH   ALMCADR
 0133   REF   1                  5724  3 5735 0              CAF    ADR77770
 0134   REF   1                  5725  1 5715 0              TCF    BOTHABRT

 0135                            5726  0 0004 0   ALARM1     INHINT
 0136   REF  16  LAST 1381       5727  53'364 0              DXCH   ALMCADR
 0137                            5730  0 0004 0   ALMNCADR   INHINT
 0138   REF 379  LAST 1381       5731  50 002 0              INDEX  Q
 0139                            5732  3 0000 1              CA     0
 0140   REF 272  LAST 1381       5733  54 001 1              TS     L
 0141   REF   1                  5734  1 5603 0              TCF    LARMENT

 0142   REF   5  LAST 1371       5735  1 5652 1   ADR77770   TCF    OCT77770
 0143   REF   3  LAST 1378       5736  1 5634 1   ADR40400   TCF    OCT40400
 0144   REF 149  LAST 1377       5146             DOALARM    EQUALS ENDOFJOB
 01444  REF  52  LAST  894    E7,1515                        EBANK= DVCNTR
 01445  REF   2  LAST 1380       5737   56067 0   BBSERVDL   BBCON  SERVIDLE
R0145   CALLING SEQUENCE FOR VARALARM

A0146                                                        CAF    (ALARM)
A0147                                                        TC     VARALARM

R0148   VARALARM TURNS ON PROGRAM ALARM LIGHT BUT DOES NOT DISPLAY
 0149                            5740  0 0004 0   VARALARM   INHINT

 0150   REF 273  LAST 1381       5741  54 001 1              TS     L                   SAVE USERS ALARM CODE

 0151   REF 380  LAST 1381       5742  3 0002 0              CA     Q                   SAVE USERS Q
 0152   REF  17  LAST 1381       5743  55'363 1              TS     ALMCADR

 0153   REF   2  LAST 1379       5744  0 5577 1              TC     PRIOENT
 0154                            5745   00014 1   OCT14      OCT    14                  DONT MOVE

 0155   REF  18  LAST 1381       5746  0 1363 0              TC     ALMCADR             RETURN TO USER

 0156   REF   4  LAST 1380       5636             ABORT      EQUALS WHIMPER
 0158   REF   1               21,2000                        SETLOC ABTFLGS
 0159                         21,3007                        BANK
 0160   REF   1                                              COUNT* $$/ALARM

 0161   REF   1               21,3007  4 4740 1   FLAGS      CS     STATEBIT
 0162   REF  16  LAST 1336    21,3010  7 0077 0              MASK   FLAGWRD3
 0163   REF  17  LAST 1381    21,3011  54 077 0              TS     FLAGWRD3
 0164   REF   3  LAST 1217    21,3012  4 4736 0              CS     REINTBIT
 0165   REF  23  LAST  866    21,3013  7 0106 1              MASK   FLGWRD10
 0166    REF  24  LAST 1381    21,3014  54 106 1             TS       FLGWRD10
 0167    REF   3  LAST  241    21,3015  4 4744 0             CS       NODOBIT
 0168    REF  25  LAST 1312    21,3016  7 0076 1             MASK     FLAGWRD2
 0169    REF  26  LAST 1382    21,3017  54 076 1             TS       FLAGWRD2
 01691   REF   4  LAST  300    21,3020  4 6017 0             CS       BITS9+7
 01692   REF   7  LAST 1332       0010            FLAGREF1 EQUALS RNDVZFLG
 01693   REF   3  LAST  731       0006            FLAGREF2 EQUALS P25FLAG
 01694   REF  34  LAST 1373    21,3021  7 0074 0             MASK     FLAGWRD0
 01695   REF  35  LAST 1382    21,3022  54 074 0             TS       FLAGWRD0
 01696   REF   6  LAST  711    21,3023  4 0031 1             CS       TRACKFLG
 01697   REF  37  LAST 1312    21,3024  7 0075 1             MASK     FLAGWRD1
 01698   REF  38  LAST 1382    21,3025  54 075 1             TS       FLAGWRD1
 0170    REF 381  LAST 1381    21,3026  0 0002 0             TC       Q
```

```
R0001   PROGRAM NAME:     P27
R0002   WRITTEN BY:       KILROY/ DE WOLF

R0003   MOD NO:           6
R0004   MOD BY:           KILROY
R0005   DATE:             01DEC67

R0006   LOG SECTION:      UPDATE PROGRAM.

R0007   FUNCT. DESCR:     P27 (THE UPDATE PROGRAM) PROCESSES COMMANDS AND DATA
R0008                          INSERTIONS REQUESTED BY THE GROUND VIA UPLINK.
R0009                          THE P27 PROGRAM WILL ACCEPT UPDATES
R0010                          ONLY DURING P00 FOR THE LM, AND ONLY DURING P00,
R0011                     P02, AND FRESH START FOR THE CSM

R0012   CALLING SEQ:      PROGRAM IS INITIATED BY UPLINK ENTRY OF VERBS 70, 71, 72 AND 73.

R0014   SUBROUTINES:      TESTXACT, NEWMODEX, NEWMODEX +3, GOXDSPF, BANKCALL, FINDVAC, INTPRET, INTSTALL, TPAGREE,
R0016                     INTWAKEU, ENDEXT, POSTJUMP, FALTON, NEWPHASE, PHASCHNG

R0017   NORMAL EXIT:      TC ENDEXT

R0018   ALARM/ABORT:      TC FALTON FOLLOWED BY TC ENDEXT

R0019   RESTARTS:         P27 IS RESTART PROTECTED IN TWO WAYS...
R0020                     1. PRIOR TO VERIFLAG INVERSION(WHICH IS CAUSED BY THE GROUND/ASTRONAUT'S VERIFICATION OF UPDATE
R0022                        DATA BY SENDING A V33E WHEN V21N02 IS FLASHING)---
R0023                        NO PROTECTION EXCEPT PRE-P27 MODE IS RESTORED, COAST + ALIGN DOWNLIST IS SELECTED AND UPLINK
R0025                        ACTIVITY LIGHT IS TURNED OFF.(JUST AS IF A V34E WAS SENT DURING P27 DATA LOADS).
R0027                        V70,V71,V72 OR V73 WILL HAVE TO BE COMPLETELY RESENT BY USER.
R0029                     2. AFTER VERIFLAG INVERSION(WHEN UPDATE OF THE SPECIFIED ERASABLES IS BEING PERFORMED)---
R0031                        PROTECTED AGAINST RESTARTS.

R0032   DEBRIS:           UPBUFF   (20D)  TEMP STORAGE FOR ADDRESSES AND CONTENTS.
R0033                     UPVERB   (1)    VERB NUMBER MINUS 70D (E.G. FOR V72, UPVERB = 72D - 70D = 2)
R0035                     UPOLDMOD (1)    OLD MAJOR MODE INTERRUPTED BY P27.
R0036                     COMPNUMB (1)    TOTAL NUMBER OF COMPONENTS TO BE TRANSMITTED.
R0038                     UPCOUNT  (1)    ACTUAL NUMBER OF COMPONENTS RECEIVED.
R0039                     UPTEMP   (1)    SCRATCH, BUT USUALLY CONTAINS COMPONENT NUMBER TO BE CHANGED DURING VERIFY CYCLE


R0041   INPUT:

R0042    ENTRY:             DESCRIPTION

R0043    V70EXXXXXEXXXXXE (LIFTOFF TIME INCREMENT) DOUBLE PRECISION OCTAL TIME INCREMENT, XXXXX XXXXX,
R0045                       IS ADDED TO TEPHEM, SUBTRACTED FROM AGC CLOCK(TIME2,TIME1), SUBTRACTED FROM CSM STATE
R0047                       VECTOR TIME(TETCSM) AND SUBTRACTED FROM LEM STATE VECTOR TIME(TETLEM).
R0049                       THE DP OCTAL TIME INCREMENT IS SCALED AT 2(28).
```

```
R0050    V71EIIEAAAAE      (CONTIGUOUS BLOCK UPDATE) II-2 OCTAL COMPONENTS,XXXXX,
R0051     XXXXXE           ARE LOADED INTO ERASABLE STARTING AT ECADR, AAAA.
R0052    XXXXXE            IT IS .GE. 3 .AND. .LE. 20D.,
R0053                      AND (AAAA + II - 3) DOES NOT PRODUCE AN ADDRESS IN THE
R0054    9 NEXT BANK
R0055      .               SCALING IS SAME AS INTERNAL REGISTERS.

R0056     V72EIIE          (SCATTER UPDATE) (II-1)/2 OCTAL COMPONENTS,XXXXX, ARE
R0057     AAAAEXXXXXE      LOADED INTO ERASABLE LOCATIONS, AAAA.
R0058     AAAAEXXXXXE      II IS .GE. 3 .AND. .LE. 19D, AND MUST BE ODD.
R0060       .              SCALING IS SAME AS INTERNAL REGISTERS.

R0061     V73EXXXXXEXXXXXE (OCTAL CLOCK INCREMENT) DOUBLE PRECISION OCTAL TIME
R0062                      INCREMENT XXXXX XXXXX, IS ADDED TO THE AGC CLOCK, IN
R0063                      CENTISECONDS SCALED AT (2)28.
R0064                      THIS LOAD IS THE OCTAL EQUIVALENT OF V55.


R0065    OUTPUT:         IN ADDITION TO THE ABOVE REGISTER LOADS, ALL UPDATES
R0066                    COMPLEMENT BIT3 OF FLAGWORD7.


R0067    ADDITIONAL NOTES: VERB 71, JUST DEFINED ABOVE WILL BE USED TO PERFORM BUT NOT LIMITED TO THE FOLLOWING UPDATES--

R0069                    1. CSM/LM STATE VECTOR UPDATE
R0072                    2. REFSMMAT UPDATE


R0073              THE FOLLOWING COMMENTS DELINEATE EACH SPECIAL UPDATE----

R0074    1. CSM/LM STATE VECTOR UPDATE(ALL DATA ENTRIES IN OCTAL)

R0075    ENTRIES:        DATA DEFINITION:                                          SCALE FACTORS:
R0077    V71E            CONTIGUOUS BLOCK UPDATE VERB
R0078       21E          NUMBER OF COMPONENTS FOR STATE VECTOR UPDATE
R0080     AAAAE          ECADR OF 'UPSVFLAG'
R0082    XXXXXE          STATE VECTOR IDENTIFIER: 00001 FOR CSM, 77776 FOR LEM - EARTH SPHERE OF INFLUENCE SCALING
R0083                                             00002 FOR CSM, 77775 FOR LEM - LUNAR SPHERE OF INFLUENCE SCALING
R0084    XXXXXEXXXXXE    X POSITION
R0086    XXXXXEXXXXXE    Y POSITION
R0088    XXXXXEXXXXXE    Z POSITION
R0090    XXXXXEXXXXXE    X VELOCITY
R0092    XXXXXEXXXXXE    Y VELOCITY
R0094    XXXXXEXXXXXE    Z VELOCITY
R0096    XXXXXEXXXXXE    TIME FROM AGC CLOCK ZERO
R0098    V33E            VERB 33 TO SIGNAL THAT THE STATE VECTOR IS READY TO BE STORED.


R0144    2. REFSMMAT(ALL DATA ENTRIES IN OCTAL)
R0145    ENTRIES:        DATA DEFINITIONS:                                         SCALE FACTORS:
```

```
R0147   V71E              CONTIGUOUS BLOCK UPDATE VERB
R0148      24E            NUMBER OF COMPONENTS FOR REFSMMAT UPDATE
R0150    AAAAE            ECADR OF 'REFSMMAT'
R0152   XXXXXEXXXXXE      ROW 1 COLUMN 1                                       2(-1)
R0154   XXXXXEXXXXXE      ROW 1 COLUMN 2                                       2(-1)
R0156   XXXXXEXXXXXE      ROW 1 COLUMN 3                                       2(-1)
R0158   XXXXXEXXXXXE      ROW 2 COLUMN 1                                       2(-1)
R0160   XXXXXEXXXXXE      ROW 2 COLUMN 2                                       2(-1)
R0162   XXXXXEXXXXXE      ROW 2 COLUMN 3                                       2(-1)
R0164   XXXXXEXXXXXE      ROW 3 COLUMN 1                                       2(-1)
R0166   XXXXXEXXXXXE      ROW 3 COLUMN 2                                       2(-1)
R0168   XXXXXEXXXXXE      ROW 3 COLUMN 3                                       2(-1)
R0170   V33E              VERB 33 TO SIGNAL THAT REFSMMAT IS READY TO BE STORED.


 0171                       07,3767                        BANK    07
 0172   REF    7  LAST  309 43,2000                        SETLOC  EXTVERBS
 0173                       43,3727                        BANK

 0174   REF    5  LAST 1222 E3,1706                        EBANK=  TEPHEM

 0175   REF    1                                           COUNT*  $$/P27
 0176   REF    1            43,3727  3 4746 0  V70UPDAT CAF     UP70            COMES HERE ON V70E
 0177   REF    2  LAST  275 43,3730  1 3736 1           TCF     V73UPDAT +1


 0178   REF    1            43,3731  3 4744 1  V71UPDAT CAF     UP71            COMES HERE ON V71E
 0179   REF    3  LAST 1385 43,3732  1 3736 1           TCF     V73UPDAT +1


 0180   REF    1            43,3733  3 4743 0  V72UPDAT CAF     UP72            COMES HERE ON V72E
 0181   REF    4  LAST 1385 43,3734  1 3736 1           TCF     V73UPDAT +1


 0182   REF    1            43,3735  3 6266 0  V73UPDAT CAF     UP73            COMES HERE ON V73E

 0183   REF    1            43,3736  55'165 0    +1     TS      UPVERBSV        SAVE UPVERB UNTIL IT'S OK TO ENTER P27

 0184   REF   19  LAST  311 43,3737  0 2076 1           TC      TESTXACT        GRAB DISPLAY IF AVAILABLE, OTHERWISE
A0185                                                                           TURN*OPERATOR ERROR* ON AND TERMINATEJOB

 0197   REF   63  LAST 1380 43,3740  0 4626 1           TC      POSTJUMP        LEAVE EXTENDED VERB BANK AND
 0198   REF    1            43,3741   11372 1           CADR    UPPART2         GO TO UPDATE PROGRAM(P27) BANK.


 0211   REF 267  LAST 1374     4746            UP70     EQUALS ZERO
 0212   REF 132  LAST 1372     4744            UP71     EQUALS ONE
 0213   REF  87  LAST 1379     4743            UP72     EQUALS TWO
 0214   REF  42  LAST 1369     6266            UP73     EQUALS THREE
 0215                         04,3372                          BANK    04
 0216    REF   2  LAST 1222   04,2000                          SETLOC  UPDATF2
 0217                         04,3372                          BANK

 0218    REF   1                                               COUNT*  $$/P27

 0219                         04,3372               UPPART2    EQUALS                      UPDATE PROGRAM - PART 2

 0220    REF  23  LAST 1291   04,3372   3 1010 1               CA      MODREG              IS UPDATE ALLOWED AT THIS TIME?
 0221                         04,3373   0 0006 1               EXTEND                      IS MODREG +0 (POOH) OR -0 (FRESH START)?
 0222    REF   1              04,3374   1 3376 1               BZF     UPDATOK

 0223    REF   1              04,3375   0 3764 1    UPERROR    TC      UPERROUT +2         TURN ON OPERATOR ERROR LIGHT AND EXIT

 0224    REF   4  LAST  217   04,3376   55'170 1    UPDATOK    TS      UPDLDMOD

 0225    REF   2  LAST 1385   04,3377   31'165 1               CAE     UPVERBSV            SET UPVERB TO TELL P27 WHICH EXTENDED
 0226    REF   4  LAST  217   04,3400   55'171 0               TS      UPVERB                VERB CALLED IT

 0227    REF 133  LAST 1385   04,3401   3 4744 1               CAF     ONE
 0228    REF   4  LAST  217   04,3402   55'172 0               TS      UPCOUNT

 0229    REF 117  LAST 1332   04,3403   0 5355 1               TC      PHASCHNG            SET RESTART GROUP 6 TO RESTORE OLD MODE
 0230                         04,3404    07026 1               OCT     07026               AND DOWNLIST AND EXIT IF RESTART OCCURS.
 0231                         04,3405    30000 1               OCT     30000               PRIORITY SAME AS CHRPRIO
 0232    REF   6  LAST  217     1173                           EBANK=  UPBUFF
 0233    REF   2  LAST 1223   04,3406    03714 0               2CADR   UPOUT +1
 0233                         04,3407    10102 0

 0234    REF 134  LAST 1386   04,3410   3 4744 1               CAF     ONE
 0235    REF  10  LAST  990   04,3411   54 333 0               TS      DNLSTCOD            DOWNLIST

 0236    REF   4  LAST  799   04,3412   0 5313 0               TC      NEWMODEX            SET MAJOR MODE = 27
 0237                         04,3413    00033 1               DEC     27

 0238    REF   5  LAST 1386   04,3414   51'171 1               INDEX   UPVERB              BRANCH DEPENDING ON WHETHER THE UPDATE
 0239                         04,3415   1 3416 0               TCF     +1                  VERB REQUIRES A FIXED OR VARIABLE NUMBER
 0240                         04,3416   1 3421 1               TCF     +3                  V70 FIXED.                  (OF COMPONENTS.
 0241    REF   1              04,3417   1 3424 1               TCF     OHWELL1             V71 VARIABLE - GO GET NO. OF COMPONENTS
 0242    REF   2  LAST 1386   04,3420   1 3424 1               TCF     OHWELL1             V72 VARIABLE - GO GET NO. OF COMPONENTS
 0243    REF  88  LAST 1385   04,3421   3 4743 0               CA      TWO                 V73 (AND V70) FIXED
 0244    REF   4  LAST  216   04,3422   55'167 1               TS      COMPNUMB            SET NUMBER OF COMPONENTS TO 2.
 0245    REF   1              04,3423   1 3447 1               TCF     OHWELL2             GO GET THE TWO UPDATE COMPONENTS

 0246    REF   1              04,3424   3 3517 1    OHWELL1    CAF     ADUPBUFF            * REQUEST USER TO SEND NUMBER  *
 0247    REF 827  LAST 1370   04,3425   54 156 1               TS      MPAC +2             * OF COMPONENTS PARAMETER(II). *
 0248    REF   1              04,3426   3 3520 0      +2       CAF     UPLOADNV            (CK4V32 RETURNS HERE IF V32 ENCOUNTERED)
 0249    REF 302  LAST 1380   04,3427   0 4607 1               TC      BANKCALL            DISPLAY A FLASHING V21N01
 0250    REF  11  LAST  720   04,3430    20323 1               CADR    GOXDSPF             TO REQUEST II.
 0251    REF   1              04,3431   1 3714 1               TCF     UPOUT4              V34 TERMINATE UPDATE(P27) RETURN
```

```
L        UPDATE PROGRAM                                                                            USER'S PAGE NO.   5      E3 S4

 0252   REF   3  LAST 1386   04,3432  1 3426 0              TCF     OHWELL1 +2
 0253   REF   1              04,3433  0 3510 0              TC      CK4V32          DATA OR V32 RETURN
 0254   REF  50  LAST 1321   04,3434  4 4743 1              CS      BIT2
 0255   REF   7  LAST 1386   04,3435  6 1173 0              AD      UPBUFF          IS II(NUMBER OF COMPONENTS PARAMETER)
 0256                        04,3436  0 0006 1              EXTEND                  .GE. 3 AND .LE. 20D.
 0257   REF   4  LAST 1387   04,3437  6 3426 1              BZMF    OHWELL1 +2
 0258   REF   8  LAST 1387   04,3440  4 1173 1              CS      UPBUFF
 0259   REF   1              04,3441  6 4353 0              AD      UP21
 0260                        04,3442  0 0006 1              EXTEND
 0261   REF   5  LAST 1387   04,3443  6 3426 1              BZMF    OHWELL1 +2
 0262   REF   9  LAST 1387   04,3444  31'173 0              CAE     UPBUFF
 0263   REF   5  LAST 1386   04,3445  55'167 1              TS      COMPNUMB        SAVE II IN COMPNUMB

R0264            UPBUFF LOADING SEQUENCE

 0265   REF   5  LAST 1386   04,3446  25'172 1              INCR    UPCOUNT         INCREMENT COUNT OF COMPONENTS RECEIVED.
 0266   REF   1              04,3447  3 3664 0  OHWELL2     CAF     ADUPBFM1        CALCULATE LOCATION(ECADR) IN UPBUFF
 0267   REF   6  LAST 1387   04,3450  6 1172 1              AD      UPCOUNT         WHERE NEXT COMPONENT SHOULD BE STORED.
 0268   REF 828  LAST 1386   04,3451  54 156 1    +2        TS      MPAC +2         PLACE ECADR INTO R3.
 0269   REF   2  LAST 1386   04,3452  3 3520 0    +3        CAF     UPLOADNV        (CK4V32 RETURNS HERE IF V32 ENCOUNTERED)
 0270   REF 303  LAST 1386   04,3453  0 4607 1              TC      BANKCALL        DISPLAY A FLASHING V21N01
 0271   REF  12  LAST 1386   04,3454   20323 1              CADR    GOXDSPF         TO REQUEST DATA.
 0272   REF   2  LAST 1386   04,3455  1 3714 1              TCF     UPOUT4          V34 TERMINATE UPDATE(P27) RETURN.
 0273   REF   2  LAST 1386   04,3456  1 3452 0              TCF     OHWELL2 +3      V33 PROCEED RETURN
 0274   REF   2  LAST 1387   04,3457  0 3510 0              TC      CK4V32          DATA OR V32 RETURN
 0275   REF   7  LAST 1387   04,3460  4 1172 0              CS      UPCOUNT         HAVE WE FINISHED RECEIVING ALL
 0276   REF   6  LAST 1387   04,3461  6 1167 0              AD      COMPNUMB        THE DATA WE EXPECTED.
 0277                        04,3462  0 0006 1              EXTEND
 0278   REF   1              04,3463  6 3465 0              BZMF    UPVERIFY        YES- GO TO VERIFICATION SEQUENCE
 0279   REF   3  LAST 1387   04,3464  1 3446 0              TCF     OHWELL2 -1      NO- REQUEST ADDITIONAL DATA.

R0280            VERIFY SEQUENCE

 0281   REF   1              04,3465  3 3516 0  UPVERIFY    CAF     ADUPTEMP        PLACE ECADR WHERE COMPONENT NO. INDEX
 0282   REF 829  LAST 1387   04,3466  54 156 1              TS      MPAC +2         IS TO BE STORED INTO R3.
 0283   REF   1              04,3467  3 3521 1              CAF     UPVRFYNV        (CK4V32 RETURNS HERE IF V32 ENCOUNTERED)
 0284   REF 304  LAST 1387   04,3470  0 4607 1              TC      BANKCALL        DISPLAY A FLASHING V21N02 TO REQUEST
 0285   REF  13  LAST 1387   04,3471   20323 1              CADR    GOXDSPF         DATA CORRECTION OR VERIFICATION.
 0286   REF   3  LAST 1387   04,3472  1 3714 1              TCF     UPOUT4          V34 TERMINATE UPDATE(P27) RETURN
 0287   REF   1              04,3473  1 3522 0              TCF     UPSTORE         V33 DATA SENT IS GOOD. GO STORE IT.
 0288   REF   3  LAST 1387   04,3474  0 3510 0              TC      CK4V32          COMPONENT NO. INDEX OR V32 RETURN
 0289   REF   3  LAST  108   04,3475  3 1166 1              CA      UPTEMP          DOES THE COMPONENT NO. INDEX JUST SENT
 0290                        04,3476  0 0006 1              EXTEND                  SPECIFY A LEGAL COMPONENT NUMBER?
 0291   REF   2  LAST 1387   04,3477  6 3465 0              BZMF    UPVERIFY        NO, IT IS NOT POSITIVE NONZERO
 0292   REF   4  LAST 1387   04,3500  4 1166 0              CS      UPTEMP
 0293   REF   7  LAST 1387   04,3501  6 1167 0              AD      COMPNUMB
 0294   REF  59  LAST 1324   04,3502  6 4744 1              AD      BIT1
 0295                        04,3503  0 0006 1              EXTEND
 0296   REF   3  LAST 1387   04,3504  6 3465 0            BZMF     UPVERIFY         NO
 0297   REF   2  LAST 1387   04,3505  3 3664 0            CAF      ADUPBFM1         YES- BASED ON THE COMPONENT NO. INDEX
 0298   REF   5  LAST 1387   04,3506  6 1166 1            AD       UPTEMP           CALCULATE THE ECADR OF LOCATION IN
 0299   REF   4  LAST 1387   04,3507  1 3451 0            TCF      OHWELL2 +2       UPBUFF WHICH USER WANTS TO CHANGE.

 0300   REF   3  LAST 1386   04,3714           UPOUT4     EQUALS   UPOUT +1         COMES HERE ON V34 TO TERMINATE UPDATE


R0301                CHECK FOR VERB 32 SEQUENCE

 0302   REF 830  LAST 1387   04,3510  4 0154 0 CK4V32     CS       MPAC             ON DATA RETURN FROM 'GOXDSPF'
 0303   REF  57  LAST 1363   04,3511  7 4737 1            MASK     BIT6             ON DATA RETURN FROM "GOXDSP"& THE CON-
 0304   REF 450  LAST 1380   04,3512  10 000 0            CCS      A                TENTS OF MPAC = VERB.  SO TEST FOR V32.
 0305   REF 382  LAST 1382   04,3513  0 0002 0            TC       Q                IT'S NOT A V32, IT'S DATA.  PROCEED.
 0306   REF 383  LAST 1388   04,3514  50 002 0            INDEX    Q
 0307                        04,3515  7'7771 0            TC       0 -6             V32 ENCOUNTERED - GO BACK AND GET DATA

 0308   REF   6  LAST 1388   04,3516   01166 1 ADUPTEMP   ADRES    UPTEMP           ADDRESS OF TEMP STORAGE FOR CORRECTIONS
 0309   REF  10  LAST 1387   04,3517   01173 0 ADUPBUFF   ADRES    UPBUFF           ADDRESS OF UPDATE DATA STORAGE BUFFER
 0310                        04,3520   05201 1 UPLOADNV   VN       2101             VERB 21 NOUN 01
 0311                        04,3521   05202 1 UPVRFYNV   VN       2102             VERB 21 NOUN 02
 0312   REF   4  LAST 1097      4353           UP21       =        MD1              DEC 21 = MAX NO OF COMPONENTS +1
 0313   REF  20  LAST 1353      4747           UPDTPHAS   EQUALS   FIVE

R0314                PRE-STORE AND FAN TO APPROPRIATE BRANCH SEQUENCE

 0315                        04,3522           UPSTORE    EQUALS                    GROUND HAS VERIFIED UPDATE. STORE DATA.

 0316                        04,3522  0 0004 0            INHINT

 0317   REF  33  LAST 1380   04,3523  30 103 0            CAE      FLAGWRD7         INVERT VERIFLAG(BIT3 OF FLAGWRD7) TO
 0318   REF 274  LAST 1381   04,3524  56 001 0            XCH      L                INDICATE TO THE GROUND(VIA DOWNLINK)
 0319   REF   1              04,3525  3 4742 1            CAF      VERIFBIT         THAT THE V33 (WHICH THE GROUND SENT TO
 0320                        04,3526  0 0006 1            EXTEND                    VERIFY THE UPDATE) HAS BEEN SUCCESSFULLY
 0321   REF  14  LAST 1372   04,3527  06 C01 0            RXOR     LCHAN            RECEIVED BY THE UPDATE PROGRAM
 0322   REF  34  LAST 1388   04,3530  54 103 1            TS       FLAGWRD7

 0326   REF 118  LAST 1386   04,3531  0 5355 1            TC       PHASCHNG         SET RESTART GROUP 6 TO REDO THE UPDATE
 0327                        04,3532   04026 1            OCT      04026            DATA STORE IF A RESTART OCCURS.
 0328                        04,3533  0 0004 0            INHINT                    (BECAUSE PHASCHNG DID A RELINT)

 0329   REF  89  LAST 1386   04,3534  4 4743 1            CS       TWO              GO TO UPENDVAC IF INSTALL IS REQUIRED,
 0330   REF   6  LAST 1386   04,3535  6 1171 1            AD       UPVERB           THAT IS, IF IT'S A V70 - V72.
 0331                        04,3536  0 0006 1            EXTEND                    GO TO UPEND73 IF IT'S A V73.
 0332   REF   1              04,3537  6 3546 0            BZMF     UPENDVAC

R0333                VERB 73 BRANCH

 0334                        04,3540  0 0006 1 UPEND73    EXTEND                    V73-PERFORM DP OCTAL AGC CLOCK INCREMENT
 0335   REF  11  LAST 1388   04,3541  3 1174 1            DCA      UPBUFF
 0336   REF  12  LAST 1388   04,3542  53'204 1            DXCH    UPBUFF +8D
 0337   REF   1              04,3543  0 3571 1            TC      TIMEDIDL
 0338   REF   8  LAST  837   04,3544  0 4355 0            TC      FALTON            ERROR- TURN ON *OPERATOR ERROR* LIGHT
 0339   REF   4  LAST 1388   04,3545  0 3714 0            TC      UPOUT +1          GO TO COMMON UPDATE PROGRAM EXIT

 0340   REF   7  LAST 1335   04,3546  3 4346 1  UPFINDVAC CAF     CHRPRIO           (USE EXTENDED VERB PRIORITY)
 0341   REF  43  LAST 1365   04,3547  0 5076 0            TC      FINDVAC           GET VAC AREA FOR 'CALL INTSTALL'
 0342   REF   6  LAST 1335   E3,1706                      EBANK=  TEPHEM
 0343   REF   1              04,3550   03553 1            2CADR   UPJOB             (NOTE: THIS WILL ALSO SET EBANK FOR
 0343   REF   1              04,3551   10103 1
 0344   REF 150  LAST 1381   04,3552  0 5146 1            TC      ENDOFJOB          'TEPHEM' UPDATE BY V70)

 0345   REF 237  LAST 1262   04,3553  0 6060 1  UPJOB     TC      INTPRET           THIS COULD BE A STATE VECTOR UPDATE--SO
 0346                        04,3554   77624 1            CALL                      WAIT(PUT JOB TO SLEEP) IF ORBIT INT(OI)
 0347   REF  38  LAST 1221   04,3555   27447 0                    INTSTALL          IS IN PROGRESS--OR--GRAB OI AND RETURN
A0348                                                                               TO UPWAKE IF OI IS NOT IN PROGRESS.

 0349                        04,3556   77776 1  UPWAKE    EXIT

 0350   REF 119  LAST 1388   04,3557  0 5355 1            TC      PHASCHNG          RESTART PROTECT(GROUP 6)
 0351                        04,3560   04026 1            OCT     04026

 0352   REF  78  LAST 1362   04,3561  0 5506 1            TC      UPFLAG            SET INTEGRATION RESTART BIT
 0353   REF   5  LAST 1240   04,3562   00236 0            ADRES   REINTELG
 0354                        04,3563  0 0004 0            INHINT
 0355                        04,3564            UPPART3   EQUALS

 0356   REF   7  LAST 1388   04,3564  51'171 1            INDEX   UPVERB            BRANCH TO THE APPROPRIATE UPDATE VERB
 0357                        04,3565  1 3566 0            TCF     +1                ROUTINE TO ACTUALLY PERFORM THE UPDATE
 0358   REF   1              04,3566  1 3725 0            TCF     UPEND70           V70
 0359   REF   1              04,3567  1 3634 1            TCF     UPEND71           V71
 0360   REF   1              04,3570  1 3666 0            TCF     UPEND72           V72


R0361                ROUTINE TO INCREMENT CLOCK(TIME2,TIME1) WITH CONTENTS OF DP WORD AT UPBUFF.

 0363                        04,3571  0 0006 1  TIMEDIDL  EXTEND
 0364   REF   7  LAST 1388   04,3572  23'166 1            QXCH    UPTEMP            SAVE Q FOR RETURN
 0365   REF 268  LAST 1385   04,3573  3 4746 0            CAF     ZERO              ZERO AND SAVE TIME2,TIME1
 0366                        04,3574  22 007 0            ZL
 0367   REF  36  LAST 1334   04,3575  52 025 1            DXCH    TIME2
 0368   REF  13  LAST 1389   04,3576  53'216 1            DXCH    UPBUFF +18D       STORE IN CASE OF OVERFLOW

 0369   REF   1              04,3577  3 4747 1            CAF     UPDTPHAS          DO
 0370   REF 275  LAST 1388   04,3600  54 001 1            TS      L                 A
 0371                        04,3601  4 0000 0            COM                       QUICK
 0372   REF   4  LAST  869   04,3602  52 764 0            DXCH    -PHASE6           PHASCHNG

 0373                        04,3603  0 0004 0  TIMEDIDR  INHINT
 0374   REF 269  LAST 1389   04,3604  3 4746 0           CAF     ZERO
 0375                        04,3605  22 007 0           ZL                        PICK UP INCREMENTER(AND ZERO
 0376   REF 831  LAST 1388   04,3606  54 156 1           TS      MPAC +2           IT IN CASE OF RESTARTS) AND
 0377   REF  14  LAST 1389   04,3607  53'204 1           DXCH    UP8UFF +8D        STORE IT
 0378   REF 832  LAST 1390   04,3610  52 155 1           DXCH    MPAC              INTO MPAC FOR TPAGREF.

 0379                        04,3611  0 0006 1           EXTEND
 0380   REF  15  LAST 1390   04,3612  3 1216 0           DCA     UPBUFF +18D
 0381   REE 833  LAST 1390   04,3613  20 155 1           DAS     MPAC              FORM SUM IN MPAC
 0382                        04,3614  0 0006 1           EXTEND
 0383   REF   1              04,3615  1 3624 0           8ZF     DELTATOK          TEST FOR OVERFLOW
 0384   REF 270  LAST 1390   04,3616  3 4746 0           CAF     ZERO
 0385   REF  16  LAST 1390   04,3617  53'216 1           DXCH    UPBUFF +18D       OVERFLOW, RESTORE OLD VALUE OF CLOCK
 0386   REF  37  LAST 1389   04,3620  20 025 1           DAS     TIME2             AND TURN ON OPERATOR ERROR

 0387   REF 120  LAST 1389   04,3621  0 5355 1           TC      PHASCHNG          RESTART PROTECT(GROUP 6)
 0388                        04,3622   04026 1           OCT     04026

 0389   REF'  8  LAST 1389   04,3623  0 1166 1           TC      UPTEMP            GO TO ERROR EXIT

 0390   REF  18  LAST 1334   04,3624  0 7300 0  DELTATOK TC      TPAGREE           FORCE SIGN AGREEMENT
 0391   REF 834  LAST 1390   04,3625  52 155 1           DXCH    MPAC
 0392   REF  38  LAST 1390   04,3626  20 025 1           DAS     TIME2             INCREMENT TIME2,TIME1

 0393   REF 121  LAST 1390   04,3627  0 5355 1           TC      PHASCHNG          RESTART PROTECT(GROUP 6)
 0394                        04,3630   04026 1           OCT     04026

 0395                        04,3631  0 0004 0           INHINT
 0396   REF   9  LAST 1390   04,3632  51'166 1           INDEX   UPTEMP            (CODED THIS WAY FOR RESTART PROTECTION)
 0397                        04,3633  0 0001 0           TC      1                 NORMAL RETURN
R0398            VFR8 71 BRANCH

 0399   REF  17  LAST 1390   04,3634  31'174 1  UPEND71  CAF     UPBUFF +1         SET EBANK
 0400   REF  87  LAST 1362   04,3635  54 003 0           TS      E8ANK               AND
 0401   REF  20  LAST 1322   04,3636  7 4350 1           MASK    LOW8              CALCULATE
 0402   REF  10  LAST 1390   04,3637  55'166 0           TS      UPTEMP            S-REG VALUE OF RECEIVING AREA

 0403   REF   6  LAST 1321   04,3640  6 7766 1           AD      NEG3              IN THE PROCESS OF
 0404   REF   8  LAST 1387   04,3641  6 1167 0           AD      COMPNUM8          PERFORMING
 0405                        04,3642  0 0006 1           EXTEND                    THIS UPDATE
 0406   REF   1              04,3643  1 3651 1           BZF     STORLP71          WILL WE
 0407   REF  32  LAST 1329   04,3644  7 4734 1           MASK    BIT9              OVERFLOW
 0408   REF 451  LAST 1388   04,3645  10 000 0           CCS     A                 INTO THE NEXT EBANK....
 0409   REF   2  LAST 1386   04,3646  1 3762 0           TCF     UPERROUT          YES

 0410   REF   7  LAST 1390   04,3647  3 7766 1           CA      NEG3              NO- CALCULATE NUMBER OF
 0411   REF   9  LAST 1390   04,3650  6 1167 0           AD      COMPNUMB          WORDS TO BE STORED MINUS ONE
 0412   REF 835  LAST 1390   04,3651  54 154 0  STORLP71 TS      MPAC              SAVE NO. OF WORDS REMAINING MINUS ONE
 0413   REF 452  LAST 1390   04,3652  50 000 1           INDEX   A                 TAKE NEXT UPDATE WORD FROM
 0414   REF  18  LAST 1390   04,3653  3 1175 0           CA      UP8UFF +2         UPBUFF AND
 0415   REF 276  LAST 1389   04,3654  54 001 1            TS      L                 SAVE IT IN L
 0416   REF 836  LAST 1390   04,3655  3 0154 1            CA      MRAC              CALCULATE NEXT
 0417   REF  11  LAST 1390   04,3656  6 1166 1            AD      UPTEMP            RECEIVING ADDRESS
 0418   REF 453  LAST 1390   04,3657  50 000 1            INDEX   A
 0419                        E3,1400                      EBANK=  1400
 0420                        04,3660  23'400 1            LXCH    1400              UPDATE THE REGISTER  BY CONTENTS OF L
 0421   REF   7  LAST 1389   E3,1706                      EBANK=  TEPHEM
 0422   REF 837  LAST 1391   04,3661  10 154 0            CCS     MPAC              ARE THERE ANY WORDS LEFT TO BE STORED
 0423   REF   2  LAST 1390   04,3662  1 3651 1            TCF     STORLP71          YES
 0424   REF   5  LAST 1389   04,3663  1 3713 0            TCF     UPOUT             NO- THEN EXIT UPDATE PROGRAM
 0425   REF  19  LAST 1390   04,3664   01172 1  ADUPBEM1  ADRES   UPBUFF -1         SAME AS ADUPBUFF BUT LESS 1 (DON'T MOVE)
 0426   REF   6  LAST 1391   04,3665  1 3713 0            TCF     UPOUT             NO- EXIT UPDATE(HERE WHEN COMPNUMB = 3)

R0427                 VERB 72 BRANCH

 0428   REF  60  LAST 1387   04,3666  3 4744 1  UPEND72   CAF     BIT1              HAVE AN ODD NO. OF COMPONENTS
 0429   REF  10  LAST 1390   04,3667  7 1167 1            MASK    COMPNUMB          BEEN SENT FOR A V72 UPDATE...
 0430   REF 454  LAST 1391   04,3670  10 000 0            CCS     A
 0431   .                    04,3671  1 3673 1            TCF     +2                YES
 0432   REF   3  LAST 1390   04,3672  1 3762 0            TCF     UPERROUT          ERROR- SHOULD BE ODD NO. OF COMPONENTS
 0433   REF  51  LAST 1387   04,3673  4 4743 1            CS      BIT2
 0434   REF  11  LAST 1391   04,3674  6 1167 0            AD      COMPNUMB
 0435   REF 838  LAST 1391   04,3675  54 154 0  LDLOOP72  TS      MPAC              NOW PERFORM THE UPDATE
 0436   REF 455  LAST 1391   04,3676  50 000 1            INDEX   A
 0437   REF  20  LAST 1391   04,3677  31'174 1            CAE     UPBUFF +1         PICK UP NEXT UPDATE WORD
 0438   REF 456  LAST 1391   04,3700  22 000 1            LXCH    A
 0439   REF 839  LAST 1391   04,3701  10 154 0            CCS     MPAC              SET POINTER TO ECADR(MUST BE CCS)
 0440   REF 840  LAST 1391   04,3702  54 154 0            TS      MPAC
 0441   REF 457  LAST 1391   04,3703  50 000 1            INDEX   A
 0442   REF  21  LAST 1391   04,3704  31'174 1            CAE     UPBUFF +1         PICK UP NEXT ECADR OF REG TO BE UPDATED
 0443   REF  88  LAST 1390   04,3705  54 003 0            TS      EBANK             SET EBANK
 0444   REF  21  LAST 1390   04,3706  7 4350 1            MASK    LOW8              ISOLATE RELATIVE ADDRESS
 0445   REF 458  LAST 1391   04,3707  50 000 1            INDEX   A
 0446                        E3,1400                      EBANK=  1400
 0447                        04,3710  23'400 1            LXCH    1400              UPDATE THE REGISTER BY CONTENTS OF L
 0448   REF   8  LAST 1391   E3,1706                      EBANK=  TEPHEM
 0449   REF 841  LAST 1391   04,3711  10 154 0            CCS     MPAC              ARE WE THROUGH THE V72 UPDATE...
 0450   REF   1              04,3712  1 3675 1            TCF     LDLOOP72          NO

R0451                 NORMAL FINISH OF P27

 0452                        04,3713            UPOUT     EQUALS
 0453   REF   1              04,3713  0 3172 0            TC      INTWAKEU          RELEASE  GRAB  OF ORBITAL INTEGRATION
 0454   REF   5  LAST 1386   04,3714  31'170 0   +1       CAE     UPOLDMOD          RESTORE PRIOR R27 MODE
 0455   REF   5  LAST 1386   04,3715  0 5316 0            TC      NEWMODEX +3
 0456   REF 271  LAST 1390   04,3716  3 4746 0            CAF     ZERO
 0457   REF  11  LAST 1386   04,3717  54 333 0            TS      DNLSTCOD
 0458   REF   1              04,3720  0 3767 1            TC      UPACTOFF          TURN OFF 'UPLINK ACTIVITY' LIGHT
```

```
L     UPCATE PROGRAM                                                                        USER'S PAGE NO.  10      E3 S4

 0459                         04,3721  C 0006 1            EXTEND                  KILL GROUP 6.
 0460   REF  27  LAST 1310    C4,3722  3 4746 0            DCA    NFGO
 0461   RFF   5  LAST 1389    04,3723  52 764 0            DXCH   -PHASE6

 0462   REF  42  LAST  721    04,3724  0 5474 0            TC     ENDEXT           FXTENDED VERB FXIT


R0463              VERB 70 BRANCH

 0464                         04,3725  0 CC06 1  UPFND70   EXTFND                  V70 DOES THE FOLLOWING WITH DP DELTA
 0465   RFF  22  LAST 1391    04,3726  4 1174 0            DCS    UPBUFF           TIME IN UPBUFF
 0466   REF  23  LAST 1392    C4,3727  53'204 1            DXCH   UPBUFF +8D
 0467   REF   2  LAST 1389    04,3730  0 3571 1            TC     TIMEDIDL         DECRFMENT AGC CLOCK

 0468   REF   4  LAST 1391    04,3731  0 3762 1            TC     UPERROUT         ERROR WHILE DFCREMENTING CLOCK -- FXIT

 0469   REF   9  LAST 1391    C3,1706                      EBANK= TEPHEM
 0470                         C4,3732  0 CC06 1            EXTEND
 0471   RFF  24  LAST 1392    04,3733  4 1174 0            DCS    UPBUFF           COPY DECREMENTERS FOR
 0472   REF  25  LAST 1392    04,3734  53'206 0            DXCH   UPBUFF +10D      RESTART PROTECTION
 0473                         04,3735  0 0006 1            EXTEND
 0474   REF  26  LAST 1392    04,3736  4 1174 0            DCS    UPBUFF
 0475   RFF  27  LAST 1392    04,3737  53'210 1            DXCH   UPBUFF +12D

 0476   RFF 122  LAST 1390    04,3740  0 5355 1            TC     PHASCHNG         RFSTART PROTFCT(GROUP 6)
 0477                         04,3741   04026 1            OCT    04026

 0478   PEF 272  LAST 1391    04,3742  3 4746 0            CAF    ZERO
 0479                         04,3743  22 007 0            ZL
 0480   REF  28  LAST 1392    04,3744  53'206 0            DXCH   UPBUFF +10D      DFCRFMFNT CSM STATE VFCTOR TIME
 0431   RFF   5  LAST  516    04,3745  21'571 1            DAS    TETCSM

 0482   REF 273  LAST 1392    04,3746  3 4746 0            CAF    ZFRO
 0483                         04,3747  22 007 0            ZL
 0484   REF  29  LAST 1392    04,3750  53'210 1            DXCH   UPBUFF +12D      DECREMENT LFM STATF VECTOR TIME
 0485   RFF   4  LAST  628    C4,3751  21'643 0            DAS    TETLEM

 0486   REF 274  LAST 1392    04,3752  3 4746 0            CAF    ZFRO
 0487                         04,3753  22 007 0            ZL
 0488   RFF  30  LAST 1392    04,3754  53'174 0            DXCH   UPBUFF
 0489   RFF  10  LAST 1392    04,3755  21'710 1            DAS    TEPHEM +1        INCRFMENT TP TFPHEM
 0490   REF  11  LAST 1392    04,3756  27'706 0            ADS    TEPHEM

 0491   REF 123  LAST 1392    04,3757  0 5355 1            TC     PHASCHNG         RESTART PROTECT(GROUP 6)
 0492                         C4,3760   04026 1            OCT    04026

 0493   RFF  31  LAST 1392       1173                      FBANK= UPBUFF

 0494   RFF   7  LAST 1391    04,3761  0 3713 1            TC     UPOUT            GO TO STANDARD UPDATF PROGRAM EXIT
```

```
R0495                 ERROR SEQUENCE

 0496   REF   5  LAST 1389   04,3762  0 4355 0  UPERROUT TC       FALTON          TURN ON *OPERATOR ERROR* LIGHT
 0497   REF   8  LAST 1392   04,3763  1 3713 0           TCF      UPOUT           GO TO COMMON UPDATE PROGRAM EXIT

 0498   REF  10  LAST 1393   04,3764  0 4355 0    +2     TC       FALTON          TURN ON 'OPERATOR ERROR' LIGHT
 0499   REF   2  LAST 1391   04,3765  0 3767 1           TC       UPACTOFF        TURN OFF'UPLINK ACTIVITY'LIGHT
 0500   REF  43  LAST 1392   04,3766  0 5474 0           TC       ENDEXT          EXTENDED VERB EXIT
A0501                                                                             (THE PURPOSE OF UPERROUT +2 EXIT IS
A0502                                                                             TO PROVIDE AN ERROR EXIT WHICH DOES NOT
A0503                                                                             RESET ANY RESTART GROUPS)
A0504

R0505                 :UPACTOFF: IS A ROUTINE TO TURN OFF UPLINK ACTIVITY LIGHT ON ALL EXITS FROM UPDATE PROGRAM(P27).

 0507   REF  38  LAST 1336   04,3767  4 4742 0  UPACTOFF CS       BIT3
 0508                        04,3770  0 0006 1           EXTEND                   TURN OFF UPLINK ACTIVITY LIGHT
 0509   REF  36  LAST 1364   04,3771  03 011 1           WAND     DSALMOUT        (BIT 3 OF CHANNEL 11)
 0510   REF 384  LAST 1388   04,3772  0 0002 0           TC       Q
 0001                        22,3774                      BANK    22
 0002    REF   1             10,2000                      SETLOC RTBCODES
 0003                        10,3603                      BANK

 0004    REF  12  LAST 1262  E5,1664                      EBANK= XNB
 0005    REF   1                                          COUNT* $$/RTB

R0006             LOAD TIME2, TIME1 INTO MPAC:

 0007                        10,3603  0 0006 1  LOADTIME EXTEND
 0008    REF  39  LAST 1390  10,3604  3 0025 0           DCA     TIME2
 0009    REF   2  LAST 1017  10,3605  1 6076 1           TCF     SLOAD2

R0010             CONVERT THE SINGLE PRECISION 2'S COMPLEMENT NUMBER ARRIVING IN MPAC (SCALED IN HALF-REVOLUTIONS) TO A
R0012    DP 1'S COMPLEMENT NUMBER SCALED IN REVOLUTIONS.

 0016    REF 842  LAST 1391  10,3606  10 154 0  CDULOGIC CCS     MPAC
 0017    REF 275  LAST 1392  10,3607  3 4746 0           CAF     ZERO
 0018                        10,3610  1 3613 1           TCE     +3
 0019                        10,3611  13 612 0           NOOP
 0020    REF  30  LAST 1100  10,3612  4 4727 0           CS      HALF

 0021    REF 843  LAST 1394  10,3613  54 155 1           TS      MPAC +1
 0022    REF 276  LAST 1394  10,3614  3 4746 0           CAF     ZERO
 0023    REF 844  LAST 1394  10,3615  56 154 1           XCH     MPAC
 0024                        10,3616  0 0006 1           EXTEND
 0025    REF  31  LAST 1394  10,3617  7 4727 0           MP      HALF
 0026    REF 845  LAST 1394  10,3620  20 155 1           DAS     MPAC
 0027    REF  62  LAST 1279  10,3621  1 6102 0           TCF     DANZIG          MODE IS ALREADY AT DOUBLE-PRECISION

R0054             FORCE TP SIGN AGREEMENT IN MPAC:

 0055    REF  19  LAST 1390  10,3622  0 7300 0  SGNAGREE TC      TPAGREE
 0056    REF  63  LAST 1394  10,3623  1 6102 0           TCF     DANZIG

R0057             CONVERT THE DP 1'S COMPLEMENT ANGLE SCALED IN REVOLUTIONS TO A SINGLE PRECISION 2'S COMPLEMENT ANGLE
R0059    SCALED IN HALF-REVOLUTIONS.

 0060    REF   1             10,3624  0 3654 0  1STO2S   TC      1TO2SUB
 0061    REF 277  LAST 1394  10,3625  3 4746 0           CAF     ZERO
 0062    REF 846  LAST 1394  10,3626  54 155 1           TS      MPAC +1
 0063    REF   5  LAST 1045  10,3627  1 6101 0           TCF     NEWMODE

R0064             DO 1STO2S ON A VECTOR OF ANGLES:

 0065    REF   2  LAST 1394  10,3630  0 3654 0  V1STO2S  TC      1TO2SUB         ANSWER ARRIVES IN A AND MPAC.

 0066    REF 847  LAST 1394  10,3631  52 162 0           DXCH    MPAC +5
 0067    REF 848  LAST 1394  10,3632  52 155 1           DXCH    MPAC
 0068    REF   3  LAST 1394  10,3633  0 3654 0           TC      1TO2SUB
 0069   REF 849  LAST 1394   10,3634  54 156 1              TS      MPAC +2

 0070   REF 850  LAST 1395   10,3635  52 160 1              DXCH    MPAC +3
 0071   REF 851  LAST 1395   10,3636  52 155 1              DXCH    MPAC
 0072   REF   4  LAST 1394   10,3637  0 3654 0              TC      1TO2SUB
 0073   REF 852  LAST 1395   10,3640  54 155 1              TS      MPAC +1

 0074   REF 853  LAST 1395   10,3641  3 C161 1              CA      MPAC +5
 0075   REF 854  LAST 1395   10,3642  54 154 0              TS      MPAC

 0076   REF 135  LAST 1386   10,3643  3 4744 1  TPMODE      CAF     ONE              MODE IS TP.
 0077   REF   6  LAST 1394   10,3644  1 6101 0              TCF     NEWMODE

R0078                VISTO2S FOR 2 COMPONENT VECTOR. USED BY RR.

 0079   REF   5  LAST 1395   10,3645  0 3654 0  2VISTO2S    TC      1TO2SUB
 0080   REF 855  LAST 1395   10,3646  52 160 1              DXCH    MPAC +3
 0081   REF 856  LAST 1395   10,3647  52 155 1              DXCH    MPAC
 0082   REF   6  LAST 1395   10,3650  0 3654 0              TC      1TO2SUB
 0083   REF 277  LAST 1391   10,3651  54 001 1              TS      L
 0084   REF 857  LAST 1395   10,3652  3 C157 1              CA      MPAC +3
 0085   REF   3  LAST 1394   10,3653  1 6C76 1              TCF     SLOAD2

R0086                SUBROUTINE TO DO DOUBLING AND 1'S TO 2'S CONVERSION:

 0087   REF 858  LAST 1395   10,3654  52 155 1  1TO2SUB     DXCH    MPAC             FINAL MPAC +1 UNSPECIFIED.
 0088                        10,3655  20 001 1              DDOUBL
 0089   REF 459  LAST 1391   10,3656  10 000 0              CCS     A
 0090   REF 136  LAST 1395   10,3657  6 4744 1              AD      ONE
 0091                        10,3660  1 3662 1              TCF     +2
 0092                        10,3661  4 C000 0              COM                      THIS WAS REVERSE OF MSU.

 0093   REF 859  LAST 1395   10,3662  54 154 0              TS      MPAC             AND SKIP ON OVERFLOW.
 0094   REF 385  LAST 1393   10,3663  0 0002 0              TC      Q

 0095   REF 460  LAST 1395   10,3664  50 000 1              INDEX   A                OVERFLOW UNCORRECT AND IN MSU.
 0096   REF   5  LAST 1100   10,3665  3 4725 0              CAF     LIMITS
 0097   REF 860  LAST 1395   10,3666  26 154 0              ADS     MPAC
 0098   REF 386  LAST 1395   10,3667  0 0002 0              TC      Q

R0114                THE FOLLOWING ROUTINE INCREMENTS IN 2S COMPLEMENT THE REGISTER WHOSE ADDRESS IS IN BUF BY THE 1S COMPL.
R0116           QUANTITY FOUND IN TEM2. THIS MAY BE USED TO INCREMENT DESIRED IMU AND OPTICS CDU ANGLES OR ANY OTHER 2S COMPL.
R0118           (+0 UNEQUAL TO -0) QUANTITY. MAY BE CALLED BY BANKCALL/SWCALL.

 0119   REF  33  LAST 1264   10,3670  54 142 1  CDUINC      TS      TEM2             1S COMPL.QUANT. ARRIVES IN ACC. STORE IT
 0120   REF 167  LAST 1264   10,3671  50 130 0              INDEX   BUF
 0121                        10,3672  10 C00 0              CCS     0                CHANGE 2S COMPL. ANGLE(IN BUF)INTO 1S
 0122   REF 137  LAST 1395   10,3673  6 4744 1              AD      ONE
 0123                        10,3674  1 3700 1              TCF     +4
 0124   REF 138  LAST 1395   10,3675  6 4744 1              AD      ONE
```

```
L        RTB OP CODES                                                                        USER'S PAGE NO.   3      E5 S4

 0125    REF 139  LAST 1395    10,3676  6 4744 1            AD      ONE              OVERFLOW HERE IF 2S COMPL. IS 180 DEG.
 0126                          10,3677  4 0000 0            COM

 0127    REF  34  LAST 1395    10,3700  6 0142 0            AD      TEM2             SULT MOVES FROM 2ND TO 3D QUAD.(OR BACK)
 0129    REF 461  LAST 1395    10,3701  10 000 0            CCS     A                BACK TO 2S COMPL.
 0130    REF 140  LAST 1396    10,3702  6 4744 1            AD      ONE
 0131                          10,3703  1 3705 1            TCF     +2
 0132                          10,3704  4 0000 0            COM
 0133    REF  35  LAST 1396    10,3705  54 142 1            TS      TEM2             STORE 14BIT QUANTITY WITH PRESENT SIGN
 0134                          10,3706  1 3712 1            TCF     +4
 0135    REF 462  LAST 1396    10,3707  50 000 1            INDEX   A                 SIGN.
 0137    REF   6  LAST 1395    10,3710  3 4725 0            CAF     LIMITS           FIX IT,BY ADDING IN 37777 OR 40000
 0138    REF  36  LAST 1396    10,3711  6 0142 0            AD      TEM2

 0139    REF 168  LAST 1395    10,3712  50 130 0            INDEX   BUF
 0140                          10,3713  54 000 0            TS      0                STORE NEW ANGLE IN 2S COMPLEMENT.
 0141    REF 387  LAST 1395    10,3714  0 0002 0            TC      Q
```

```
P0142             RTB TO TORQUE GYROS, EXCEPT FOR THE CALL TO IMUSTALL. ECADR OF COMMANDS ARRIVES IN X1.

 0144    REF  66  LAST 1217   10,3715  50 120 1  PULSEIMU INDEX  FIXLOC          ADDRESS OF GYRO COMMANDS SHOULD BE IN X1
 0145    REF  69  LAST 1268   10,3716   3 0046 0          CA     X1
 0146    REF 305  LAST 1387   10,3717   0 4607 1          TC     BANKCALL
 0147    REF   7  LAST  966   10,3720    17310 0          CADR   IMUPULSE
 0148    REF  64  LAST 1394   10,3721   1 6102 0          TCF    DANZIG
```

```
R0192             THE SUBROUTINE  SIGNMPAC  SETS C(MPAC, MPAC +1) TO SIGN(MPAC).
R0193   FOR THIS, ONLY THE CONTENTS OF MPAC ARE EXAMINED.    ALSO +0 YIELDS POSMAX AND -0 YIELDS NEGMAX.

R0195   ENTRY MAY BE BY EITHER OF THE FOLLOWING:

R0196   1.        LIMIT THE SIZE OF MPAC ON INTERPRETIVE OVERFLOW:
R0197   ENTRY:              BOVB
R0198                                SIGNMPAC

R0199   2.        GENERATE IN MPAC THE SIGNUM FUNCTION OF MPAC:
R0200   ENTRY:              RTB
R0201                                SIGNMPAC

R0202   IN EITHER CASE, RETURN IS TO  THE NEXT INTERPRETIVE INSTRUCTION IN THE CALLING SEQUENCE.

 02035  REF    1                 14,2000                          SETLOC RTBCODE1
 02036                           14,3765                          BANK

 0204                            14,3765  0 0006 1  SIGNMPAC EXTEND
 0205   REF    2  LAST  456      14,3766  3 4724 1           OCA    DPOSMAX
 0206   REF 861  LAST 1395       14,3767  52 155 1           DXCH   MPAC
 0207   REF 463  LAST 1396       14,3770  10 000 0           CCS    A
 0208   REF 278  LAST 1394       14,3771  3 4746 0  DPMODE   CAF    ZERO              SETS MPAC +2 TO ZERO IN THE PROCESS
 0209   REF    4  LAST 1395      14,3772  1 6100 1           TCF    SLOAD2 +2
 0210                            14,3773  1 3774 1           TCF    +1
 0211                            14,3774  0 0006 1           EXTEND
 0212   REF    3  LAST 1398      14,3775  4 4724 0           OCS    DPOSMAX
 0213   REF    5  LAST 1398      14,3776  1 6076 1           TCF    SLOAD2

 02135  REF    2  LAST 1394      10,2000                          SETLOC RTBCODES
 02136                           10,3722                          BANK

R0214        RTB OP CODE NORMUNIT IS LIKE INTERPRETIVE INSTRUCTION UNIT, EXCEPT THAT IT CAN BE DEPENDED ON NOT TO BLOW
R0216   UP WHEN THE VECTOR BEING UNITIZED IS VERY SMALL -- IT WILL BLOW UP WHEN ALL COMPONENTS ARE ZERO.   IF NORMUNIT
R0218   IS USED AND THE UPPER ORDER HALVES OF ALL COMPONENTS ARE ZERO, THE MAGNITUDE RETURNED IN 36D WILL BE TOO LARGE
R0220   BY A FACTOR OF 2(13) AND THE SQUARED MAGNITUDE RETURNED AT 34D WILL BE TOO BIG BY A FACTOR OF 2(26).

 0222   REF 141  LAST 1396      10,3722  3 4744 1  NORMUNX1 CAF    ONE
 02221  REF  11  LAST  909      10,3723  1 3725 0           TCF    NORMUNIT +1
 02222  REF 279  LAST 1398      10,3724  3 4746 0  NORMUNIT CAF    ZERO
 02223  REF  67  LAST 1397      10,3725  6 0120 1           AD     FIXLOC
 02224  REF 862  LAST 1398      10,3726  54 156 1           TS     MPAC  +2
 02225  REF 306  LAST 1397      10,3727  0 4607 1           TC     BANKCALL           GET SIGN AGREEMENT IN ALL COMPONENTS
 0223   REF   3  LAST 1068      10,3730   01010 1           CADR   VECAGREE
 0224   REF 863  LAST 1398      10,3731  10 154 0           CCS    MPAC
 0225   REF   1                 10,3732  1 3766 1           TCF    NOSHIFT
 0226                           10,3733  1 3735 1           TCF    +2
 0227   REF   2  LAST 1398      10,3734  1 3766 1           TCF    NOSHIFT
 0228   REF 864  LAST 1398      10,3735  10 157 0           CCS    MPAC  +3
 0229   REF   3  LAST 1398      10,3736  1 3766 1           TCF    NOSHIFT
 0230                             10,3737  1 3741 1            TCF      +2
 0231   REF   4  LAST 1398        10,3740  1 3766 1            TCF      NOSHIFT
 0232   REF 865  LAST 1398        10,3741  10 161 0            CCS      MPAC   +5
 0233   REF   5  LAST 1399        10,3742  1 3766 1            TCF      NOSHIFT
 0234                             10,3743  1 3745 0            TCF      +2
 0235   REF   6  LAST 1399        10,3744  1 3766 1            TCF      NOSHIFT
 0236   REF 866  LAST 1399        10,3745  3 0155 0            CA       MPAC   +1         SHIFT ALL COMPONENTS LEFT 13
 0237                             10,3746  0 0006 1            EXTEND
 0238   REF  79  LAST 1367        10,3747  7 4727 0            MP       BIT14
 0239   REF 867  LAST 1399        10,3750  20 155 1            DAS      MPAC              DAS GAINS A LITTLE ACCURACY
 0240   REF 868  LAST 1399        10,3751  3 0160 0            CA       MPAC   +4
 0241                             10,3752  0 0006 1            EXTEND
 02411  REF  80  LAST 1399        10,3753  7 4727 0            MP       BIT14
 02412  REF 869  LAST 1399        10,3754  20 160 1            DAS      MPAC   +3
 02413  REF 870  LAST 1399        10,3755  3 0162 1            CA       MPAC   +6
 02414                            10,3756  0 0006 1            EXTEND
 02415  REF  81  LAST 1399        10,3757  7 4727 0            MP       BIT14
 02416  REF 871  LAST 1399        10,3760  20 162 0            DAS      MPAC   +5
 02417  REF   2  LAST 1068        10,3761  3 4752 0            CAF      THIRTEEN
 02418  REF 872  LAST 1399        10,3762  50 156 0            INDEX    MPAC   +2
 02419                            10,3763  54 045 1            TS       37D
 0242   REF  64  LAST 1385        10,3764  0 4626 1  OFFTUNIT  TC       POSTJUMP
 0243   REF   2  LAST 1011        10,3765   01024 0            CADR     UNIT   +1         SKIP THE "TC VECAGREE" DONE AT UNIT


 02431  REF 280  LAST 1398        10,3766  3 4746 0  NOSHIFT   CAF      ZERO
 02432  REF   1                   10,3767  1 3762 0            TCF      OFFTUNIT -2

R0300     RTB   VECSGNAG    ...FORCES SIGN AGREEMENT OF VECTOR IN MPAC.

 0301   REF 307  LAST 1398        10,3770  0 4607 1  VECSGNAG  TC       BANKCALL
 0302   REF   4  LAST 1398        10,3771   01010 1            CADR     VECAGREE
 0303   REF  65  LAST 1397        10,3772  0 6102 1            TC       DANZIG



*** END OF SKIPPER .131 ***
```

```
R0001    PROGRAM NAMES:  (1) T6JOBCHK       MOD. NO. 5    OCTOBER 2, 1967
R0002                    (2) DOT6RUPT

R0003    MODIFICATION BY: LOWELL G HULL (A.C.ELECTRONICS)
R0004    THESE PROGRAMS ENABLE THE LM DAP TO CONTROL THE THRUST TIMES OF THE REACTION CONTROL SYSTEM JETS BY USING TIME6.
R0006    SINCE THE LM DAP MAINTAINS EXCLUSIVE CONTROL OVER TIME6 AND ITS INTERRUPTS, THE FOLLOWING CONVENTIONS HAVE BEEN
R0008    ESTABLISHED AND MUST NOT BE TAMPERED WITH:
R0009              1. NO NUMBER IS EVER PLACED INTO TIME6 EXCEPT BY LM DAP.
R0010              2. NO PROGRAM OTHER THAN LM DAP ENABLES THE TIME6 COUNTER.
R0011              3. TO USE TIME6, THE FOLLOWING SEQUENCE IS ALWAYS EMPLOYED:
R0012                   A. A POSITIVE (NON-ZERO) NUMBER IS STORED IN TIME6.
R0013                   B. THE TIME6 CLOCK IS ENABLED.
R0014                   C. TIME6 IS INTERROGATED AND IS:
R0015                          I. NEVER FOUND NEGATIVE(NON-ZERO) OR +0.
R0016                         II. SOMETIMES FOUND POSITIVE(BETWEEN 1 AND 240D) INDICATING THAT IT IS ACTIVE.
R0018                        III. SOMETIMES FOUND POSMAX INDICATING THAT IT IS INACTIVE AND NOT ENABLED.
R0020                         IV. SOMETIMES FOUND NEGATIVE ZERO INDICATING THAT:
R0021                                   A. A T6RUPT IS ABOUT TO OCCUR AT THE NEXT DINC, OR
R0023                                   B. A T6RUPT IS WAITING IN THE PRIORITY CHAIN, OR
R0025                                   C. A T6RUPT IS IN PROCESS NOW.
R0026              4) ALL PROGRAMS WHICH OPERATE IN EITHER INTERRUPT MODE OR WITH INTERRUPT INHIBITED MUST CALL T6JOBCHK
R0028                 EVERY 5 MILLISECONDS TO PROCESS A POSSIBLE WAITING T6RUPT BEFORE IT CAN BE HONORED BY THE HARDWARE.

R0030             (5. PROGRAM JTLST, IN Q,R-AXES, HANDLES THE INPUT LIST.)
R0031    T6JOBCHK CALLING SEQUENCE:

A0032                                          L          TC      T6JOBCHK
A0033                                          L +1     (RETURN)

R0034    DOT6RUPT CALLING SEQUENCE:

A0035                                                     DXCH    ARUPT             T6RUPT LEAD IN AT LOCATION 4004.
A0036                                                     EXTEND
A0037                                                     DCA     T6ADR
A0038                                                     DTCB

R0039    SUBROUTINES CALLED: DOT6RUPT CALLS T6JOBCHK.

R0040    NORMAL EXIT MODES: T6JOBCHK RETURNS TO L +1.
R0041                       DOT6RUPT TRANSFERS CONTROL TO RESUME.

R0042    ALARM/ABORT MODES: NONE.

R0043    INPUT: TIME6    NXT6ADR       OUTPUT: TIME6    NXT6ADR     CHANNEL 5
R0044           T6NEXT   T6NEXT +1             T6NEXT   T6NEXT +1   CHANNEL 6
R0045           T6FURTHA T6FURTHA +1           T6FURTHA T6FURTHA +1 BIT15/CH13
R0046    DEBRIS: T6JOBCHK CLOBBERS A.  DOT6RUPT CLOBBERS NOTHING.


 0047                      5747                      BLOCK  02
```

```
L        T6-RUPT PROGRAMS                                                                  USER'S PAGE NO.   2       EO S4

 0055                        17,2055                       BANK    17
 0056    REF   1             17,2000                       SETLOC  DAPS2
 0057                        17,2055                       BANK
 0058    REF   2  LAST  230  E6,1466                       EBANK=  T6NEXT
 0059    REF   1                                           COUNT*  $$/DAPT6

 0060    REF   1             17,2055  10 031 1  T6JOBCHK  CCS     TIME6          CHECK TIME6 FOR WAITING T6RUPT:
 0061    REF 388  LAST 1396  17,2056  0 0002 0            TC      Q              NONE: CLOCK COUTING DOWN.
 0062    REF  20  LAST 1113  17,2057  0 5701 1            TC      CCSHOLE
 0063    REF  21  LAST 1401  17,2060  0 5701 1            TC      CCSHOLE
R0064    CONTROL PASSES TO T6JOB ONLY WHEN C(TIME6) = -0 (I.E. WHEN A T6RUPT MUST BE PROCESSED).

 0069    REF  35  LAST 1126  17,2061  3 4724 1  T6JOB     CA      POSMAX
 0070                        17,2062  22 007 0            ZL
 0071    REF   1             17,2063  53'471 0            DXCH    T6FURTHA
 0072    REF   3  LAST 1401  17,2064  53'467 1            DXCH    T6NEXT
 0073    REF   2  LAST  230  17,2065  23'465 1            LXCH    NXT6ADR
 0074    REF   2  LAST 1401  17,2066  54 031 1            TS      TIME6

 0075    REF   8  LAST 1367  17,2067  6 7746 0            AD      PRIO37
 0076    REF 464  LAST 1398  17,2070  54 000 0            TS      A
 0077    REF   1             17,2071  1 2075 0            TCF     ENABLET6
 0078    REF  36  LAST 1401  17,2072  3 4724 1            CA      POSMAX
 0079    REF   3  LAST 1401  17,2073  54 031 1            TS      TIME6
 0080    REF   1             17,2074  1 2115 1            TCF     GOCH56
 0081                        17,2075  0 0006 1  ENABLET6  EXTEND
 00812   REF   3  LAST  991  17,2076  23'265 1            QXCH    C13QSAV
 008125  REF  40  LAST 1374  17,2077  22 070 0            LXCH    RUPTREG1
 00813   REF   8  LAST  991  17,2100  0 6040 0            TC      C13STALL
 00814                       17,2101  0 0006 1            EXTEND
 00815   REF   4  LAST 1401  17,2102  23'265 1            QXCH    C13QSAV
 008155  REF  41  LAST 1401  17,2103  22 070 0            LXCH    RUPTREG1
 00816   REF  50  LAST 1373  17,2104  3 4726 0            CAF     BIT15
 0082                        17,2105  0 0006 1            EXTEND
 0083    REF  20  LAST 1333  17,2106  05 013 0            WOR     CHAN13
 0084    REF   4  LAST 1401  17,2107  3 1466 1            CA      T6NEXT
 0085    REF   9  LAST 1401  17,2110  6 7746 0            AD      PRIO37
 0086    REF 465  LAST 1401  17,2111  54 000 0            TS      A
 0087    REF   2  LAST 1401  17,2112  1 2115 1            TCF     GOCH56
 0088    REF  37  LAST 1401  17,2113  3 4724 1            CA      POSMAX
 0089    REF   5  LAST 1401  17,2114  55'466 0            TS      T6NEXT
 0090    REF 278  LAST 1395  17,2115  50 001 0  GOCH56    INDEX   L
 0091    REF   1             17,2116  1 5747 1            TCF     WRITEP -1

 0092                           5747                       BLOCK   02
 0093    REF   1                4000                       SETLOC  FFTAG9
 0094                           5747                       BANK
 0095    REF  18  LAST  911  E6,1634                       EBANK=  CDUXD
 0096    REF   1                                           COUNT*  $$/DAPT6
 0097   REF   4  LAST  230        5747  3 1472 1            CA      NEXTP
 0098                             5750  0 0006 1  WRITEP    EXTEND
 0099   REF   2  LAST  223        5751  01 006 0            WRITE   CHAN6
 0100   REF 389  LAST 1401        5752  0 0002 0            TC      Q

 0101   REF   1                   5753  3 1473 0            CA      NEXTU
 0102   REF 279  LAST 1401        5754  54 001 1  WRITEU    TS      L
 0103   REF   1                   5755  4 5770 0            CS      00314OCT
 0104                             5756  0 0006 1            EXTEND
 0105   REF   3  LAST 1024        5757  02 005 0            RAND    CHAN5
 0106   REF 280  LAST 1402        5760  6 0001 0            AD      L
 0107                             5761  0 0006 1            EXTEND
 0108   REF   4  LAST 1402        5762  01 005 0            WRITE   CHAN5
 0109   REF 390  LAST 1402        5763  0 0002 0            TC      Q

 0110   REF   1                   5764  3 1474 1            CA      NEXTV
 0111   REF 281  LAST 1402        5765  54 001 1  WRITEV    TS      L
 0112   REF   2  LAST 1402        5766  3 5770 1            CA      00314OCT
 0113                             5767  1 5756 1            TCF     -9D
 0114                             5770   00314 1  00314OCT  OCT     00314

 0115                          17,2117                      BANK    17
 0116   REF   2  LAST 1401     17,2000                      SETLOC  DAPS2
 0117                          17,2117                      BANK

 0118   REF   6  LAST 1401     E6,1466                      EBANK=  T6NEXT
 0119   REF   2 LAST 1401 TO 1401:     34     34*           COUNT*  $$/DAPT6

 0120   REF  11  LAST 1336     17,2117  22 016 0  DOT6RUPT  LXCH    BANKRUPT         (INTERRUPT LEAD INS CONTINUED)
 0121                          17,2120  0 0006 1            EXTEND
 0122   REF  10  LAST 1336     17,2121  22 012 1            QXCH    QRUPT

 0123   REF   1                17,2122  0 2055 0            TC      T6JOBCHK         CALL T6JOBCHK.

 0124   REF  23  LAST 1337     17,2123  1 5272 1            TCF     RESUME           END TIME6 INTERRUPT PROCESSOR.
 0001                         20,2115               BANK    20
 0002   REF    3  LAST    45  20,2000               SETLOC DAPS3
 0003                         20,2115               BANK

 0004   REF   19  LAST 1401   E6,1634               EBANK= CDUXD
 0005   REF    1                                    COUNT* $$/DAPIF

R0006   MOD 0             DATE  11/15/66       BY  GEORGE W. CHERRY

R0007   MOD 1                   1/23/67        MODIFICATION BY PETER ADLER

R0008   FUNCTIONAL DESCRIPTION

R0009           HEREIN ARE A COLLECTION OF SUBROUTINES WHICH ALLOW MISSION CONTROL PROGRAMS TO CONTROL THE MODE
R0011           AND INTERFACE WITH THE DAP.

R0012   CALLING SEQUENCES

R0013   IN INTERRUPT OR WITH INTERRUPT INHIBITED
R0014           TC      IBNKCALL
R0015           FCADR   ROUTINE

R0016   IN A JOB WITHOUT INTERRUPT INHIBITED
R0017           INHINT
R0018           TC      IBNKCALL
R0019           FCADR   ROUTINE
R0020           RELINT

R0021   OUTPUT

R0022           SEE INDIVIDUAL ROUTINES BELOW

R0023   DEBRIS

R0024           A,L, AND SOMETIMES MDUETEMP                              ODE      NOT IN PULSES MODE
```

```
R0087   SUBROUTINE NAMES:
R0088             SETMAXDB, SETMINDB, RESTORDB, PFLITEDB

R0089   MODIFIED: 30 JANUARY 1968 BY P S WEISSMAN TO CREATE RESTORDB.

R0090   MODIFIED: 1 MARCH 1968 BY P S WEISSMAN TO SAVE EBANK AND CREATE PFLITEDB

R0091   FUNCTIONAL DESCRIPTION:
R0092             SETMAXDB - SET DEADBAND TO 5.0 DEGREES
R0093             SETMINDB - SET DEADBAND TO 0.3 DEGREE
R0094             RESTORDB - SET DEADBAND TO .3,1, OR 5 ACCORDING TO BITS 4 AND 5 OF DAPBOOLS
R0096             PFLITEDB - SET DEADBAND TO 1.0 DEGREE AND ZERO THE COMMANDED ATTITUDE CHANGE AND COMMANDED RATE
R0098             ALL ENTRIES SET UP A NOVAC JOB TO DO 1/ACCS SO THAT THE TJETLAW SWITCH CURVES ARE POSITIONED TO
R0100   REFLECT THE NEW DEADBAND.  IT SHOULD BE NOTED THAT THE DEADBAND REFERS TO THE ATTITUDE IN THE P-,U-,AND V-AXES.

R0102   SUBROUTINE CALLED:  NOVAC

R0103   CALLING SEQUENCE: SAME AS ABOVE
A0104                                                  OR        TC      RESTORDB +1      FROM ALLCOAST
R0105   DEBRIS:  A, L, Q, RUPTREG1, (ITEMPS IN NOVAC)

 0106   REF  33  LAST  907   20,2115  30 111 0  RESTORDB CAF     DAPBOOLS         DETERMINE CREW-SELECTED DEADBAND.
 01061  REF   1              20,2116  7 4740 1           MASK    DBSELECT2        CHECK FOR MAX DB (5 DEG)
 01062                       20,2117  0 0006 1           EXTEND
 01063                       20,2120  1 2122 0           BZF     +2
 01064  REF   1              20,2121  1 2130 0           TCF     SETMAXDB         BIT5 DAPBOOLS IS SET - CREW WANTS 5 DEG
 01065  REF  34  LAST 1404   20,2122  30 111 0           CAE     DAPBOOLS
 0107   REF   1              20,2123  7 4741 0           MASK    DBSELECT         CHECK FOR 1 DEG DEADBAND SELECTION
 0108                        20,2124  0 0006 1           EXTEND
 0109   REF   6  LAST  854   20,2125  1 2141 0           BZF     SETMINDB

 01091  REF   1              20,2126  3 2153 1           CAF     POWERDB          BIT4 DAPBOOLS IS SET - CREW WANTS 1 DEG
 01092  REF   2  LAST 1404   20,2127  1 2131 1           TCF     SETMAXDB +1
 0110   REF   1              20,2130  3 2152 0  SETMAXDB CAF     WIDEDB           SET 5 DEGREE DEADBAND.
 0111   REF   5  LAST  833   20,2131  55343 0    +1      TS      DB

 0112                        20,2132  0 0006 1           EXTEND                   SET UP JOB TO RE-POSITION SWITCH CURVES.
 0113   REF  42  LAST 1401   20,2133  22 070 0           QXCH    RUPTREG1
 0114   REF   5  LAST  739   20,2134  3 7736 1  CALLACCS CAF     PRIO27
 0115   REF  29  LAST 1368   20,2135  0 5063 1           TC      NOVAC
 0116   REF  10  LAST  735   E6,1536                     EBANK=  AOSQ
 0117   REF   2  LAST  203   20,2136   03603 1           2CADR   1/ACCJOB
 0117                        20,2137   42106 0

 0118   REF  43  LAST 1404   20,2140  0 0070 0           TC      RUPTREG1         RETURN TO CALLER.

 0119   REF   1              20,2141  3 2151 0  SETMINDB CAF     NARROWDB         SET 0.3 DEGREE DEADBAND.
 0120   REF   3  LAST 1404   20,2142  1 2131 1           TCF     SETMAXDB +1
 0121                          20,2143   0 0006 1  PFLITEDB EXTEND                   THE RETURN FROM CALLACCS IS TO RUPTREG1.
 0122   REF  44  LAST 1404     20,2144   22 070 0           QXCH     RUPTREG1
 0123   REF   8  LAST  854     20,2145   0 2154 0           TC       ZATTEROR        ZERO THE ERRORS AND COMMANDED RATES.
 0124   REF   2  LAST 1404     20,2146   3 2153 1           CAF      POWERDB         SET DB TO 1.0 DEG.
 0125   REF   6  LAST 1404     20,2147   55'343 0           TS       DB
 0126   REF   1                20,2150   1 2134 1           TCF      CALLACCS        SET UP 1/ACCS AND RETURN TO CALLER.
 01261                         20,2151    00155 0  NARROWDB OCTAL    00155           0.3 DEGREE SCALED AT 45.
 01262                         20,2152    03434 1  WIDEDB   OCTAL    03434           5.0 DEGREES SCALED AT 45.
 0127                          20,2153    00554 0  POWERDB  DEC      .02222          1.0 DEGREE SCALED AT 45.

 0128   REF   9  LAST  901     20,2154   3 5006 1  ZATTEROR CAF      EBANK6
 0129   REF  89  LAST 1391     20,2155   56 003 1           XCH      EBANK
 0130   REF 282  LAST 1402     20,2156   54 001 1           TS       L               SAVE CALLERS EBANK IN L.
 0131   REF  21  LAST 1310     20,2157   30 032 0           CAE      CDUX
 0132   REF  20  LAST 1403     20,2160   55'634 0           TS       CDUXD
 0133   REF  13  LAST 1306     20,2161   30 033 1           CAE      CDUY
 0134   REF   8  LAST  908     20,2162   55'635 1           TS       CDUYD
 0135   REF  16  LAST 1306     20,2163   30 034 0           CAE      CDUZ
 0136   REF   7  LAST  908     20,2164   55'636 1           TS       CDUZD
 0137   REF  10  LAST  921     20,2165   1 2171 0           TCF      STOPRATE +3

 0138   REF  10  LAST 1405     20,2166   3 5006 1  STOPRATE CAF      EBANK6
 0139   REF  90  LAST 1405     20,2167   56 003 1           XCH      EBANK
 0140   REF 283  LAST 1405     20,2170   54 001 1           TS       L               SAVE CALLERS EBANK IN L.
 0141   REF 281  LAST 1399     20,2171   3 4746 0   +3      CAF      ZERO
 0142   REF  12  LAST  915     20,2172   55'642 1           TS       OMEGAPD
 0143   REF   8  LAST  914     20,2173   55'643 0           TS       OMEGAQD
 0144   REF   7  LAST  914     20,2174   55'644 1           TS       OMEGARD
 0145   REF   5  LAST  915     20,2175   55'637 0           TS       DELCDUX
 0146   REF   2  LAST  140     20,2176   55'640 0           TS       DELCDUY
 0147   REF   2  LAST  140     20,2177   55'641 1           TS       DELCDUZ
 0148   REF   4  LAST  915     20,2200   55'274 0           TS       DELPEROR
 0149   REF   2  LAST  381     20,2201   55'275 1           TS       DELQEROR
 0150   REF   2  LAST  381     20,2202   55'276 1           TS       DELREROR
 0151   REF  91  LAST 1405     20,2203   22 003 1           LXCH     EBANK           RESTORE CALLERS EBANK.
 0152   REF 391  LAST 1402     20,2204   0 0002 0           TC       Q

R0153   SUBROUTINE NAME:  ALLCOAST

R0154   WILL BE CALLED BY FRESH STARTS AND ENGINE OFF ROUTINES.

R0156   CALLING SEQUENCE: (SAME AS ABOVE)

R0157   EXIT:  RETURN TO Q.

R0158   SUBROUTINES CALLED:  STOPRATE, RESTORDB, NOVAC

R0159   ZERO:  (FOR ALL AXES) AOS, ALPHA, AOSTERM, OMEGAD, DELCDU, DELEROR
```

```
R0160   OUTPUT:  DRIFTBIT/DAPBOOLS, DB, JCB TO DO 1/ACCS

R0161   DEBRIS:  A, L, Q, RUPTREG1, RUPTREG2, (ITEMPS IN NOVAC)

 0162                          20,2205  0 0006 1  ALLCOAST EXTEND                      SAVE Q FOR RETURN
 0163   REF  21  LAST 1327     20,2206  22 071 1           QXCH     RUPTREG2
 0164   REF  11  LAST 1405     20,2207  0 2166 1           TC       STOPRATE           CLEAR RATE INTERFACE.  RETURN WITH A=0
 0165   REF  92  LAST 1405     20,2210  22 003 1           LXCH     EBANK                AND L=EBANK6.  SAVE CALLERS EBANK.
 0166   REF  11  LAST 1404     20,2211  55'536 1           TS       AOSQ
 0167   REF  12  LAST 1406     20,2212  55'537 0           TS       AOSQ +1
 0168   REF   2  LAST  735     20,2213  55'540 0           TS       AOSR
 0169   REF   3  LAST 1406     20,2214  55'541 1           TS       AOSR +1
 0170   REF   3  LAST  206     20,2215  55'424 0           TS       ALPHAQ             FOR DOWNLIST.
 0171   REF   3  LAST  215     20,2216  55'425 1           TS       ALPHAR
 0172   REF   2  LAST  138     20,2217  55'544 1           TS       AOSQTERM
 0173   REF   1                20,2220  55'545 0           TS       AOSRTERM
 0174   REF  93  LAST 1406     20,2221  22 003 1           LXCH     EBANK              RESTORE EBANK  (EBANK6 NO LONGER NEEDED)

 0175   REF  35  LAST 1404     20,2222  4 0111 1           CS       DAPBOOLS           SET UP DRIFTBIT
 0176   REF   2  LAST  735     20,2223  7 4735 0           MASK     DRIFTBIT
 0177   REF  36  LAST 1406     20,2224  26 111 1           ADS      DAPBOOLS
 0178   REF   8  LAST  855     20,2225  0 2116 0           TC       RESTORDB +1        RESTORE DEADBANK TO CREW-SELECTED VALUE.

 0179   REF  22  LAST 1406     20,2226  0 0071 1           TC       RUPTREG2           RETURN.
```

```
L         DAPIDLER PROGRAM                                                         USER'S PAGE NO.   1       FO S4

R0001    THE DAPIDLER PROGRAM IS STARTED BY FRESH START AND RESTART.           THE DAPIDLER PROGRAM IS DONE 10 TIMES
R0003    PER SECOND UNTIL THE ASTRONAUT DESIRES THE DAP TO WAKE UP, AND THE IMU AND CDUS ARE READY FOR USE BY THE DAP.
R0005    THE NECESSARY INITIALIZATION OF THE DAP IS DONE BY THE DAPIDLER PROGRAM.
 0006                              16,2000                   BANK    16
 0007    REF    1                  16,2000                   SETLOC  DAPS1
 0008                              16,2000                   BANK

 0009    REF   13  LAST 1406       E6,1536                   EBANK=  AOSQ

 0010    REF    1                                            COUNT*  $$/DAPID

R001005    CHEKBITS IS CALLED EVERY 0.1 SEC AT THE BEGINNING OF THE DAP PASS, WHETHER THE AUTOPILOT IS ACTIVE OR IDLING.
R001015  IT CHECKS FOR THE FOLLOWING
R00102              A. IS THE PGNCS MODE SELECT SWITCH TURNED TO "OFF"?
R001025             B. IS THE IMU UNAVAILABLE AS AN ATTITUDE REFERENCE?
R00103              C. HAS THE INDICATION GONE FROM AGS TO PGNCS SINCE LAST CHECKED
R001035    IF EITHER A OR B HOLD, THE FDAI ERROR NEEDLES MUST NOT BE UPDATED (TOAVOID CONFLICT OVER USE OF THE DACS WITH
R001045  V43 OR COARSE ALIGN) AND THE DAP MUST IDLE.  A BIT IS SET TO CAUSE  NEEDLER TO INITIALIZE ITSELF WHEN IT IS NEXT
R001055  CALLED AND CONTROL IS TRANSFERRED TO A SHORT IDLING ROUTINE.  OTHERWISE, THE NEEDLES ARE UPDATED AND CONDITION
R001065  "C" IS TESTED.

R00107     IF C HOLDS, THE DAP IS REINITIALIZED.  OTHERWISE, THE DAP SHOULD BE ACTIVE AND CONTROL IS TRANSFERRED BACK TO
R00108   THE CALLER OF CHEKBITS.

 0011                              16,2000  0 0006 1  CHEKBITS EXTEND
 0012    REF    9  LAST  912       16,2001  00 031 0           READ    CHAN31          IF BOTH BIT13 AND BIT14 ARE ONE, THEN
 0013                              16,2002  4 0000 0           COM                     THE MODE SELECT SWITCH IS IN THE OFF
 0014    REF    6  LAST  513       16,2003  7 4346 0           MASK    BIT13-14        POSITION, AND SO THE DAP SHOULD BE OFF,
 0015                              16,2004  0 0006 1           EXTEND                  WITH NO ATTITUDE ERROR DISPLAY.
 0016    REF    1                  16,2005  1 2012 1           BZF     NONEEDLE

 0017    REF   48  LAST 1314       16,2006  4 1300 1           CS      IMODES33        IF IMU NOT USABLE, DAP SHOULD IDLE WITH
 0018    REF   58  LAST 1388       16,2007  7 4737 1           MASK    BIT6              NO FDAI NEEDLE DISPLAY.
 0019    REF  466  LAST 1401       16,2010  10 000 0           CCS     A
 0020    REF    1                  16,2011  1 2212 0           TCF     JUMPDSP
 0021    REF    2  LAST  143       16,2012  4 1774 0  NONEEDLE CS      RCSFLAGS        SET FLAG TO INITIALIZE NEEDLE DISPLAY.
 0022    REF   39  LAST 1393       16,2013  7 4742 0           MASK    BIT3
 0023    REF    3  LAST 1407       16,2014  27'774 0           ADS     RCSFLAGS
 0024    REF    1                  16,2015  1 2164 1           TCF     SHUTDOWN

 0025    REF   48  LAST 1336       16,2016  3 4733 1  CHEKMORE CAF     BIT10           BIT 10 OF 30 IS PGNCS CONTROL OF S/C
 0026                              16,2017  0 0006 1           EXTEND
 0027    REF    9  LAST  908       16,2020  02 030 0           RAND    CHAN30          BITS IN 30 ARE INVERTED
 0028    REF  467  LAST 1407       16,2021  10 000 0           CCS     A
 0029    REF    1                  16,2022  1 2033 1           TCF     AGSINDIC        AGS: GO SET NPGNCSFL BUT CONTROL ANYHOW.
 00291   REF   25  LAST 1382       16,2023  4 0106 1           CS      FLGWRD10
 00292   REF    1                  16,2024  7 4744 0           MASK    NPGNCSBT
 00293   REF  468  LAST 1407       16,2025  10 000 0           CCS     A
 00294                             16,2026  0 0002 0           RETURN                  PGNCS BOTH LAST TIME & THIS: GO CONTROL.
 00295  REF    2  LAST 1407   16,2027  4 4744 0             CS      NPGNCSBT         PGNCS THIS TIME BUT AGS LAST: CLEAR
 00296  REF   26  LAST 1407   16,2030  7 0106 1             MASK    FLGWRD10           NPGNCSFL AND GO INITIALIZE DAP.
 00297  REF   27  LAST 1408   16,2031  54 106 1             TS      FLGWRD10
 00298  REF    1              16,2032  1 2043 0             TCF     STARTDP1

 00299  REF   28  LAST 1408   16,2033  4 0106 1  AGSINDIC CS      FLGWRD10
 00300  REF    3  LAST 1408   16,2034  7 4744 0             MASK    NPGNCSBT
 00301  REF   29  LAST 1408   16,2035  26 106 1             ADS     FLGWRD10
 00302                        16,2036  0 0002 0             RETURN
```

```
P0031   DAPIDLER ENTRY.

 0032   REF  12  LAST 1402   16,2037  22 016 0  DAPIDLER LXCH   BANKRUPT       INTERRUPT LEAD INS (CONTINUED)
 0033                        16,2040  0 0006 1           EXTEND
 0034   REF  11  LAST 1402   16,2041  22 012 1           QXCH   QRUPT

 0042   REF   1              16,2042  0 2000 0  CHECKUP  TC     CHEKBITS       CHECK TO SEE IF LM DAP IS TO GO ON AND
A0043                                                                            DO ERROR DISPLAY.

 0044   REF  37  LAST 1406   16,2043  30 111 0  STARTDP1 CAF    DAPBOOLS       IF 1/ACCS HAS NOT BEEN COMPLETED, IDLE.
 0045   REF   2  LAST  230   16,2044  7 4742 0           MASK   ACCSOKAY         NOTE: ONLY FRESH START AND RESTART
 0046                        16,2045  0 0006 1           EXTEND                        KNOCK THIS BIT DOWN.
 0047   REF   1              16,2046  1 2160 0           BZF    MOREIDLE

 0048   REF  53  LAST 1315   16,2047  0 4665 0  STARTDAP TC     IBNKCALL       ZERO ATTITUDE ERROR AND DESIRED RATES.
 0049   REF   9  LAST 1405   16,2050   40154 0           FCADR  ZATTEROR
 0050   REF 282  LAST 1405   16,2051  3 4746 0           CAF    ZERO           ********** INITIALIZE: **********
 0051   REF   3  LAST  138   16,2052  55'524 1           TS     TJP
 0052   REF   2  LAST  139   16,2053  55'525 0           TS     TJU
 0053   REF   1              16,2054  55'526 0           TS     TJV
 0054   REF   9  LAST  208   16,2055  55'421 0           TS     OMEGAP         RATES IN BODY (PILOT) COORDINATES.
 0055   REF  11  LAST  820   16,2056  55'422 0           TS     OMEGAQ
 0056   REF   4  LAST  215   16,2057  55'423 1           TS     OMEGAR
 0057   REF   6  LAST  135   16,2060  55'430 0           TS     TRAPEDP
 0058   REF   1              16,2061  55'431 1           TS     TRAPEDQ
 0059   REF   1              16,2062  55'432 1           TS     TRAPEDR
 0060   REF  14  LAST 1407   16,2063  55'536 1           TS     AOSQ           OFFSET ACCELERATION ESTIMATES.
 0061   REF  15  LAST 1409   16,2064  55'537 0           TS     AOSQ +1
 0062   REF   4  LAST 1406   16,2065  55'540 0           TS     AOSR
 0063   REF   5  LAST 1409   16,2066  55'541 1           TS     AOSR +1
 0064   REF   4  LAST 1406   16,2067  55'424 0           TS     ALPHAQ         COPIES OF OFFSET ESTIMATES FOR DOWNLIST.
 0065   REF   4  LAST 1406   16,2070  55'425 1           TS     ALPHAR
 0066   REF   3  LAST  139   16,2071  55'501 0           TS     NEGUQ
 0067   REF   1              16,2072  55'503 1           TS     NEGUR
 0068   REF   3  LAST 1406   16,2073  55'544 1           TS     AOSQTERM       QRAXIS RATE DERIVATION TERMS AND KALMAN
 0069   REF   2  LAST 1406   16,2074  55'545 0           TS     AOSRTERM       FILTER INITIALIZATION TERMS.
 0070   REF   1              16,2075  55'510 0           TS     QACCDOT        DESCENT ACCELERATION DERIVATIVE EST.
 0071   REF   1              16,2076  55'512 1           TS     RACCDOT
 0072   REF   1              16,2077  55'502 0           TS     ALLOWGTS       AOSTASK FLAG FOR QRAXIS RCS CONTROL USE.
 0073   REF   1              16,2100  55'630 1           TS     COTROLER       DO TRYGTS ON FIRST PASS (WILL GO TO RCS)
 0074   REF   1              16,2101  55'632 0           TS     INGTS          RECOGNIZE FIRST GTS PASS AS SUCH.
 0075   REF   3  LAST  139   16,2102  55'631 0           TS     QGIMTIMR       STOP GIMBAL DRIVES.  (PROBABLY WOULD BE
 0076   REF   1              16,2103  55'633 1           TS     RGIMTIMR         GOOD ENOUGH JUST TO INACTIVATE TIMERS)
 0077   REF   1              16,2104  55'460 0           TS     OLDPMIN        MINIMUM IMPULSE MODE ERASABLES
 0078   REF   1              16,2105  55'461 1           TS     OLDQRMIN
 00781  REF   3  LAST  142   16,2106  55'766 0           TS     PJETCTR        INITIALIZE DOCKED JET INHIBITION
 00782  REF   1              16,2107  55'767 1           TS     UJETCTR        COUNTERS
 00783  REF   1              16,2110  55'770 1           TS     VJETCTR
 0079   REF  49  LAST 1377      4740            CALLGMBL EQUALS BIT5           RCSFLAGS INITIALIZATION.
 0080   REF   1              16,2111  4 2206 0           CS     MANFLAG
```

```
L       CAPIDLER PROGRAM                                                                         USER'S PAGE NO.    4       F6 S4

 0081   REF    4  LAST 1407   16,2112  7 1774 0            MASK   RCSFLAGS          NEGUQ(R) HAVE BEEN GENERATED.
 0082   REF    5  LAST 1410   16,2113  55'774 0            TS     RCSFLAGS

R0083   SET UP "OLD" MEASURED CDU ANGLES:

 0084                         16,2114  0 0006 1            EXTEND
 0085   REF   22  LAST 1405   16,2115  3 0033 1            DCA    CDUX              OLDXFORP AND OLDYFORP
 0086   REF    3  LAST  135   16,2116  53'441 0            DXCH   OLDXFORP
 0087   REF   17  LAST 1405   16,2117  3 0034 0            CA     CDUZ
 0088   REF    1              16,2120  55'442 0            TS     OLDZFORQ
 0089   REF    6  LAST 1410   16,2121  4 1774 0            CS     RCSFLAGS
 0090   REF   35  LAST 1364   16,2122  7 4731 1            MASK   BIT12
 00901  REF    7  LAST 1410   16,2123  27'774 0            ADS    RCSFLAGS          BIT 12 SET TO 1.
 0091   REF   33  LAST 1361   16,2124  3 4742 1            CA     FOUR
 0092   REF    2  LAST  138   16,2125  55'534 0            TS     SKIPU
 0093   REF    1              16,2126  55'535 1            TS     SKIPV
 0094   REF   38  LAST 1401   16,2127  3 4724 1            CA     POSMAX
 0095   REF    4  LAST 1401   16,2130  54 031 1            TS     TIME6
 0096   REF    7  LAST 1402   16,2131  55'466 0            TS     T6NEXT
 0097   REF    2  LAST 1401   16,2132  55'470 1            TS     T6FURTHA
 0098   REF  283  LAST 1409   16,2133  3 4746 0            CA     ZERO
 0099   REF    8  LAST 1410   16,2134  55'467 1            TS     T6NEXT +1
 0100   REF    3  LAST 1410   16,2135  55'471 0            TS     T6FURTHA +1
 0101   REF    3  LAST 1401   16,2136  55'465 0            TS     NXT6ADR
 0102   REF    5  LAST 1402   16,2137  55'472 0            TS     NEXTP
 0103   REF    2  LAST 1402   16,2140  55'473 1            TS     NEXTU
 0104   REF    2  LAST 1402   16,2141  55'474 0            TS     NEXTV
 0105   REF    8  LAST 1036   16,2142  4 4354 0            CS     TEN
 0106   REF    1              16,2143  55'756 0            TS     DAPZRUPT          TASK NOT IN PROGRESS, INITIALIZE NEG.
 0107   REF   90  LAST 1388   16,2144  3 4743 0            CA     TWO
 0108   REF    1              16,2145  55'433 0            TS     NPTRAPS
 0109   REF    1              16,2146  55'434 1            TS     NQTRAPS
 0110   REF    1              16,2147  55'435 0            TS     NRTRAPS
 0111                         16,2150  0 0006 1            EXTEND
 0112   REF    1              16,2151  3 2211 1            DCA    PAXADIDL
 0113   REF    4  LAST  816   16,2152  53'263 0            DXCH   T5ADR
 0114   REF    1              16,2153  3 7750 1  SETTIME5  CAF    MS100
 0115   REF    4  LAST  861   16,2154  54 030 0            TS     TIME5
 0116   REF   24  LAST 1402   16,2155  1 5272 1            TCF    RESUME
 0117   REF   16  LAST 1409   E6,1536                      EBANK= AOSQ
 0118   REF    3  LAST  821   16,2156   02037 1  IDLERADR  2CADR  DAPIDLER
 0118                         16,2157   34106 1
 0119   REF   54  LAST 1409   16,2160  0 4665 0  MOREIDLE  TC     IBNKCALL          CALCULATE Q,R-AXES ATTITUDE ERRORS.
 0120   REF    1              16,2161   36655 1            CADR   QEPRCALC

 0121   REF   55  LAST 1410   16,2162  0 4665 0            TC     IBNKCALL
 0122   REF    1              16,2163   35447 0            CADR   CALCPERR          CALCULATE P AXIS ATTITUDE ERRORS.

 0123                         16,2164  0 0006 1  SHUTDOWN  EXTEND
 0124   REF    1              16,2165  3 2157 0            DCA    IDLERADR
```

```
L        DAPIDLER PROGRAM                                                                       USER'S PAGE NO.   5      E6 S4

 0125    REF   5  LAST 1410    16,2166  53'263 0               DXCH    T5ADR

 0126    REF 284  LAST 1410    16,2167  3 4746 0               CAF     ZERO               KILL ANY POSSIBLE JET REQUESTS
 0127    REF   6  LAST 1410    16,2170  55'472 0               TS      NEXTP
 0128    REF   3  LAST 1410    16,2171  55'473 1               TS      NEXTU
 0129    REF   3  LAST 1410    16,2172  55'474 0               TS      NEXTV
 0130                          16,2173  0 0006 1               EXTEND                     COMMAND JETS OFF.
 0131    REF   5  LAST 1402    16,2174  01 005 0               WRITE   CHAN5
 0132                          16,2175  0 0006 1               EXTEND
 0133    REF   3  LAST 1402    16,2176  01 006 0               WRITE   CHAN6
 0134    REF   1               16,2177  4 2207 1               CS      BGIM23             TURN TRIM GIMBAL OFF
 0135                          16,2200  0 0006 1               EXTEND
 0136    REF  62  LAST 1324    16,2201  03 012 1               WAND    CHAN12
 01361   REF   5  LAST  192    16,2202  4 4743 1               CS      CONTRLBT
 01362   REF  30  LAST 1408    16,2203  7 0106 1               MASK    FLGWRD10           CLEAR FLAG TO CAUSE THE NO CONTROL DSKY
 01363   REF  31  LAST 1411    16,2204  54 106 1               TS      FLGWRD10            LIGHT TO BE LIT BY T4RUPT.
 0137    REF   1               16,2205  1 2153 0               TCF     SETTIME5           RETURN IN 100 MSEC.

 01371                         16,2206   03021 1    MANFLAG    OCT     03021
 0138                          16,2207   07400 1    BGIM23     OCTAL   07400
 0139    REF  10  LAST 1409    E6,1421                         EBANK=  OMEGAP
 0140    REF   1               16,2210   02217 1    PAXADIDL   2CADR   PAXIS
 0140    REF   1               16,2211   34106 1
 0141    REF   2  LAST  165       7750              MS100      =       OCT37766
 0142    REF  67  LAST 1380       0061              COSMG      =       ITEMP1
 01431                         16,2212  0 0006 1    JUMPDSP    EXTEND                     TRANSFER TO BANK 20
 01432   REF   1               16,2213  3 2216 0               DCA     DSPCADR            FOR ATTITUDE ERROR DISPLAYS
 01433                         16,2214  52 006 0               DTCB

 01434   REF   3  LAST  142    E6,1760                         EBANK=  AK
 01435   REF   1               16,2215   02227 1    DSPCADR    2CADR   ALTDSPLY
 01435   REF   1               16,2216   40106 1
 01436                          20,2227                     BANK    20
 01437  REF   4  LAST 1403      20,2000                     SETLOC DAPS3
 01438                          20,2227                     BANK
 01439  REF   1                                             COUNT* $$/NEEDL

R0144   PROGRAM: ALTDSPLY

R0145   MOD 0.  6 DEC 1967

R0146   AUTHOR:  CRAIG WORK, DON KEENE, MIT IL

R0147   MOD 3 BY DON KEENE AUG 1, 1968 MOVED PROGRAM TO BANK 20

R0148   PROGRAM DESCRIPTION:

R0149   ALTDSPLY REVERSES THE DSPLYALT BIT OF RCSFLAGS EACH TIME IT IS CALLED, WHICH IS PRESUMABLY EVERY 100 MS.
R0151   IF THE REVERSED BIT IS ONE, NEEDLER IS CALLED TO DISPLAY ATTITUDE ERRORS.  IF THE BIT IS ZERO, THE ATTITUDE ERR-
R0153   ORS ARE CALCULATED AS 1) ESTIMATED RATES (FOLLOWING) IF NEED2FLG = 1, OTHERWISE AS 2) DAP FOLLOWING ERRORS FOR
R0154I  NEEDLFLG = 0 AND 3) TOTAL ATTITUDE ERRORS FOR NEEDLFLG = 1.

R0155   WARNING:  ALTDSPLY MAY ONLY BE CALLED WITH INTERRUPT INHIBITED.

R0156   WARNING:  EBANK MUST BE SET TO 6 WHEN USING THIS ROUTINE.

R0157   INPUT:  RCSFLAGS AND 1) IF NEEDLFLG=0, INPUT PERROR,QERROR,RERROR.
R0158                       2) IF NEEDLFLG=1, INPUT CPHI,CTHETA,CPSI,CDUX,CDUY,CDUZ,M11,M21,M31,M22,M32. (GPMATRIX)

R0159I                3) IF NEED2FLG = 1, INPUT OMEGAP, OMEGAQ, AND OMEGAR.

R0160   OUTPUTS:  RCSFLAGS WITH DSPLYALT REVERSED,AK,AK1,AK2,+ NEEDLER OUTPUTS.

R0161   ENTRY:    TCF    ALTDSPLY

R0162   EXIT:     TCF    CHEKMORE

R0163   ALARM OR ABORT EXITS:  NONE

R0164   SUBPROGRAMS CALLED: NEEDLER, CVERSUB2

R0165   DEBRIS:  A,L,AND NEEDLER DEBRIS.

 0166   REF   8  LAST 1410      20,2227  3 1774 1  ALTDSPLY CA     RCSFLAGS        INVERT THE DISPLAY ALTERNATION BIT.
 0167   REF 284  LAST 1405      20,2230  54 001 1           TS     L
 0168   REF   1                 20,2231  3 4741 1           CA     DSPLYALT
 0169                           20,2232  0 0006 1           EXTEND
 0170   REF  15  LAST 1388      20,2233  06 001 0           RXOR   LCHAN
 0171   REF   9  LAST 1412      20,2234  55'774 0           TS     RCSFLAGS

 0172   REF   2  LAST 1412      20,2235  7 4741 0           MASK   DSPLYALT
 0173   REF 469  LAST 1407      20,2236  10 000 0           CCS    A               IS ALTERNATION FLAG ZERO?
```

```
L        CAPIDLER PROGRAM                                                                              USER'S PAGE NO.   7       F6 S4

 0174    REF    1                 20,2237  1 2336 1             TCF     NEEDLER

 01741   RFF   36  LAST 1382      20,2240  4 CC74 0             CS      FLAGWRD0         CHECK FOR RATE DISPLAY TO ERROR NEEDLES
 01742   REF    1                 20,2241  7 4726 1             MASK    NEED2BIT         VIA EXTENDED VERB 60
 01743                            20,2242  0 CC06 1             EXTEND
 01744   REE    1                 20,2243  1 2257 1             BZF     DISPRATE

 0175    REF   37  LAST 1413      20,2244  30 074 1             CAE     ELAGWRD0         NEEDLFLG WILL INDICATE TOTAL OR DAP AT-
 0176    REF    1                 20,2245  7 4741 0             MASK    NEEDLBIT         TITUDE ERROR DISPLAY REQUEST.
 0177    REF 470   LAST 1412      20,2246  10 000 0             CCS     A
 0178    REF    1                 20,2247  1 2266 0             TCF     DSPLYTOT         TOTAL EPROR IS NEEDED IN AK,AK +1,AK +2

 0179    REF    2  LAST  137      20,2250  4 1450 0             CS      QFRROR           YES. DISPLAY ATT ERRORS ON THE ,-BALL.
 0180    REF    4  LAST 1411      20,2251  55'761 1             TS      AK +1            ERROR COMPLEMENTS ARE INPUT TO NEEDLER.
 0181    REE    2  LAST  137      20,2252  4 1452 1             CS      RERROR
 01815   REF    5  LAST 1413      20,2253  55'762 1             TS      AK +2
 0182    REF    2  LAST  164      20,2254  4 1464 1             CS      PERROR
 0183    RFF    6  LAST 1413      20,2255  57'760 1             XCH     AK

 0184    RFF    1                 20,2256  1 2456 0             TCF     RETNMORE         DISPLAY THESE THE NEXT TIME THROUGH

 01841   REF   12  LAST 1409      20,2257  4 1422 0  DISPRATE   CS      OMEGAQ           LOAD ESTIMATED RATES (FOLLOWING)
 01342   REF    7  LAST 1413      20,2260  55'761 1             TS      AK +1
 01843   REF    5  LAST 1409      20,2261  4 1423 1             CS      OMEGAR
 01844   REF    8  LAST 1413      20,2262  55'762 1             TS      AK +2
 01845   REF   11  LAST 1411      20,2263  4 1421 0             CS      OMEGAP
 01846   REF    9  LAST 1413      20,2264  57'760 1             XCH     AK
 01847   REF    2  LAST 1413      20,2265  1 2456 0             TCF     RFTNMORE

R0185    CALCULATE GIMBAL ANGLE TOTAL ERRCRS, RESOLVE INTO PILOT AXES, STORE TOTAL ERRORS EOR NEEDLER.  Q-AXIS FIRST.

 0187                             20,2266  0 0006 1  DSPLYTOT   EXTEND
 0188    RFE   68  LAST 1411      20,2267  22 061 0             QXCH    ITEMP1           SAVE Q FOR CHEKBITS RETURN.

 0189    REF    3  LAST  493      20,2270  3 0322 1             CA      CTHETA           DESIRED ATTITUDE, Y-AXIS, 2'S COMP.
 0190                             20,2271  0 0006 1             EXTEND                   SUBTRACT CURRENT ATTITUDE.
 0191    REF   14  LAST 1405      20,2272  20 033 0             MSU     CDUY             DIFFERENCE SCALED AT PI, 1'S COMP.
 0192    REE   10  LAST 1413      20,2273  55'760 0             TS      AK               SAVE FOR R-ERROR CALCULATION.
 0193                             20,2274  0 CC06 1             EXTEND
 0194    REF    2  LAST  200      20,2275  7 1415 1             MP      M21              (CHTETA-CDUY)*M21 SCALED AT PI RADIANS.
 0195    RFF   11  LAST 1413      20,2276  57'761 0             XCH     AK +1            STORE FIRST TERM OF Q ERROR.
 0196    REF    5  LAST  535      20,2277  3 0323 0             CA      CPSI             DESIRED ATTITUDE,Z-AXIS, 2'S COMP.
 0197                             20,2300  0 0006 1             EXTEND                   SUBTRACT CURRENT ATTITUDE.
 0198    RFF   18  LAST 1410      20,2301  20 034 1             MSU     CDUZ             DIFFERENCE SCALED AT PI, 1'S COMP.
 0199    REF   12  LAST 1413      20,2302  55'762 1             TS      AK +2            SAVE Z-AXIS TERM FOR R ERROR CALCULATION
 0200                             20,2303  0 CC06 1             EXTEND
 0201    REF    8  LAST  902      20,2304  7 1417 0             MP      M22              (CPSI-CDUZ)*M22, SCALED AT PI RADIANS.
 0202    REF   13  LAST 1413      20,2305  6 1761 0             AD      AK +1            Q ERROR COMPLETE           , AT PI RAD.
 0203    REE    1                 20,2306  0 2451 0             TC      OVERSUB2         PIN NEEDLES IN CASE OF OVERFLOW.
 0204    REF   14  LAST 1413      20,2307  55'761 1             TS      AK +1
```

```
R0205    R ERROR CALCULATION NEXT.

 0206    REF  15  LAST 1413   20,2310  3 1760 1            CA      AK              Y-AXIS DIFFERENCE STORED BY Q-AXIS CALC.
 0207                         20,2311  0 0006 1            EXTEND
 0208    REF   2  LAST  200   20,2312  7 1416 1            MP      M31             (CTHETA-CDUY)*M31, SCALED AT PI RADIANS.
 0209    REF  16  LAST 1414   20,2313  57'762 0            XCH     AK +2           FIRST TERM OF R ERROR.
A0210                                                                              Z-AXIS DIFFERENCE, STORED BY A CALC. IS
 0211                         20,2314  0 0006 1            EXTEND                  RECOVERED BY THE EXCHANGE.
 0212    REF   6  LAST  902   20,2315  7 1420 1            MP      M32             (CPSI-CDUZ)*M32, SCALED AT PI RADIANS.
 0213    REF  17  LAST 1414   20,2316  6 1762 0            AD      AK +2           R ERROR COMPLETE         , AT PI RAD.
 0214    REF   2  LAST 1413   20,2317  0 2451 0            TC      OVERSUB2        PIN NEEDLES IN CASE OF OVERFLOW.
 0215    REF  18  LAST 1414   20,2320  55'762 1            TS      AK +2

R0216    NOW CALCULATE P ERROR.  (NOTE THAT M13 = 1, SCALED AT 1, SO THE MULTIPLICATION IS BY-PASSED.)

 0218    REF  19  LAST 1414   20,2321  3 1760 1            CA      AK              Y-AXIS DIFFERENCE STORED BY Q AXIS CALC.
 0219                         20,2322  0 0006 1            EXTEND
 0220    REF   7  LAST  199   20,2323  7 1414 0            MP      M11             (CTHETA-CDUY)*M11 SCALED AT PI RADIANS.
 0221    REF  20  LAST 1414   20,2324  57'760 1            XCH     AK              FIRST TERM OF P ERROR IN AK, AT PI RAD.
 0222    REF  11  LAST  911   20,2325  30 321 1            CAE     CPHI            DESIRED ATTITUDE, X-AXIS, 2'S COMP.
 0223                         20,2326  0 0006 1            EXTEND                  SUBTRACT CURRENT X ATTITUDE.
 0224    REF  23  LAST 1410   20,2327  20 032 1            MSU     CDUX            X-AXIS DIFFERENCE, 1'S COMP, AT PI RAD.

R0225    M13 = 1, SO BYPASS THE MULTIPLICATION.
R0226             EXTEND
R0227             MP      M13             (CPHI-CDUX)*M13 SCALED AT PI RADIANS.

 0228    REF  21  LAST 1414   20,2330  6 1760 1            AD      AK              P ERROR COMPLETE       , SCALED AT PI RAD
 0229    REF   3  LAST 1414   20,2331  0 2451 0            TC      OVERSUB2        PIN NEEDLES IN CASE OF OVERFLOW.
 0230    REF  22  LAST 1414   20,2332  55'760 0            TS      AK

 0231                         20,2333  0 0006 1            EXTEND
 0232    REF  69  LAST 1413   20,2334  22 061 0            QXCH    ITEMP1          RESTORE Q FOR CHEKBITS RETURN.

 0233    REF   3  LAST 1413   20,2335  1 2456 0            TCF     RETNMORE        DISPLAY THESE THE NEXT TIME THROUGH
```

```
P0234   FDAI ATTITUDE ERROR DISPLAY SUBROUTINE

R0235   PROGRAM DESCRIPTION:     D. KEENE   5/24/67

R0236   MOD 1 BY CRAIG WORK, 12 DEC 67

R0237   MOD 2 BY CRAIG WORK, 6 APRIL 68 CONVERTS ATTITUDE ERROR DISPLAY SCALING FROM 16 7/8 DEG. TO 42 3/16 DEGREES.

R0239       THIS SUBROUTINE IS USED TO DISPLAY ATTITUDE ERRORS ON THE FDAI VIA THE DIGITAL TO ANALOG CONVERTERS (DACS)
R0241   IN THE CDUS.  CARE IS TAKEN TO METER OUT THE APPROPRIATE NUMBER OF PULSES TO THE IMU ERROR COUNTERS AND PREVENT
R0243   OVERFLOW, TO CONTROL THE RELAY SEQUENCING, AND TO AVOID INTERFERENCE WITH THE COARSE ALIGN LOOP WHICH ALSO USES
R0245   THE DACS.


R0246   CALLING SEQUENCE:

R0247       DURING THE INITIALIZATION SECTION OF THE USER'S PROGRAM, BIT3 OF RCSFLAGS SHOULD BE SET TO INITIATE THE
R0249   TURN-ON SEQUENCE WITHIN THE NEEDLES PROGRAM:

R0250             CS      RCSFLAGS          IN EBANK6
R0251             MASK    BIT3
P0252             ADS     RCSFLAGS

R0253   THEREAFTER, THE ATTITUDE ERRORS GENERATED BY THE USER SHOULD BE TRANSFERED TO THE FOLLOWING LOCATIONS IN EBANK6:

R0255             AK      SCALED 180 DEGREES  NOTE: THESE LOCATIONS ARE SUBJECT
R0256             AK1     SCALED 180 DEGREES        TO CHANGE
R0257             AK2     SCALED 180 DEGREES

R0258   FULL SCALED DEFLECTION OF THE NEEDLES CORRESPONDS TO 5 1/16 DEGREES, WHILE 384 BITS IN THE IMU ERROR COUNTER
R0260   CORRESPONDS TO 42 3/16 DEGREES.  (DAC MAXIMUM CAPACITY IS 384 BITS.) 46 BITS EFFECTIVELY PIN THE NEEDLES.

R0261   FOR RATE DISPLAY, FULL SCALE NEEDLE DEFLECTION IS 1 17/64 DEG/SEC, AND A FULL COUNTER IS ABOUT 10.5 DEG/SEC.
R0262   A CALL TO NEEDLER WILL THEN UPDATE THE DISPLAY:

R0263             INHINT
R0264             TC      IBNKCALL          NOTE: EBANK SHOULD BE SET TO E6
R0265             CADR    NEEDLER
R0266             RELINT

R0267       THIS PROCESS SHOULD BE REPEATED EACH TIME THE ERRORS ARE UPDATED.  AT LEAST 3 PASSES THRU THE PROGRAM ARE
R0269   REQUIRED BEFORE ANYTHING IS ACTUALLY DISPLAYED ON THE ERROR METERS.
R0270   NOTE: EACH CALL TO NEEDLER MUST BE SEPARATED BY AT LEAST 50MS TO ASSURE PROPER RELAY SEQUENCING.

R0272   ERASABLE USED:
R0273                           AK          CDUXCMD
R0274                           AK1         CDUYCMD
R0275                           AK2         CDUZCMD
R0276                           EDRIVEX     A,L,Q
R0277                           EDRIVEY     T5TEMP
```

```
R0278                            EDRIVEZ    DINDX

R0279   SWITCHES:                RCSFLAGS   BITS 3,2

R0280   I/O CHANNELS:            CHAN12     BIT 4 (COARSE ALIGN - READ ONLY)
R0281                            CHAN12     BIT 6 (IMU ERROR COUNTER ENABLE)
R0282                            CHAN14     BIT 13,14,15 (DAC ACTIVITY)


R0283   SIGN CONVENTION<       AK = THETAC - THETA
R0284             WHERE        THETAC = COMMAND ANGLE
R0285                          THETA  = PRESENT ANGLE


 0286   REF  10  LAST 1412   20,2336  3 1774 1  NEEDLER  CA      RCSFLAGS
 0287   REF  24  LAST 1368   20,2337  7 6263 1           MASK    SIX
 0288                        20,2340  0 0006 1           EXTEND
 0289   REF   1              20,2341  1 2376 0           BZF     NEEDLES3
 0290   REF  40  LAST 1407   20,2342  7 4742 0           MASK    BIT3
 0291                        20,2343  0 0006 1           EXTEND
 0292   REF   1              20,2344  1 2367 0           BZF     NEEDLER2          BIT3 = 0, BIT2 = 1

 0293   REF  59  LAST 1407   20,2345  4 4737 1           CS      BIT6              FIRST PASS BIT3 = 1
 0294                        20,2346  0 0006 1           EXTEND                    DISABLE IMU ERROR COUNTER TO ZERO DACS
 0295   REF  63  LAST 1411   20,2347  03 C12 1           WAND    CHAN12            MUST WAIT AT LEAST 60 MS BEFORE
 0296   REF 285  LAST 1411   20,2350  4 4745 1  NEEDLEI1 CS      ZERO              ENABLING COUNTERS.
 0297   REF  23  LAST 1414   20,2351  55'760 0           TS      AK                ZERO THE INPUTS ON FIRST PASS
 0298   REF   1              20,2352  55'761 1           TS      AK1
 0299   REF   1              20,2353  55'762 1           TS      AK2
 0300   REF   3  LAST  142   20,2354  55'763 0           TS      EDRIVEX           ZERO THE DISPLAY REGISTERS
 0301   REF   1              20,2355  55'764 1           TS      EDRIVEY
 0302   REF   1              20,2356  55'765 0           TS      EDRIVEZ
 0303   REF   4  LAST 1310   20,2357  54 050 0           TS      CDUXCMD           ZERO THE OUT COUNTERS
 0304   REF   2  LAST  184   20,2360  54 051 1           TS      CDUYCMD
 0305   REF   2  LAST  185   20,2361  54 052 1           TS      CDUZCMD
 0306   REF  25  LAST 1416   20,2362  4 6263 1           CS      SIX               RESET RCSFLAGS FOR PASS2
 0307   REF  11  LAST 1416   20,2363  7 1774 0           MASK    RCSFLAGS
 0308   REF  52  LAST 1391   20,2364  6 4743 0           AD      BIT2
 0309   REF  12  LAST 1416   20,2365  55'774 0           TS      RCSFLAGS
 0310   REF   4  LAST 1414   20,2366  1 2456 0           TCF     RETNMORE

 0311   REF  60  LAST 1416   20,2367  3 4737 0  NEEDLER2 CAF     BIT6              ENABLE IMU ERROR COUNTERS
 0312                        20,2370  0 0006 1           EXTEND
 0313   REF  64  LAST 1416   20,2371  05 C12 1           WOR     CHAN12
 0314   REF  26  LAST 1416   20,2372  4 6263 1           CS      SIX               RESET RCSFLAGS TO DISPLAY ATTITUDE
 0315   REF  13  LAST 1416   20,2373  7 1774 0           MASK    RCSFLAGS          ERRORS    WAIT ATLEAST 4 MS FOR
 0316   REF  14  LAST 1416   20,2374  55'774 0           TS      RCSFLAGS          RELAY CLOSURE
 0317   REF   5  LAST 1416   20,2375  1 2456 0           TCF     RETNMORE

 0318   REF  61  LAST 1416   20,2376  3 4737 0  NEEDLES3 CAF     BIT6              CHECK TO SEE IF IMU ERROR COUNTER
```

```
0319                          20,2377  0 0006 1            EXTEND                  IS ENABLED
0320   REF  65   LAST 1416    20,2400  02 C12 0            RAND     CHAN12
0321   REF 471   LAST 1413    20,2401  10 000 0            CCS      A              IF NOT, RE-INITIALIZE NEEDLER.
0322   RFF   1                20,2402  1 2407 1            TCF      NEEDLES

0323   REF  15   LAST 1416    20,2403  4 1774 0            CS       RCSFLAGS       SET UP INITIALIZATION FLAG IN RCSFLAGS.
0324   REF  41   LAST 1416    20,2404  7 4742 0            MASK     BIT3
0325   REF  16   LAST 1417    20,2405  27'774 0            ADS      RCSFLAGS
0326   REF   6   LAST 1416    20,2406  1 2456 0            TCF      RETNMORE

0327   REF  91   LAST 1410    20,2407  3 4743 0  NEEDLES   CAF      TWO
0328   REF   1                20,2410  54 C63 0  OACLOOP   TS       DINDX
0329   REF   1                20,2411  4 2450 0            CS       ONETENTH       RESCALE INPUTS TO + OR - 1800 DEGREES.
0330                          20,2412  0 C006 1            EXTENO
0331   REF   2   LAST 1417    20,2413  5 C063 1            INOEX    DINOX
0332   REF  24   LAST 1416    20,2414  7 1760 0            MP       AK
0333   REF 285   LAST 1412    20,2415  54 001 1            TS       L
0334   REF 472   LAST 1417    20,2416  10 000 0            CCS      A
0335   REF   1                20,2417  3 2446 0            CA       DACLIMIT
0336                          20,2420  1 2422 0            TCF      +2
0337   REF   2   LAST 1417    20,2421  4 2446 1            CS       OACLIMIT
0338   REF 286   LAST 1417    20,2422  6 0001 0            AD       L
0339   REF   1                20,2423  54 061 1            TS       T5TEMP         OVFLO CHK
0340                          20,2424  1 2430 0            TCF      +4
0341   RFF 473   LAST 1417    20,2425  50 000 1            INDEX    A              ON OVERFLOW LIMIT OUTPUT TO +-384
0342   REF   3   LAST 1417    20,2426  3 2446 0            CAF      DACLIMIT
0343   REF 287   LAST 1417    20,2427  54 001 1            TS       L
0344   REF   3   LAST 1417    20,2430  50 063 1            INDEX    OINOX
0345   REF   4   LAST 1416    20,2431  4 1763 0            CS       EORIVEX        CURRENT VALUE OF OAC
0346   REF 288   LAST 1417    20,2432  6 0001 0            AO       L
0347   RFF   4   LAST 1417    20,2433  50 C63 1            INOEX    DINDX
0348   REF   5   LAST 1416    20,2434  26 050 0            ADS      CDUXCMD
0349   REF   5   LAST 1417    20,2435  50 063 1            INDEX    OINOX
0350   REF   5   LAST 1417    20,2436  23'763 1            LXCH     EORIVEX
0351   RFF   6   LAST 1417    20,2437  10 063 0            CCS      DINOX
0352   RFF   1                20,2440  1 2410 1            TCF      OACLOOP
0353   REF   5   LAST 1370    20,2441  3 7761 0            CAF      13,14,15
0354                          20,2442  0 0006 1            EXTEND
0355   RFF  26   LAST 1323    20,2443  05 014 1            WOR      CHAN14         SET OAC ACTIVITY BITS
0356   RFF   7   LAST 1417    20,2444  1 2456 0            TCF      RETNMORE

0357                          20,2445   77177 0            OEC      -384
0358                          20,2446   37200 1  DACLIMIT  OEC      16000
0359                          20,2447   CC600 1            DEC      384

0360                          20,2450   03146 1  ONETENTH  OCT      03146          DECIMAL  +0.1, SCALED AT 1.
0361   REF  61   LAST 1363       4741            OSPLYALT  FQUALS   BIT4           100 MS ALTERNATION BIT IN RCSFLAGS


0362                          20,2451  54 007 1  OVERSUB2  TS       7              RETURNS  A  UNCHANGED  OR LIMITED TO
```

```
 0363   REF 392  LAST 1405   20,2452  0 0002 0             TC      Q                 POSMAX OR NEGMAX IF A HAS OVERFLOW
 0364   REF 474  LAST 1417   20,2453  50 000 1             INDEX   A
 0365   REF   7  LAST 1396   20,2454  4 4725 1             CS      LIMITS            DUPLICATE CODING IN  BANK 16
 0366   REF 393  LAST 1418   20,2455  0 0002 0             TC      Q

 0367                        20,2456  0 0006 1  RETNMORE EXTEND                    RETURN TO CHEKMORE
 0368   REF   1              20,2457  3 2462 0           DCA     MORECADR
 0369                        20,2460  52 006 0           DTCB

 0370   REF  17  LAST 1410   E6,1536                     FBANK= AOSQ
 0371   REF   1              20,2461   02016 1  MORECADR 2CADR   CHEKMORE
 0371   REF   1              20,2462   34106 1
 0001                         16,2217                         BANK    16
 0002   REF   2  LAST 1407    16,2000                         SETLOC  DAPS1
 0003                         16,2217                         BANK

 0004   REF   3  LAST 1413    E6,1464                         EBANK=  PERROR
 0005   REF   1                                               COUNT*  $$/DAPP

R0006   THE FOLLOWING T5RUPT ENTRY BEGINS THE PROGRAM WHICH CONTROLS THE P-AXIS ACTION OF THE LEM USING THE RCS JETS.
R0008   THE NOMINAL TIME BETWEEN THE P-AXIS RUPTS IS 100 MS IN ALL NON-IDLING MODES OF THE DAP.

 0010   REF   2  LAST 1410    16,2217  3 7750 1  PAXIS        CA      MS100
 0011   REF   5  LAST 1410    16,2220  26 0030 0              ADS     TIME5           *** NECESSARY IN ORDER TO ALLOW SYN-
A00115                                                                                CHRONIZATION WITH OTHER INTERRUPTS ***

 0012   REF  13  LAST 1409    16,2221  22 0016 0              LXCH    BANKRUPT        INTERRUPT LEAD IN (CONTINUED)
 0013                         16,2222  0 0006 1               EXTEND
 0014   REF  12  LAST 1409    16,2223  22 012 1               QXCH    QRUPT

R0015   CHECK IF DAP PASS IS PERMISSIBLE

 0016   REF   2  LAST 1410    16,2224  11'756 0               CCS     DAPZRUPT        IF DAPZRUPT POSITIVE, DAP (JASK) IS
 0017   REF   3  LAST 1357    16,2225  0 5626 0               TC      BAILOUT            STILL IN PROGRESS AND A RESTART IS
 0018                         16,2226    32000 0              OCT     32000             CALLED FOR.  IT IS NEVER ZERO

 0019   REF   2  LAST 1409    16,2227  0 2000 0               TC      CHEKBITS        RETURN IS TO I+1 IF DAP SHOULD STAY ON.

 00191  REF  24  LAST 1414    16,2230  3 0032 0               CA      CDUX            READ AND STORE CDU'S
 00192  REF   1               16,2231  55'747 0               TS      DAPTREG4
 00193  REF  15  LAST 1413    16,2232  3 0033 1               CA      CDUY
 00194  REF   2  LAST  136    16,2233  55'750 0               TS      DAPTREG5
 00195  REF  19  LAST 1413    16,2234  3 0034 0               CA      CDUZ
 00196  REF   2  LAST  138    16,2235  55'751 1               TS      DAPTREG6
R0020   ***** KALCMANU-DAP AND "RATE-HOLD"-DAP INTERFACE *****

R0021   THE FOLLOWING SECTION IS EXECUTED EVERY 100 MS (10 TIMES A SECOND) WITHIN THE P-AXIS REACTION CONTROL SYSTEM
R0023   AUTOPILOT (WHENEVER THE DAP IS IN OPERATION).

 0024   REF  21  LAST 1405    16,2236  3 1634 1               CA      CDUXD
 0025                         16,2237  0 0006 1               EXTEND
 0026   REF   6  LAST 1405    16,2240  21'637 0               MSU     DELCDUX
 0027   REF   1               16,2241  0 2262 0               TC      1STOTWOS
 0028   REF  22  LAST 1419    16,2242  55'634 0               TS      CDUXD
 0029   REF   9  LAST 1405    16,2243  3 1635 0               CA      CDUYD
 0030                         16,2244  0 0006 1               EXTEND
 0031   REF   3  LAST 1405    16,2245  21'640 0               MSU     DELCDUY
 0032   REF   2  LAST 1419    16,2246  0 2262 0               TC      1STOTWOS
 0033   REF  10  LAST 1419    16,2247  55'635 1               TS      CDUYD
 0034   REF   8  LAST 1405    16,2250  3 1636 0               CA      CDUZD
 0035                         16,2251  0 0006 1               EXTEND
 0036   REF   3  LAST 1405    16,2252  21'641 1               MSU     DELCDUZ
 0037   REF   3  LAST 1419   16,2253  0 2262 0           TC     1STOTWOS
 0038   REF   9  LAST 1419   16,2254  55'636 1           TS     CDUZD
 00381                       16,2255  0 0006 1           EXTEND                  DIMINISH MANUAL CONTROL DIRECT RATE
 00382  REF   1              16,2256  27'445 1           DIM    TCP              TIME COUNTERS.
 00383                       16,2257  0 0006 1           EXTEND
 00384  REF   1              16,2260  27'457 1           DIM    TCOR
A0039                                           RATELOOP COMPUTES JETRATEQ, JETRATER, AND 1JACC*NO. PJETS IN ITEMP1.
A0040                                             RETURNS TO BACKP.

A0041                                             JETRATE = 1JACC*NO.PJETS*TJP  (NOTE TJ IS THE TIME FIRED DURING CSP)

A0042                                             JETRATEQ= 1JACCQ(TJU*NO.UJETS - TJV*NO.VJETS)

A0043                                             JETRATER= 1JACCR(TJU*NO.UJETS + TJV*NO.VJETS)

 0044   REF   1              16,2261  1 2653 1           TCF    PAXFILT          PROCEEDS TO RATELOOP AFTER SUPERJOB
 0045   REF 475  LAST 1418   16,2262  10 000 0  1STOTWOS CCS    A
 0046   REF 142  LAST 1398   16,2263  6 4744 1           AD     ONE
 0047   REF 394  LAST 1418   16,2264  0 0002 0           TC     Q
 0048   REF 476  LAST 1420   16,2265  4 0000 0           CS     A
 0049   REF 395  LAST 1420   16,2266  0 0002 0           TC     Q
 0050                        16,2267  0 0006 1  SUBDIVDE EXTEND                  OVERFLOW PROCTION ROUTINE TO GIVE
 0051   REF   3  LAST  138   16,2270  7 1740 1           MP     DAPTEMP3           POSMAX OR NEGMAX IF THE DIVIDE WOULD
 0052   REF   3  LAST  135   16,2271  21'427 0           DAS    OMEGAU             OVERFLOW

 0053                        16,2272  0 0006 1  +3       EXTEND
 00531  REF   4  LAST 1420   16,2273  3 1427 1           DCA    OMEGAU
 00532  REF   2  LAST  136   16,2274  53'743 1           DXCH   DAPTEMP5
 00533  REF   5  LAST 1420   16,2275  11'426 1           CCS    OMEGAU
 0054                        16,2276  1 2300 1           TCF    +2
 0055   REF   1              16,2277  1 2310 0           TCF    DIVIDER
 0056   REF   1              16,2300  6 2321 0           AD     -OCT630
 0057                        16,2301  0 0006 1           EXTEND
 0058   REF   2  LAST 1420   16,2302  6 2310 1           BZMF   DIVIDER

 0059   REF   6  LAST 1420   16,2303  11'426 1           CCS    OMEGAU
 0060   REF  39  LAST 1410   16,2304  3 4724 1           CA     POSMAX            45 DEG/SEC
 0061   REF 396  LAST 1420   16,2305  0 0002 0           TC     Q
 0062   REF  40  LAST 1420   16,2306  4 4724 0           CS     POSMAX
 0063   REF 397  LAST 1420   16,2307  0 0002 0           TC     Q

 0064   REF   7  LAST 1420   16,2310  53'427 0  DIVIDER  DXCH   OMEGAU
 0065                        16,2311  0 0006 1           EXTEND
 0066   REF   2  LAST 1419   16,2312  11'747 0           DV     DAPTREG4
 0067   REF 398  LAST 1420   16,2313  0 0002 0           TC     Q

 0068                        16,2314  54 007 1  OVERSUB  TS     7                RETURNS A UNCHANGED OR LIMITED TO
 0069   REF 399  LAST 1420   16,2315  0 0002 0           TC     Q                  POSMAX OR NEGMAX IF A HAS OVERFLOW
 0070   REF 477  LAST 1420   16,2316  50 000 1           INDEX  A
 0071   REF  51  LAST 1401   16,2317  4 4725 1           CS     BIT15 -1
 0072  REF 400  LAST 1420   16,2320  0 0002 0               TC      Q

 0073                       16,2321   77147 0  -OCT630    OCT     77147

 0074  REF  19  LAST  141   16,2322  3 1736 1  BACKP      CA      DAPTEMP1
 0075                       16,2323  0 0006 1             EXTEND
 0076  REF   6  LAST  915   16,2324  7 1530 1             MP      1JACC
 0077  REF   3  LAST  137   16,2325  55'744 0             TS      JETRATE
A0078                                          BEGINNING OF THE RATE DERIVATION
A0079                                          OMEGAP,Q,R         BODY RATES SCALED AT PI/4
A0080                                          TRAPER,Q,R         BODY ANGLE ERRORS FROM PREDICTED ANGLE (PI/40)
A0081                                          NP(QR)TRAPS        NUMBER OF TIMES ANGLE ERROR HAS BEEN ACCUMULATED
A0082                                          ADSQ(R)TERM        CHANGE IN RATE DUE TO OFFSET ACCELLERATION. (PI/4)
A0083                                          JETRATE,Q,R        CHANGE IN RATE DUE TO  JET   ACCELLERATION. (PI/4)
A0084                                          TRAPSIZE           NEGATIVE LIMIT OF MAGNITUDE OF TRAPEDP,ECT.
A0086                                          OMEGAU             DP-TEMPORARY STORAGE

A0087                                             OMEGA = OMEGA + JETRATE + ADSTERM (+TRAPED/NTRAPS IF TRAPED BIG)

 0088  REF   3  LAST 1420   16,2326  31'747 1             CAE     DAPTREG4         CDUX IS STORED HERE
 0089  REF 289  LAST 1417   16,2327  54 001 1             TS      L
 0090                       16,2330  0 0006 1             EXTEND
 0091  REF   4  LAST 1410   16,2331  21'440 1             MSU     OLDXFORP         SCALED AT PI
 0092  REF   5  LAST 1421   16,2332  23'440 0             LXCH    OLDXFORP
 0093  REF  20  LAST 1421   16,2333  55'736 0             TS      DAPTEMP1
 0094  REF   1              16,2334  3 3621 1             CA      1/40
 0095  REF   4  LAST 1421   16,2335  55'747 0             TS      DAPTREG4
 0096  REF   4  LAST 1421   16,2336  4 1744 0             CS      JETRATE
 0097                       16,2337  0 0006 1             EXTEND
 0098  REF  82  LAST 1399   16,2340  7 4727 0             MP      BIT14
 0099  REF   7  LAST 1409   16,2341  27'430 0             ADS     TRAPEDP
 0100  REF   1              16,2342  3 1745 0             CA      JETRATEQ
 0101  REF   4  LAST 1409   16,2343  6 1544 0             AD      ADSQTERM
 0102                       16,2344  0 0006 1             EXTEND
 0103  REF   1              16,2345  7 7757 1             MP      -BIT14
 0104  REF   2  LAST 1409   16,2346  27'431 1             ADS     TRAPEDQ
 0105  REF   1              16,2347  3 1746 0             CA      JETRATER
 0106  REF   3  LAST 1409   16,2350  6 1545 1             AD      ADSRTERM
 0107                       16,2351  0 0006 1             EXTEND
 0108  REF   2  LAST 1421   16,2352  7 7757 1             MP      -BIT14
 0109  REF   2  LAST 1409   16,2353  27'432 1             ADS     TRAPEDR

 0110  REF   3  LAST 1419   16,2354  3 1750 1             CA      DAPTREG5         CDUY IS STORED HERE
 0111  REF 290  LAST 1421   16,2355  54 001 1             TS      L
 0112                       16,2356  0 0006 1             EXTEND
 0113  REF   1              16,2357  21'441 0             MSU     OLDYFORP         SCALED AT PI
 0114  REF   2  LAST 1421   16,2360  23'441 1             LXCH    OLDYFORP
 0115  REF   3  LAST  138   16,2361  55'737 1             TS      DAPTEMP2
 0116                       16,2362  0 0006 1             EXTEND
 0117  REF   8  LAST 1414   16,2363  7 1414 0             MP      M11              M11 SCALED AT 1
```

```
L        P-AXIS RCS AUTOPILOT                                                                    USER'S PAGE NO.   4       E6 S4

 0118    REF  21  LAST 1421    16,2364  6 1736 1          AD      DAPTEMP1
 0119    REF   8  LAST 1420    16,2365  53'427 0          DXCH    OMEGAU

 0120    REF   1               16,2366  0 2272 1          TC      SUBDIVDE +3       RETURNS WITH CDU-RATE AT PI/4

 0121                          16,2367  0 0006 1          EXTEND
 0122    REF  12  LAST 1413    16,2370  61'421 1          SU      OMEGAP
 0123    REF   8  LAST 1421    16,2371  27'430 0          ADS     TRAPEDP
 0124    REF   1               16,2372  0 2314 0          TC      OVERSUB
 0125    REF   9  LAST 1422    16,2373  55'430 0          TS      TRAPEDP
 012501                        16,2374  0 0006 1          EXTEND
 012502  REF   3  LAST 1420    16,2375  3 1743 0          DCA     DAPTEMP5
 012503  REF   3  LAST  135    16,2376  21'447 0          DAS     DXERROR
 012504  REF   1               16,2377  4 1454 1          CS      PLAST
 012505                        16,2400  0 0006 1          EXTEND
 012506  REF   2  LAST 1421    16,2401  7 3621 0          MP      1/40
 012507  REF   4  LAST 1422    16,2402  21'447 0          DAS     DXERROR           MANUAL MODE X-ATTITUDE ERROR (DP)
 0126    REF   3  LAST 1419    16,2403  3 1751 0          CA      DAPTREG6          CDUZ IS STORED HERE
 0127    REF 291  LAST 1421    16,2404  54 0001 1         TS      L
 0128                          16,2405  0 0006 1          EXTEND
 0129    REF   2  LAST 1410    16,2406  21'442 0          MSU     OLDZFORQ
 0130    REF   4  LAST 1420    16,2407  55'740 1          TS      DAPTEMP3
 0131    REF   3  LAST 1422    16,2410  23'442 1          LXCH    OLDZFORQ
 0132    REF   3  LAST 1413    16,2411  3 1415 0          CA      M21
 0133                          16,2412  0 0006 1          EXTEND
 0134    REF   4  LAST 1421    16,2413  7 1737 1          MP      DAPTEMP2
 0135    REF   9  LAST 1422    16,2414  53'427 0          DXCH    OMEGAU
 0136    REF   9  LAST 1413    16,2415  3 1417 1          CA      M22
 0137    REF   2  LAST 1422    16,2416  0 2267 0          TC      SUBDIVDE

 0138                          16,2417  0 0006 1          EXTEND
 0139    REF  13  LAST 1413    16,2420  61'422 1          SU      OMEGAQ
 0140    REF   3  LAST 1421    16,2421  27'431 1          ADS     TRAPEDQ
 0141    REF   2  LAST 1422    16,2422  0 2314 0          TC      OVERSUB
 0142    REF   4  LAST 1422    16,2423  55'431 1          TS      TRAPEDQ
 014201                        16,2424  0 0006 1          EXTEND
 014202  REF   4  LAST 1422    16,2425  3 1743 0          DCA     DAPTEMP5
 014203  REF   2  LAST  135    16,2426  21'451 1          DAS     DYERROR
 014204  REF   1               16,2427  4 1455 0          CS      QLAST
 014205                        16,2430  0 0006 1          EXTEND
 014206  REF   3  LAST 1422    16,2431  7 3621 0          MP      1/40
 014207  REF   3  LAST 1422    16,2432  21'451 1          DAS     DYERROR           MANUAL MODE Y-ATTITUDE ERROR (DP)
 0143    REF   3  LAST 1414    16,2433  3 1416 0          CA      M31
 0144                          16,2434  0 0006 1          EXTEND
 0145    REF   5  LAST 1422    16,2435  7 1737 1          MP      DAPTEMP2
 0146    REF  10  LAST 1422    16,2436  53'427 0          DXCH    OMEGAU
 0147    REF   7  LAST 1414    16,2437  3 1420 0          CA      M32

 0148    REF   3  LAST 1422    16,2440  0 2267 0          TC      SUBDIVDE
```

```
0149                          16,2441  0 0006 1           EXTEND
0150    REF   6  LAST 1413    16,2442  61'423 0           SU       OMEGAR
0151    REF   3  LAST 1421    16,2443  27'432 1           ADS      TRAPEDR
0152    REF   3  LAST 1422    16,2444  0 2314 0           TC       OVERSUB
0153    REF   4  LAST 1423    16,2445  55'432 1           TS       TRAPEDR          TRAPEDS HAVE ALL BEEN COMPUTED

015301                        16,2446  0 0006 1           EXTEND
015302  REF   5  LAST 1422    16,2447  3 1743 0           DCA      DAPTEMP5
015303  REF   2  LAST  135    16,2450  21'453 0           DAS      DZERROR
015304  REF   1               16,2451  4 1456 0           CS       RLAST
015305                        16,2452  0 0006 1           EXTEND
015306  REF   4  LAST 1422    16,2453  7 3621 0           MP       1/40
015307  REF   3  LAST 1423    16,2454  21'453 0           DAS      DZERROR          MANUAL MODE Z-ATTITUDE ERROR (DP)
01531   REF  38  LAST 1409    16,2455  3 0111 0           CA       DAPBOOLS         PICK UP PAD LOADED STATE ESTIMATOR GAINS
01532   REF   7  LAST  907    16,2456  7 4730 0           MASK     CSMDOCKD
01533                         16,2457  0 0006 1           EXTEND
01534   REF   1               16,2460  1 2466 0           BZF      LMONLY
01535                         16,2461  0 0006 1           EXTEND                       DOCKED
01536   REF   2  LAST  224    16,2462  3 1405 1           DCA      DKOMEGAN
01537   REF   5  LAST 1421    16,2463  53'750 0           DXCH     DAPTREG4
01538   REF   2  LAST  223    16,2464  3 1403 1           CA       DKTRAP
015382                        16,2465  1 2472 0           TCF      +5
015384                        16,2466  0 0006 1  LMONLY   EXTEND                       UNDOCKED
015386  REF   2  LAST  224    16,2467  3 1410 0           DCA      LMOMEGAN
015388  REF   6  LAST 1423    16,2470  53'750 0           DXCH     DAPTREG4
01539   REF   2  LAST  223    16,2471  3 1406 1           CA       LMTRAP
015392  REF   4  LAST 1422    16,2472  55'751 1  +5       TS       DAPTREG6
0154    REF  10  LAST 1422    16,2473  11'430 0           CCS      TRAPEDP
0155                          16,2474  1 2476 1           TCF      +2
0156    REF   1               16,2475  1 2513 0           TCF      SMALPDIF
0157    REF   5  LAST 1423    16,2476  6 1751 0           AD       DAPTREG6         TRAPSIZE > ABOUT 77001 %-1.4DEG/SEC"
0158                          16,2477  0 0006 1           EXTEND
0159    REF   2  LAST 1423    16,2500  6 2513 1           BZMF     SMALPDIF
0160                          16,2501  22 007 0           ZL
0161    REF  11  LAST 1423    16,2502  23'430 1           LXCH     TRAPEDP
0162    REF 286  LAST 1416    16,2503  3 4746 0           CA       ZERO
0163                          16,2504  0 0006 1           EXTEND
0164    REF   2  LAST 1410    16,2505  11'433 0           DV       NPTRAPS
0165    REF  13  LAST 1422    16,2506  27'421 0           ADS      OMEGAP
0166    REF   4  LAST 1423    16,2507  0 2314 0           TC       OVERSUB
0167    REF  14  LAST 1423    16,2510  55'421 0           TS       OMEGAP
0168    REF   7  LAST 1423    16,2511  3 1747 1           CA       DAPTREG4         ABOUT 10 OR 0 FOR DOCKED OR UNDOCKED
0169    REF   3  LAST 1423    16,2512  55'433 0           TS       NPTRAPS
0170    REF   4  LAST 1423    16,2513  25'433 1  SMALPDIF INCR     NPTRAPS
0171    REF   5  LAST 1421    16,2514  3 1744 1  P-RATE   CA       JETRATE
0172    REF  15  LAST 1423    16,2515  27'421 0           ADS      OMEGAP
0173    REF   5  LAST 1423    16,2516  0 2314 0           TC       OVERSUB
0174    REF  16  LAST 1423    16,2517  55'421 0           TS       OMEGAP

0175    REF   5  LAST 1422    16,2520  11'431 1           CCS      TRAPEDQ
```

```
 0176                            16,2521  1 2523 0               TCF     +2
 0177    REF   1                 16,2522  1 2550 1               TCF     Q-RATE
 0178    REF   6  LAST 1423      16,2523  6 1751 0               AD      DAPTREG6           TRAPSIZE > ABOUT 77001 %-1.4DEG/SEC"
 0179                            16,2524  0 0006 1               EXTEND
 0180    REF   2  LAST 1424      16,2525  6 2550 0               BZMF    Q-RATE
 0181                            16,2526  22 007 0               ZL
 0182    REF   6  LAST 1423      16,2527  23'431 0               LXCH    TRAPEDQ
 0183    REF 287  LAST 1423      16,2530  3 4746 0               CA      ZERO
 0184                            16,2531  0 0006 1               EXTEND
 0185    REF   2  LAST 1410      16,2532  11'434 1               DV      NQTRAPS
 0186    REF  22  LAST 1422      16,2533  55'736 0               TS      DAPTEMP1           SAVE FOR OFFSET ESTIMATE
 0189    REF  14  LAST 1422      16,2534  27'422 0               ADS     OMEGAQ
 0190    REF   6  LAST 1423      16,2535  0 2314 0               TC      OVERSUB
 0191    REF  15  LAST 1424      16,2536  55'422 0               TS      OMEGAQ
 0192    REF   8  LAST 1423      16,2537  3 1747 1               CA      DAPTREG4           ABOUT 10 OR 0 FOR DOCKED OR UNDOCKED
 0193    REF   3  LAST 1424      16,2540  57'434 0               XCH     NQTRAPS
 0194    REF   4  LAST 1421      16,2541  6 1750 1               AD      DAPTREG5           KAOS > ABOUT 60D %N/N_60"
 0195    REF  23  LAST 1424      16,2542  57'736 1               XCH     DAPTEMP1
 0196                            16,2543  0 0006 1               EXTEND
 0197    REF  21  LAST 1388      16,2544  7 4747 0               MP      FIVE
 0198                            16,2545  0 0006 1               EXTEND
 0199    REF  24  LAST 1424      16,2546  11'736 0               DV      DAPTEMP1
 0200    REF  18  LAST 1418      16,2547  27'536 1               ADS     ADSQ
 0201    REF   4  LAST 1424      16,2550  25'434 0    Q-RATE     INCR    NQTRAPS
 0202    REF   2  LAST 1421      16,2551  3 1745 0               CA      JETRATEQ
 0203    REF   5  LAST 1421      16,2552  6 1544 0               AD      ADSQTERM
 0204    REF  16  LAST 1424      16,2553  27'422 0               ADS     OMEGAQ
 0205    REF   7  LAST 1424      16,2554  0 2314 0               TC      OVERSUB
 0206    REF  17  LAST 1424      16,2555  55'422 0               TS      OMEGAQ

 0207    REF   5  LAST 1423      16,2556  11'432 1               CCS     TRAPEDR
 0208                            16,2557  1 2561 0               TCF     +2
 0209    REF   1                 16,2560  1 2606 1               TCF     R-RATE
 0210    REF   7  LAST 1424      16,2561  6 1751 0               AD      DAPTREG6           TRAPSIZE > ABOUT 77001 %-1.4DEG/SEC"
 0211                            16,2562  0 0006 1               EXTEND
 0212    REF   2  LAST 1424      16,2563  6 2606 0               BZMF    R-RATE
 0213                            16,2564  22 007 0               ZL
 0214    REF   6  LAST 1424      16,2565  23'432 0               LXCH    TRAPEDR
 0215    REF 288  LAST 1424      16,2566  3 4746 0               CA      ZERO
 0216                            16,2567  0 0006 1               EXTEND
 0217    REF   2  LAST 1410      16,2570  11'435 0               DV      NRTRAPS
 0218    REF   6  LAST 1422      16,2571  55'737 1               TS      DAPTEMP2           SAVE FOR OFFSET ESTIMATE
 0221    REF   7  LAST 1423      16,2572  27'423 1               ADS     OMEGAR
 0222    REF   8  LAST 1424      16,2573  0 2314 0               TC      OVERSUB
 0223    REF   8  LAST 1424      16,2574  55'423 1               TS      OMEGAR
 0224    REF   9  LAST 1424      16,2575  3 1747 1               CA      DAPTREG4           ABOUT 10 OR 0 FOR DOCKED OR UNDOCKED
 0225    REF   3  LAST 1424      16,2576  57'435 1               XCH     NRTRAPS
 0226    REF   5  LAST 1424      16,2577  6 1750 1               AD      DAPTREG5           KAOS > ABOUT 60D %N/N_60"
 0227    REF   7  LAST 1424      16,2600  57'737 0               XCH     DAPTEMP2
 0228                            16,2601  0 0006 1               EXTEND
 0229   REF  22  LAST 1424   16,2602  7 4747 0               MP      FIVE
 0230                        16,2603  0 0006 1               EXTEND
 0231   REF   8  LAST 1424   16,2604  11'737 1               DV      DAPTEMP2
 0232   REF   6  LAST 1409   16,2605  27'540 0               ADS     AOSR
 0233   REF   4  LAST 1424   16,2606  25'435 1  R-RATE       INCR    NRTRAPS
 0234   REF   2  LAST 1421   16,2607  3 1746 0               CA      JETRATER
 0235   REF   4  LAST 1421   16,2610  6 1545 1               AD      AOSRTERM
 0236   REF   9  LAST 1424   16,2611  27'423 1               ADS     OMEGAR
 0237   REF   9  LAST 1424   16,2612  0 2314 0               TC      OVERSUB
 0238   REF  10  LAST 1425   16,2613  55'423 1               TS      OMEGAR

A0239                                           END OF RATE DERIVATION

A0240                                            BEGIN OFFSET ESTIMATER

A0241                                             IN POWERED FLIGHT, AOSTASK WILL BE CALLED EVERY 2 SECONDS.

A0242                                             AOS = AOS + K*SUMRATE

 0243   REF  39  LAST 1423   16,2614  4 0111 1               CS      DAPBOOLS
 0244   REF   3  LAST 1406   16,2615  7 4735 0               MASK    DRIFTBIT
 0245   REF 478  LAST 1420   16,2616  10 000 0               CCS     A
 0246   REF   1              16,2617  1 2630 1               TCF     WORKTIME
 0247   REF   5  LAST 1409   16,2620  55'424 0               TS      ALPHAQ          ZERO THE OFFSET ACCELERATION VALUES.
 0248   REF   5  LAST 1409   16,2621  55'425 1               TS      ALPHAR
 0249   REF   6  LAST 1424   16,2622  55'544 1               TS      AOSQTERM
 0250   REF   5  LAST 1425   16,2623  55'545 0               TS      AOSRTERM
 0251   REF  19  LAST 1424   16,2624  55'536 1               TS      AOSQ
 0252   REF   7  LAST 1425   16,2625  55'540 0               TS      AOSR
 0253   REF   1              16,2626  1 2673 0               TCF     PRETIMCK
 0254                        16,2627   00074 1  KAOS         DEC     60
 0255   REF   2  LAST 1409   16,2630  3 1510 1  WORKTIME     CA      QACCDOT
 0256                        16,2631  0 0006 1               EXTEND
 0257   REF   3  LAST 1013   16,2632  7 4757 1               MP      CALLCODE        OCTAL 00032 IS DECIMAL .1 AT 2(6).
 0258   REF  20  LAST 1425   16,2633  21'537 0               DAS     AOSQ
 0259   REF  21  LAST 1425   16,2634  3 1536 0               CA      AOSQ
 0260   REF   6  LAST 1425   16,2635  55'424 0               TS      ALPHAQ
 0261                        16,2636  0 0006 1               EXTEND
 0262   REF   1              16,2637  7 3617 0               MP      200MS            .2 AT 1
 0263   REF   7  LAST 1425   16,2640  55'544 1               TS      AOSQTERM
 0264   REF   2  LAST 1409   16,2641  3 1512 0               CA      RACCDOT
 0265                        16,2642  0 0006 1               EXTEND
 0266   REF   4  LAST 1425   16,2643  7 4757 1               MP      CALLCODE        OCTAL 00032 IS DECIMAL .1 AT 2(6).
 0267   REF   8  LAST 1425   16,2644  21'541 1               DAS     AOSR
 0268   REF   9  LAST 1425   16,2645  3 1540 1               CA      AOSR
 0269   REF   6  LAST 1425   16,2646  55'425 1               TS      ALPHAR
 0270                        16,2647  0 0006 1               EXTEND
 0271   REF   2  LAST 1425   16,2650  7 3617 0               MP      200MS            .2 AT 1
 0272   REF   6  LAST 1425   16,2651  55'545 0               TS      AOSRTERM
 02721  REF   2  LAST 1425   16,2652  1 2673 0               TCF     PRETIMCK
```

```
R0273

 0274   REF   1              16,2653  3 4740 0  PAXFILT  CA      CALLGMBL         EXECUTE ACDT+C12, IF NEEDED.
 02742  REF  17  LAST 1417   16,2654  7 1774 0           MASK    RCSFLAGS
 02744  REF 479  LAST 1425   16,2655  10 000 0           CCS     A                CALLGMBL IS NOT BIT15, SO THIS TEST IS
 02746  REF   1              16,2656  0 3737 1           TC      ACDT+C12         VALID.

 0275   REF  12  LAST 1127   16,2657  52 011 0           DXCH    ARUPT
 0276   REF   4  LAST  142   16,2660  53'753 0           DXCH    DAPARUPT
 0277   REF   1              16,2661  3 2672 0           CA      SUPERJOB         SETTING UP THE SUPERJOB
 0278   REF   3  LAST 1330   16,2662  56 017 1           XCH     BRUPT
 0279   REF  13  LAST 1419   16,2663  22 012 1           LXCH    QRUPT
 0280   REF   1              16,2664  53'755 0           DXCH    DAPBQRPT
 0281   REF   1              16,2665  3 2671 0           CA      SUPERADR
 0282   REF   1              16,2666  52 016 1           DXCH    ZRUPT
 0283   REF   3  LAST 1419   16,2667  53'757 1           DXCH    DAPZRUPT
 0284   REF   1              16,2670  1 5277 1           TCF     NOQBRSM +1       RELINT (JUST IN CASE) AND RESUME, IN THE
A0285                                                                             FORM OF A JASK, AT SUPERJOB.

 0286   REF   2  LAST 1426   16,2671   02673 1  SUPERADR GENADR SUPERJOB +1
R0287   COUNT DOWN GIMBAL DRIVE TIMERS AND TURN OFF DRIVES IF REQUIRED.

 0288   REF   1              16,2672  1 3642 0  SUPERJOB TCF     RATELOOP
 02881  REF   4  LAST 1409   16,2673  11'631 0  PRETIMCK CCS     QGIMTIMR
 0289   REF   1              16,2674  1 2714 0           TCF     DECQTIMR           POSITIVE- COUNTING DOWN
 0290   REF   1              16,2675  1 2720 1           TCF     TURNOFFQ           NEGATIVE- DRIVE SHOULD BE ENDED
 0291   REF   2  LAST 1409   16,2676  11'633 1  CHKRTIMR CCS     RGIMTIMR           NEGATIVE- INACTIVE
 0292   REF   1              16,2677  1 2716 1           TCF     DECRTIMR          (NEG ZERO- IMPOSSIBLE)
 0293   REF   1              16,2700  1 2730 0           TCF     TURNOFFR         REPEATED (ABOVE) FOR R AXIS.

 0294                        16,2701  0 0006 1           EXTEND                   DECREMENT DOCKED JET INHIBITION COUNTERS
 0295   REF   4  LAST 1409   16,2702  27'766 0           DIM     PJETCTR
 0296                        16,2703  0 0006 1           EXTEND
 0297   REF   2  LAST 1409   16,2704  27'767 1           DIM     UJETCTR
 0298                        16,2705  0 0006 1           EXTEND
 0299   REF   2  LAST 1409   16,2706  27'770 1           DIM     VJETCTR
 0300   REF  36  LAST 1410   16,2707  3 4731 0           CA      BIT12
 0301   REF  18  LAST 1426   16,2710  7 1774 0           MASK    RCSFLAGS
 0302                        16,2711  0 0006 1           EXTEND
 0303   REF   1              16,2712  1 2740 1           BZF     SKIPPAXS
 0304   REF   1              16,2713  0 2744 1           TC      CHKVISFZ
 0305   REF   5  LAST 1426   16,2714  55'631 0  DECQTIMR TS      QGIMTIMR         COUNT TIMERS DOWN TO POS ZERO.
 0306   REF   1              16,2715  1 2676 0           TCF     CHKRTIMR
 0307   REF   3  LAST 1426   16,2716  55'633 1  DECRTIMR TS      RGIMTIMR
 0308   REF   2  LAST 1426   16,2717  1 2701 1           TCF     CHKRTIMR +3

 0309   REF   4  LAST 1409   16,2720  55'501 0  TURNOFFQ TS      NEGUQ            HALT DRIVES.
 0310   REF   3  LAST 1425   16,2721  55'510 0           TS      QACCDOT
 0311   REF   1              16,2722  4 5000 0           CS      QGIMBITS
 0312                        16,2723  0 0006 1           EXTEND
 0313   REF  66  LAST 1417   16,2724  03 012 1            WAND    CHAN12
 0314   REF   8  LAST 1120   16,2725  3 4726 0            CAF     NEGMAX
 0315   REF   6  LAST 1426   16,2726  55'631 0            TS      QGIMTIMR
 0316   REF   3  LAST 1426   16,2727  1 2676 0            TCF     CHKRTIMR
 0317   REF   2  LAST 1409   16,2730  55'503 1  TURNOFFR  TS      NEGUR
 0318   REF   3  LAST 1425   16,2731  55'512 1            TS      RACCDOT
 0319   REF   1              16,2732  4 5011 0            CS      RGIMBITS
 0320                        16,2733  0 0006 1            EXTEND
 0321   REF  67  LAST 1427   16,2734  03 012 1            WAND    CHAN12
 0322   REF   9  LAST 1427   16,2735  3 4726 0            CAF     NEGMAX
 0323   REF   4  LAST 1426   16,2736  55'633 1            TS      RGIMTIMR
 0324   REF   4  LAST 1427   16,2737  1 2701 1            TCF     CHKRTIMR +3
 0325   REF  12  LAST 1300      5000            QGIMBITS  EQUALS  OCT1400           BITS 9 AND 10 (OF CHANNEL 12).
 0326   REF   4  LAST 1283      5011            RGIMBITS  EQUALS  PRIO6             BITS 11 AND 12 (OF CHANNEL 12).

 0327   REF  19  LAST 1426   16,2740  4 1774 0  SKIPPAXS  CS      RCSFLAGS
 0328   REF  37  LAST 1426   16,2741  7 4731 1            MASK    BIT12
 0329   REF  20  LAST 1427   16,2742  27'774 0            ADS     RCSFLAGS          BIT 12 SET TO 1.
 0330   REF   1              16,2743  1 3625 1            TCF     QRAXIS            GO TO QRAXIS OR TO GTS.

A0331                                           Y-Z TRANSLATION

A0332                                           INPUT:  BITS 9-12 OF CH31 (FROM TRANSLATION CONTROLER)

A0333                                           OUTPUT: NEXTP

A0334                                             NEXTP IS THE CHANNEL 6 CODE OF JETS FOR THE DESIRED TRANSLATION.
A0335                                             IF THERE ARE FAILURES IN THE DESIRED POLICY, THEN

A0336                                                (1) FOR DIAGONAL TRANS:  UNFAILED PAIR
A0337                                                                         ALARM (IF NO PAIR)

A0338                                                (2) FOR PRINCIPAL TRANS: TRY TO TACK WITH DIAGONAL PAIRS
A0339                                                                         ALARM (IF DIAGONAL PAIRS ARE FAILED)
 0340                        16,2744  0 0006 1  CHKVISFZ  EXTEND
 0341   REF  10  LAST 1407   16,2745  00 031 0            READ    CHAN31
 0342   REF 480  LAST 1426   16,2746  4 0000 0            CS      A
 0343   REF   1              16,2747  7 3614 0            MASK    07400OCT
 0344                        16,2750  0 0006 1            EXTEND
 0345   REF   1              16,2751  1 3020 1            BZF     TSNEXTP
 0346                        16,2752  0 0006 1            EXTEND
 0347   REF  36  LAST 1296   16,2753  7 4736 0            MP      BIT7
 0348   REF 481  LAST 1427   16,2754  50 000 1            INDEX   A
 0349   REF   1              16,2755  3 3573 0            CA      INDXYZ
 0350   REF   1              16,2756  55'743 1            TS      ROTINDEX
 0351   REF  27  LAST 1416   16,2757  3 6263 0  TRYUORV   CA      SIX
 0352   REF   1              16,2760  0 3552 0            TC      SELECTYZ
 0353   REF  28  LAST 1427   16,2761  4 6263 1            CS      SIX
 0354   REF   1              16,2762  6 1742 1            AD      NUMBERT
 0355                        16,2763  0 0006 1            EXTEND
 0356   REF   2  LAST 1427   16,2764  1 3017 0            BZF     TSNEXTP -1
 0357   REF  23  LAST 1425   16,2765  4 4747 0            CS      FIVE
 0358   REF   2  LAST 1427   16,2766  6 1743 0            AD      ROTINDEX
 0359                        16,2767  0 0006 1            EXTEND
 0360   REF   1              16,2770  6 3006 1            BZMF    ALTERYZ
 0361   REF   2  LAST 1427   16,2771  4 1742 0            CS      NUMBEPT
 0362   REF  34  LAST 1410   16,2772  6 4742 1            AD      FOUR
 0363                        16,2773  0 0006 1            EXTEND
 0364   REF   3  LAST 1428   16,2774  6 3017 1            BZMF    TSNEXTP -1
 0365   REF  47  LAST 1315   16,2775  0 5571 1  ABORTYZ   TC      ALARM
 0366                        16,2776   02001 1            OCT     02001
 0367   REF  61  LAST 1391   16,2777  3 4744 1            CA      BIT1              INVERT BIT 1 OF RCSFLAGS.
 0368   REF  21  LAST 1427   16,3000  23'774 1            LXCH    RCSFLAGS
 0369                        16,3001  0 0006 1            EXTEND
 0370                        16,3002  06 001 0            RXOR    1
 0371   REF  22  LAST 1428   16,3003  55'774 0            TS      RCSFLAGS
 0372   REF 289  LAST 1424   16,3004  3 4746 0            CA      ZERO
 0373   REF   4  LAST 1428   16,3005  1 3020 1            TCF     TSNEXTP
 0374   REF  62  LAST 1428   16,3006  3 4744 1  ALTERYZ   CA      BIT1              INVERT BIT 1 OF RCSFLAGS.
 0375   REF  23  LAST 1428   16,3007  23'774 1            LXCH    RCSFLAGS
 0376                        16,3010  0 0006 1            EXTEND
 0377                        16,3011  06 001 0            RXOR    1
 0378   REF  24  LAST 1428   16,3012  55'774 0            TS      RCSFLAGS
 0379   REF  63  LAST 1428   16,3013  7 4744 0            MASK    BIT1
 0380   REF  35  LAST 1428   16,3014  6 4742 1            AD      FOUR
 0381   REF   3  LAST 1428   16,3015  27'743 1            ADS     ROTINDEX
 0382   REF   1              16,3016  1 2757 1            TCF     TRYUORV
 0383   REF   1              16,3017  3 1740 0            CA      POLYTEMP
 0384   REF   7  LAST 1411   16,3020  55'472 0  TSNEXTP   TS      NEXTP
A0385                                           STATE LOGIC

A0386                                             CHECK IN ORDER:             IF ON
A0387                                               LPDPHASE                  GO TO PURGENCY
A0388                                               PULSES                    MINIMUM PULSE LOGIC
A0389                                               DETENT(BIT15 CH31)        RATE COMMAND
A0390                                               GO TO PURGENCY
 0391   REF  47  LAST 1364   16,3021  3 4730 1            CA      BIT13               CHECK STICK IF IN ATT. HOLD.
 0392                        16,3022  0 0006 1            EXTEND
 0393   REF  11  LAST 1427   16,3023  02 031 1            RAND    CHAN31
 0394                        16,3024  0 0006 1            EXTEND
 0395   REF   1              16,3025  1 3034 1            BZF     MANMODE

 0396   REF  40  LAST 1425   16,3026  3 0111 0            CA      DAPBOOLS
 0397   REF   2  LAST  907   16,3027  7 4734 1            MASK    XOVINHIB
 0398                        16,3030  0 0006 1            EXTEND
 0399   REF   1              16,3031  1 3067 1            BZF     DETENTCK            GO CHECK FOR MANUAL X-AXIS OVERRIDE.
 0400                        16,3032  0 0004 0            INHINT
 04001  REF   1              16,3033  1 3145 0            TCF     ZROURCBIT           CLEAR OURRCBIT AND GO DO AUTOMATIC LOGIC

 0401   REF   2  LAST  733   16,3034  3 4726 0  MANMODE   CA      PULSES              PULSES IS ONE FOR PULSE MODE
 0402   REF  41  LAST 1428    16,3035  7 0111 1           MASK    DAPBDDLS
 0403                         16,3036  0 0006 1           EXTEND
 0404   REF   2  LAST 1428    16,3037  1 3067 1           BZF     DETENTCK         BRANCH FOR RATE COMMAND

R04041       ***  MINIMUM IMPULSE LOGIC ***

 0405   REF 290  LAST 1428    16,3040  3 4746 0           CA      ZERO
 0406   REF   4  LAST 1419    16,3041  55'464 1           TS      PERROR
 0408   REF  25  LAST 1419    16,3042  3 0032 0           CA      CDUX
 0409   REF  23  LAST 1419    16,3043  55'634 0           TS      CDUXD

 04091  REF   6  LAST 1411    16,3044  4 4743 1           CS      CDNTRLBT
 040915                       16,3045  0 0004 0           INHINT
 04092  REF  32  LAST 1411    16,3046  7 0106 1           MASK    ELGWRD10         CLEAR FLAG TO CAUSE THE NO CONTROL DSKY
 04093  REF  33  LAST 1429    16,3047  54 106 1           TS      FLGWRD10           LIGHT TO BE LIT BY T4RUPT.

 040935                       16,3050  0 0003 1           RELINT

 0410                         16,3051  0 0006 1           EXTEND
 0411   REF  12  LAST 1428    16,3052  00 031 0           READ    CHAN31
 0412                         16,3053  4 0000 0           COM                      THE CHANNEL BITS ARE INVERSE LOGIC.
 0413   REF   5  LAST 1328    16,3054  7 5745 0           MASK    OCT14            BITS 3 AND 4 ARE +P AND -P COMMANDS
 0414   REF   2  LAST 1409    16,3055  57'460 1           XCH     OLDPMIN
 0415   REF 482  LAST 1427    16,3056  10 000 0           CCS     A                BRANCH TO SKIP THIS PASS IF THERE WAS A
 0416   REF   1               16,3057  1 3443 0           TCF     JETSOFF            COMMAND PRESENT LAST TIME OR IF THERE
 0417   REF   3  LAST 1429    16,3060  3 1460 1           CA      OLDPMIN            IS NO COMMAND THIS TIME.
 0418                         16,3061  0 0006 1           EXTEND
 0419   REF   2  LAST 1429    16,3062  1 3443 0           BZF     JETSOFF

 0420   REF   4  LAST 1429    16,3063  4 1460 0           CS      OLDPMIN          THERE IS A COMMAND TO BE HONORED.  PUT A
 0421   REF  29  LAST 1427    16,3064  6 6263 0           AD      SIX                SMALL NUMBER OF THE PROPER SIGN IN TJP
 0422   REF   4  LAST 1409    16,3065  55'524 1           TS      TJP                IT WILL BE CHANGED TO 14 MSEC LATER.
 0423   REF   1               16,3066  1 3351 1           TCF     PJETSLEC -6

R0436                   MANUAL RATE COMMAND MODE
R0437                   ========================
R0438                     BY ROBERT F. STENGEL
R0439
R0440   THIS MODE PROVIDES RCAH MANUAL CONTROL THRU 2 CONTROL LAWS:                1) DIRECT RATE AND 2) PSEUDO-AUTO.
R0442   THE DIRECT RATE MODE AFFORDS IMMEDIATE CONTROL WITHOUT OVERSHOOT. THE PSEUDO-AUTO MODE PROVIDES PRECISE
R0444   RATE CONTROL AND ATTITUDE HOLD.
R0445
R0446   IN DIRECT RATE, JETS ARE FIRED WHEN STICK POSITION CHANGES BY A FIXED NUMBER OF INCREMENTS IN ONE DAP CYCLE.
R0448   THE 'BREAKOUT LEVEL' IS .6 D/S FOR LM-ONLY AND .3 D/S FOR CSM-DOCKED. THIS LAW NULLS THE RATE ERROR TO WITHIN
R0450   THE 'TARGET DEADBAND', WHICH EQUALS THE BREAKOUT LEVEL.
R0451   IN PSEUDO-AUTO, BODY-FIXED RATE AND ATTITUDE ERRORS ARE SUPPLIED TO TJETLAW, WHICH EXERCISES CONTROL.
R0453   CONTROL SWITCHES FROM DIRECT RATE TO PSEUDO-AUTO IF THE TARGET DB IS ACHIEVED OR IF TIME IN (1) EXCEEDS 4 SEC.
R0455   IF THE INITIAL COMMAND DOES NOT EXCEED THE BREAKOUT LEVEL, CONTROL GOES TO PSEUDO-AUTO IMMEDIATELY.
R0457
R0458   SINCE P-AXIS CONTROL IS SEPARATE FROM Q,R AXES CONTROL, IT IS POSSIBLE TO USE (1) IN P-AXIS AND (2) IN Q,R AXES,
R0460   OR VICE VERSA.  THIS ALLOWS A DEGREE OF ATTITUDE HOLD IN UNCONTROLLED AXES.  DUE TO U,V CONTROL, HOWEVER, Q AND
R0462   R AXES ARE COUPLED AND MUST USE THE SAME CONTROL LAW.
R0463
R0464   HAND CONTROLLER COMMANDS ARE SCALED BY A LINEAR/QUADRATIC LAW. FOR THE LM-ALONE, MAXIMUM COMMANDED RATES ARE 20
R0466   AND 4 D/S IN NORMAL AND FINE SCALING; HOWEVER, STICK SENSITIVITY AT ZERO COUNTS (OBTAINED AT A STICK DEFLECTION
R0468   OF 2 DEGREES FROM THE CENTERED POSITION) IS .5 OR .1 D/S PER DEGREE. NORMAL AND FINE SCALINGS FOR THE CSM-DOCKED
R0470   CASE IS AUTOMATICALLY SET TO 1/10 THE ABOVE VALUES. SCALING IS DETERMINED IN ROUTINE 3.
A0472                                                    ZEROENBL        ENABLES COUNTERS SO THEY CAN BE READ NEXT TIME
A0473                                                    JUSTOUT         FIRST DETECTION OF OUT OF DETENT (BY OURRCBIT)
A0474
A0475
 0476                           16,3067  0 0006 1  DETENTCK EXTEND
 0477   REF  13  LAST 1429      16,3070  00 031 0           READ    CHAN31
 0478   REF   1                 16,3071  55'443 1           TS      CH31TEMP
 0479   REF  52  LAST 1420      16,3072  7 4726 1           MASK    BIT15            CHECK OUT-OF-DETENT BIT.
 0480                           16,3073  0 0006 1           EXTEND
 0481   REF   1                 16,3074  1 3220 0           BZF     RHCMOVED         BRANCH IF OUT OF DETENT.
 0482   REF   1                 16,3075  3 4731 0           CAF     OURRCBIT         IN DETENT. CHECK THE RATE COMMAND BIT.
 0483   REF  42  LAST 1429      16,3076  7 0111 1           MASK    DAPBOOLS
 0484                           16,3077  0 0006 1           EXTEND
 0485   REF   1                 16,3100  1 3464 0           BZF     PURGENCY         BRANCH IF NOT IN RATE COMMAND LAST PASS.
R0486   ..................................................................................
 0487   REF  33  LAST 1390      16,3101  3 4734 0           CA      BIT9             JUST IN DETENT??
 0488   REF  25  LAST 1428      16,3102  7 1774 0           MASK    RCSFLAGS
 0489                           16,3103  0 0006 1           EXTEND
 0490   REF   1                 16,3104  1 3116 0           BZF     RUTH
 0491   REF  48  LAST 1428      16,3105  3 4730 1  AUTOCHEK CAF     BIT13            CLEAR JUSTIN AND QRBIT ONLY IF AUTO.
 0492                           16,3106  0 0006 1           EXTEND
 0493   REF  14  LAST 1430      16,3107  02 031 1           RAND    CHAN31
 0494                           16,3110  0 0006 1           EXTEND
 0495   REF   1                 16,3111  1 3215 0           BZF     RATEDAMP         BRANCH IF IN ATTITUDE HOLD.

 0496   REF   1                 16,3112  4 5005 0           CS      BITS9,11         IN AUTO.
 0497   REF  26  LAST 1430      16,3113  7 1774 0           MASK    RCSFLAGS         (X-AXIS OVERRIDE)
 0498   REF  27  LAST 1430      16,3114  55'774 0           TS      RCSFLAGS         ZERO QRBIT (BIT 11) AND JUST-IN BIT (9).
 0499   REF   2  LAST 1430      16,3115  1 3215 0           TCF     RATEDAMP

 0500   REF  28  LAST 1430      16,3116  3 1774 1  RUTH     CA      RCSFLAGS
 0501   REF   1                 16,3117  7 4733 0           MASK    PBIT             IN ATTITUDE HOLD.
 0502                           16,3120  0 0006 1           EXTEND
 0503                           16,3121  1 3123 0           BZF     +2               BRANCH IF P-RATE DAMPING IS FINISHED.
 0504   REF   3  LAST 1430      16,3122  1 3215 0           TCF     RATEDAMP
 0505   REF  29  LAST 1430      16,3123  3 1774 1           CA      RCSFLAGS
 0506   REF   1                 16,3124  7 4732 1           MASK    QRBIT
 0507                           16,3125  0 0006 1           EXTEND
 0508   REF   1                 16,3126  1 3132 0           BZF     RATEDONE         BRANCH IF Q,R RATE DAMPING IS FINISHED.
 0509   REF   1                 16,3127  1 3105 1           TCF     AUTOCHEK
R0510   ================================
 0511   REF  64  LAST 1428         4744            1/10SEC  =       BIT1
 0512   REF   6  LAST 1368         4762            40CYC    =       OCT50
 0513                          16,3130   74777 0  PQRBIT    OCT     74777
 0514    REF  15  LAST  955       5005            BITS9,11  EQUALS  EBANK5
 0515                          16,3131   00056 1  LINRATP   DEC     46
R0516    ================================
 0521                          16,3132  0 0004 0  RATEDONE  INHINT                  NULL THE APPROPRIATE ATTITUDE ERRORS.
 0522    REF  49  LAST 1430    16,3133  3 4730 1            CAF     BIT13
 0523                          16,3134  0 0006 1            EXTEND
 0524    REF  15  LAST 1430    16,3135  02 031 1            RAND    CHAN31
 0525                          16,3136  0 0006 1            EXTEND
 0526                          16,3137  1 3143 0            BZF     +4
 0527    REF  26  LAST 1429    16,3140  3 0032 0            CA      CDUX            (X-AXIS OVERRIDE)
 0528    REF  24  LAST 1429    16,3141  55'634 0            TS      CDUXD
 0529                          16,3142  0 3145 1            TC      +3
 0530    REF  56  LAST 1410    16,3143  0 4665 0            TC      IBNKCALL
 0531    REF  10  LAST 1409    16,3144   40154 0            FCADR   ZATTEROR
 05311   REF   2  LAST 1430    16,3145  4 4731 1  ZRORCBIT  CS      OURRCBIT        CLEAR OURRCBIT: MANUAL MODE CLOSED OUT.
 05312   REF  43  LAST 1430    16,3146  7 0111 1            MASK    DAPBOOLS
 05313   REF  44  LAST 1431    16,3147  54 111 1            TS      DAPBOOLS
 0532                          16,3150  0 0003 1            RELINT
 0533    REF   2  LAST 1430    16,3151  1 3464 0            TCF     PURGENCY

 0534    REF   5  LAST 1429    16,3152  55'464 1  JUSTOUT   TS      PERROR          INITIALIZATION - FIRST MANUAL PASS (A=0)
 0538    REF   5  LAST 1422    16,3153  55'446 1            TS      DXERROR
 0539    REF   6  LAST 1431    16,3154  55'447 0            TS      DXERROR +1
 0540    REF   4  LAST 1422    16,3155  55'450 0            TS      DYERROR
 0541    REF   5  LAST 1431    16,3156  55'451 1            TS      DYERROR +1
 0542    REF   4  LAST 1423    16,3157  55'452 1            TS      DZERROR
 0543    REF   5  LAST 1431    16,3160  55'453 0            TS      DZERROR +1
 0544    REF   2  LAST 1422    16,3161  55'454 1            TS      PLAST
 0545    REF   2  LAST 1422    16,3162  55'455 0            TS      QLAST
 0546    REF   2  LAST 1423    16,3163  55'456 0            TS      RLAST
 0547    REF   1               16,3164  54 042 0            TS      Q-RHCCTR
 0548    REF   1               16,3165  54 044 0            TS      R-RHCCTR
 0549    REF   1               16,3166  3 3130 0            CA      PQRBIT
 0550    REF  30  LAST 1430    16,3167  7 1774 0            MASK    RCSFLAGS
 0551    REF  31  LAST 1431    16,3170  55'774 0            TS      RCSFLAGS        BITS 10 AND 11 OF RCSFLAGS ARE 0.
 0555    REF   1               16,3171  0 3176 1            TC      ZEROENBL
 05551   REF   3  LAST 1431    16,3172  3 4731 0            CA      OURRCBIT        SET INTERNAL RATE COMMAND FLAG (WHICH
 05552   REF  45  LAST 1431    16,3173  26 111 1            ADS     DAPBOOLS          WAS FOUND TO BE ZERO EARLIER)
 05553                         16,3174  0 0003 1            RELINT
 0556    REF   3  LAST 1429    16,3175  1 3443 0            TCF     JETSOFF
 0557    REF   2  LAST 1431    16,3176  22 044 1  ZEROENBL  LXCH    R-RHCCTR
 0558    REF   2  LAST 1431    16,3177  3 0042 1            CA      Q-RHCCTR
 0559    REF   1               16,3200  53'463 0            DXCH    SAVEHAND
 0560    REF 291  LAST 1429    16,3201  3 4746 0            CA      ZERO
 0561    REF   1               16,3202  54 043 1            TS      P-RHCCTR
 0562    REF   3  LAST 1431    16,3203  54 042 0            TS      Q-RHCCTR
 0563    REF   3  LAST 1431    16,3204  54 044 0            TS      R-RHCCTR
 056305                        16,3205  0 0004 0            INHINT
 05631                         16,3206  0 0006 1            EXTEND
 05632  REF   5  LAST 1401   16,3207  23'265 1            QXCH    C13QSAV
 05633  REF   9  LAST 1401   16,3210  0 6040 0            TC      C13STALL

 0564   REF   1              16,3211  3 3620 0            CA      BITS8,9
 0565                        16,3212  0 0006 1            EXTEND
 0566   REF  21  LAST 1401   16,3213  05 013 0            WOR     CHAN13            COUNTERS ZEROED AND ENABLED
 0567   REF   6  LAST 1432   16,3214  0 1265 1            TC      C13QSAV

 0568   REF 292  LAST 1431   16,3215  3 4746 0  RATEDAMP  CA      ZERO
 0569   REF   2  LAST 1431   16,3216  54 043 1            TS      P-RHCCTR
 0570   REF   1              16,3217  1 3227 1            TCF     RATERROR

 05701  REF  32  LAST 1431   16,3220  4 1774 0  RHCMOVED  CS      RCSFLAGS          SET JUSTIN BIT TO 1
 05702  REF  34  LAST 1430   16,3221  7 4734 1            MASK    BIT9
 05703  REF  33  LAST 1432   16,3222  27'774 0            ADS     RCSFLAGS
 0571   REF   4  LAST 1431   16,3223  3 4731 0            CA      OURRCBIT          P CONTROL
 0572   REF  46  LAST 1431   16,3224  7 0111 1            MASK    DAPBOOLS
 0573                        16,3225  0 0006 1            EXTEND
 0574   REF   1              16,3226  1 3152 0            BZF     JUSTOUT
 0575   REF  27  LAST 1431   16,3227  3 0032 0  RATERROR  CA      CDUX              FINDCDUW REQUIRES THAT CDUXD=CDUX DURING
 0576   REF  25  LAST 1431   16,3230  55'634 0            TS      CDUXD             X-AXIS OVERRIDE
 0577   REF   3  LAST 1432   16,3231  10 043 1            CCS     P-RHCCTR
 0578                        16,3232  1 3235 1            TCF     +3
 0579                        16,3233  1 3235 1            TCF     +2
 0580                        16,3234  1 3235 1            TCF     +1
 0581                        16,3235  6 0000 1            DOUBLE                    LINEAR/QUADRATIC CONTROLLER SCALING
 0582                        16,3236  6 0000 1            DOUBLE                    (SEE EXPLANATION IN Q,R-AXES RCS
 0583   REF   1              16,3237  6 3131 1            AD      LINRATP            AUTOPILOT)
 0584                        16,3240  0 0006 1            EXTEND
 0585   REF   4  LAST 1432   16,3241  7 0043 1            MP      P-RHCCTR
 0586   REF 292  LAST 1422   16,3242  3 0001 0            CA      L
 0587                        16,3243  0 0006 1            EXTEND
 0588   REF   6  LAST  306   16,3244  7 1444 0            MP      STIKSENS
 0589   REF   3  LAST 1431   16,3245  57'454 0            XCH     PLAST
 0590                        16,3246  4 0000 0            COM
 0591   REF   4  LAST 1432   16,3247  6 1454 0            AD      PLAST
 0592   REF  25  LAST 1424   16,3250  55'736 0            TS      DAPTEMP1
 0593   REF   2  LAST 1431   16,3251  0 3176 1            TC      ZERUENBL          INTERVAL.  ZERO AND ENABLE ACA COUNTERS.
 05931                       16,3252  0 0003 1            RELINT
 0594   REF   5  LAST 1432   16,3253  4 1454 1            CS      PLAST
 0595   REF  17  LAST 1423   16,3254  6 1421 1            AD      OMEGAP
 0596   REF   1              16,3255  55'427 0            TS      EDOTP
 0597   REF  26  LAST 1432   16,3256  11'736 0            CCS     DAPTEMP1          IF P COMMAND CHANGE EXCEEDS BREAKOUT
 0598                        16,3257  1 3262 0            TCF     +3                LEVEL, GO TO DIRECT RATE CONTROL. IF NOT
 0599                        16,3260  1 3270 0            TCF     +8                CHECK FOR DIRECT RATE CONTROL LAST TIME.
 0600                        16,3261  1 3262 0            TCF     +1
 0601   REF   5  LAST  306   16,3262  6 1476 0            AD      -RATEDB
 0602                        16,3263  0 0006 1            EXTEND
 0603                        16,3264  6 3270 1            BZMF    +4
 0604   REF   1              16,3265  3 4762 0            CA      40CYC
 0605   REF    2  LAST 1420   16,3266  55'445 1              TS      TCP
 0606   REF    1              16,3267  0 3301 0              TC      PEGI
 0607   REF   34  LAST 1432   16,3270  3 1774 1              CA      RCSFLAGS          CHECK FOR DIRECT RATE COMMAND LAST TIME.
 0608   REF    2  LAST 1430   16,3271  7 4733 0              MASK    PBIT
 0609                         16,3272  0 0006 1              EXTEND
 0610                         16,3273  1 3275 0              BZF     +2
 0611   REF    2  LAST 1433   16,3274  0 3301 0              TC      PEGI              TO PURE RATE COMMAND
 0612   REF    7  LAST 1431   16,3275  3 1446 0              CA      DXERROR           PSEUDO-AUTO CONTROL.
 0613   REF    1              16,3276  55'751 1              TS      E                 X-ATTITUDE ERROR (SP)
 0614   REF    6  LAST 1431   16,3277  55'464 1              TS      PERROR            LOAD P-AXIS ERROR FOR MODEL FDAI DISPLAY
 0615   REF    3  LAST 1431   16,3300  0 3470 1              TC      PURGENCY +4
 0616   REF   28  LAST 1432   16,3301  3 0032 0  PEGI        CA      CDUX              DIRECT RATE CONTROL.
 0617   REF   26  LAST 1432   16,3302  55'634 0              TS      CDUXD
 0618   REF  293  LAST 1432   16,3303  3 4746 0              CA      ZERO
 0619   REF    8  LAST 1433   16,3304  55'446 1              TS      DXERROR
 0620   REF    9  LAST 1433   16,3305  55'447 0              TS      DXERROR +1
 0621   REF    7  LAST 1433   16,3306  55'464 1              TS      PERROR            ZERO P-AXIS ERROR FOR MODEL FDAI DISPLAY
 0622   REF    2  LAST 1432   16,3307  11'427 0              CCS     EDOTP
 0623                         16,3310  0 3313 0              TC      +3
 0624                         16,3311  0 3313 0              TC      +2
 0625                         16,3312  0 3313 0              TC      +1
 0626   REF    1              16,3313  55'736 0              TS      ABSEDOTP
 0627   REF    1              16,3314  6 1476 0              AD      TARGETDB
 0628                         16,3315  0 0006 1              EXTEND                    IF RATE ERROR IS LESS THAN DEADBAND,
 0629   REF    1              16,3316  6 3326 0              BZMF    LAST              FIRE, AND SWITCH TO PSEUDO-AUTO.
 0630   REF    3  LAST 1433   16,3317  3 1445 0              CA      TCP
 0631                         16,3320  0 0006 1              EXTEND                    IF TIME IN RATE COMMAND EXCEEDS 4 SEC.,
 0632   REF    2  LAST 1433   16,3321  6 3326 0              BZMF    LAST
 0633   REF   35  LAST 1433   16,3322  4 1774 0              CS      RCSFLAGS
 0634   REF    3  LAST 1433   16,3323  7 4733 0              MASK    PBIT
 0635   REF   36  LAST 1433   16,3324  27'774 0              ADS     RCSFLAGS          BIT 10 IS 1.
 0636                         16,3325  1 3331 1              TCF     +4
 0637   REF    4  LAST 1433   16,3326  4 4733 0  LAST        CS      PBIT
 0638   REF   37  LAST 1433   16,3327  7 1774 0              MASK    RCSFLAGS
 0639   REF   38  LAST 1433   16,3330  55'774 0              TS      RCSFLAGS          BIT 10 IS 0.
 0640   REF    3  LAST 1433   16,3331  4 1427 0              CS      EDOTP
 0641                         16,3332  0 0006 1              EXTEND
 0642   REF    1              16,3333  7 1550 1              MP      1/ANETP           1/2JTACC SCALED AT 2EXP(7)/PI
 0643   REF  483  LAST 1429   16,3334  20 001 1              DAS     A
 0644   REF   10  LAST 1425   16,3335  0 2314 0              TC      OVERSUB
 0645                         16,3336  0 0006 1              EXTEND
 0646   REF    1              16,3337  7 7737 1              MP      25/32             A CONTAINS TJET SCALED AT 2EXP(4)(16/25)
 0647   REF    5  LAST 1429   16,3340  55'524 1              TS      TJP               4.JET TIME
 0648   REF    2  LAST 1433   16,3341  3 1736 1              CA      ABSEDOTP
 0649   REF    2  LAST  135   16,3342  6 1475 0              AD      -2JETLIM          COMPARING DELTA RATE WITH 2 JET LIMIT
 0650                         16,3343  0 0006 1              EXTEND
 0651                         16,3344  6 3347 1              BZMF    +3

 0652   REF   30  LAST 1429   16,3345  3 6263 0              CA      SIX
 0653                         16,3346  1 3356 0              TCF     +8D
 0654  REF   6  LAST 1433   16,3347  3 1524 0           CA      TJP
 0655  REF   7  LAST 1434   16,3350  27'524 1           ADS     TJP
A0656                                                 GOES TU PJETSLEC FOR TWO JETS

A0657                                               P-JET-SELECTICN-ROUTINE (RCTATION)

A0658                                               INPUT:    NUMBERT      4,5,6 FOR WHICH PAIR OR 4 JETS
A0659                                                         TJP          + FOR +P ROTATION

A0660                                               OUTPUT:   CHANNEL 6
A0661                                                         PJUMPADR                   FOR P-AXIS SKIP
A0662                                                         (JTLST CALL)               (SMALL TJP)

A0663                                                 ORDER OF PULICIES TRIED IN CASE OF FAILURE.
A0664                                                         +P                 -P
A0665                                                         7,15               8,16
A0666                                                         4,12               3,11
A0667                                                         4,7                8,11
A0668                                                         7,12               11,16
A0669                                                         12,15              3,16
A0670                                                         4,15               3,8
A0671                                                         ALARM              ALARM
 0672  REF   1              16,3351  3 4740 0           CA      AORBSYST
 0673  REF  31  LAST 1335   16,3352  7 0101 0           MASK    FLAGWRD5
 0674  REF 484  LAST 1433   16,3353  10 000 0           CCS     A
 0675  REF 143  LAST 1420   16,3354  3 4744 1           CA      ONE
 0676  REF  36  LAST 1428   16,3355  6 4742 1           AD      FOUR
 0677  REF   3  LAST 1428   16,3356  55'742 0           TS      NUMBERT
 0678  REF 144  LAST 1434   16,3357  3 4744 1  PJETSLEC CA      ONE
 0679  REF 293  LAST 1432   16,3360  54 001 1           TS      L
 0680  REF   8  LAST 1434   16,3361  11'524 1           CCS     TJP
 0681                       16,3362  1 3367 1           TCF     +5
 0682  REF   4  LAST 1431   16,3363  1 3443 0           TCF     JETSOFF
 0683                       16,3364  1 3366 0           TCF     +2
 0684  REF   5  LAST 1434   16,3365  1 3443 0           TCF     JETSOFF
 0685                       16,3366  22 007 0           ZL
 0686  REF 145  LAST 1434   16,3367  6 4744 1           AD      ONE
 0687  REF   1              16,3370  55'736 0           TS      ABSTJ
 0688  REF   4  LAST 1428   16,3371  23'743 0           LXCH    ROTINDEX
 0689  REF   1              16,3372  0 3532 0           TC      SELECTP
 0690  REF  31  LAST 1433   16,3373  4 6263 1           CS      SIX
 0691  REF   4  LAST 1434   16,3374  6 1742 1           AD      NUMBERT
 0692                       16,3375  0 0006 1           EXTEND
 0693                       16,3376  1 3400 1           BZF     +2

 0694  REF  92  LAST 1417   16,3377  4 4743 1           CS      TWO
 0695  REF  37  LAST 1434   16,3400  6 4742 1           AD      FOUR
 0696  REF   2  LAST  138   16,3401  55'521 1           TS      NO.PJETS
 0697  REF   2  LAST 1428   16,3402  3 1740 0           CA      POLYTEMP
 0698  REF   2  LAST 1401   16,3403  0 5750 0           TC      WRITEP
 0699   REF    2  LAST 1434    16,3404  4 1736 0             CS       ABSTJ
 0700   REF    1               16,3405  6 3613 0             AD       +150MST6
 0701                          16,3406  0 0006 1             EXTEND
 0702   REF    2  LAST 1427    16,3407  6 3625 0             BZMF     QRAXIS             GO TO QRAXIS OR TO GTS.

 0703   REF    1               16,3410  6 3573 0             AD       -136MST6
 0704                          16,3411  0 0006 1             EXTEND
 0705                          16,3412  6 3417 0             BZMF     +5

 0706   REF    3  LAST 1435    16,3413  27'736 0             ADS      ABSTJ
 0707   REF    5  LAST 1434    16,3414  51'743 0             INDEX    ROTINDEX
 0708   REF    1               16,3415  3 3622 1             CA       MINTIMES
 0709   REF    9  LAST 1434    16,3416  55'524 1             TS       TJP

 0710   REF    4  LAST 1435    16,3417  3 1736 1             CA       ABSTJ
 0711                          16,3420  22 007 0             ZL
 0712                          16,3421  0 0004 0             INHINT
 0713   REF    4  LAST 1410    16,3422  53'471 0             DXCH     T6FURTHA
 0714   REF   57  LAST 1431    16,3423  0 4665 0             TC       IBNKCALL
 0715   REF    1               16,3424   37143 0             CADR     JTLST
 0716   REF   38  LAST 1427    16,3425  4 4731 1             CS       BIT12
 0717   REF   39  LAST 1433    16,3426  7 1774 0             MASK     RCSFLAGS
 0718   REF   40  LAST 1435    16,3427  55'774 0             TS       RCSFLAGS           BIT 12 SET TO 0.
 0719   REF    1               16,3430  0 3432 1             TC       ALTSYST
 0720   REF    3  LAST 1435    16,3431  1 3625 1             TCF      QRAXIS

 0721   REF   32  LAST 1434    16,3432  3 0101 1  ALTSYST    CA       FLAGWRD5           ALTERNATE P-AXIS JETS
 0722   REF  294  LAST 1434    16,3433  54 001 1             TS       L
 0723   REF    2  LAST 1434    16,3434  3 4740 0             CA       AORBSYST
 0724                          16,3435  0 0006 1             EXTEND
 0725   REF   16  LAST 1412    16,3436  06 001 0             RXOR     LCHAN
 0726   REF   33  LAST 1435    16,3437  54 101 0             TS       FLAGWRD5
 0727                          16,3440  0 0003 1             RELINT
 0728   REF  401  LAST 1421    16,3441  0 0002 0             TC       Q

 0729   REF    2  LAST 1435    16,3442  0 3432 1  DKALT      TC       ALTSYST

 0730   REF    3  LAST 1434    16,3443  0 5747 0  JETSOFF    TC       WRITEP -1
 0731   REF  294  LAST 1433    16,3444  3 4746 0             CA       ZERO
 0732   REF   10  LAST 1435    16,3445  55'524 1             TS       TJP
 0733   REF    4  LAST 1435    16,3446  1 3625 1             TCF      QRAXIS
R0734   (NOTE -- M13 = 1 IDENTICALLY IMPLIES NULL MULTIPLICATION.)

 0735   REF   16  LAST 1419    16,3447  3 0033 1  CALCPERR   CA       CDUY               P-ERROR CALCULATION.
 0736                          16,3450  0 0006 1             EXTEND
 0737   REF   11  LAST 1419    16,3451  21'635 1             MSU      CDUYD              CDU VALUE - ANGLE DESIRED (Y-AXIS)
 0738                          16,3452  0 0006 1             EXTEND
 0739   REF    9  LAST 1421    16,3453  7 1414 0             MP       M11                (CDUY-CDUYD)M11 SCALED AT PI RADIANS
 0740   REF    2  LAST 1433    16,3454  57'751 0             XCH      E                  SAVE FIRST TERM (OF TWO)
 0741   REF   29  LAST 1433    16,3455  3 0032 0             CA       CDUX               THIRD COMPONENT
 0742                               16,3456  0 0006 1              EXTEND
 0743   REF  27  LAST 1433         16,3457  21'634 0              MSU     CDUXD           CDU VALUE - ANGLE DESIRED (X-AXIS)
R0744                                                              EXTEND
R0745                                                              MP      M13
 0746   REF   5  LAST 1405         16,3460  6 1274 1              AD      DELPEROR        KALCMANU INERFACE ERROR
 0747   REF   3  LAST 1435         16,3461  27'751 1              ADS     F               SAVE SUM OF TERMS.  COULD BE OVERFLOW.
 0748   REF   8  LAST 1433         16,3462  57'464 0              XCH     PERROR          SAVE P-ERROR FOR EIGHT-BALL DISPLAY.
 0749   REF 402  LAST 1435         16,3463  0 0002 0              TC      Q               RETURN TO CALLER

R0750   P-AXIS URGENCY FUNCTION CALCULATION.

 0751   REF   2  LAST 1410         16,3464  0 3447 0  PURGENCY TC      CALCPERR        CALCULATE P-AXIS ERRORS.
 0752   REF  13  LAST 1405         16,3465  4 1642 1              CS      OMEGAPD         THIS CODING IS COMMON TO BOTH LM DAP AND
 0753   REF  18  LAST 1432         16,3466  6 1421 1              AD      OMEGAP          SPS-BACKUP MODE.
 0754   REF   4  LAST 1433         16,3467  55'427 0              TS      EDOTP           EDOTP = OMEGAP - OMEGAPD AT PI/4 RAD/SEC


 0755   REF.146  LAST 1434         16,3470  4 4744 0              CS      ONE
 0756   REF   2  LAST  137         16,3471  55'505 1              TS      AXISCTR
 0757   REF  47  LAST 1432         16,3472  3 0111 0              CA      DAPBOOLS
 0758   REF   8  LAST 1423         16,3473  7 4730 0              MASK    CSMDOCKD
 0759                               16,3474  0 0006 1              EXTEND
 0760   REF   1                    16,3475  1 3506 0              BZF     HEADTJET
 0761                               16,3476  0 0004 0              INHINT                  IF CSMDOCKD = 1, GO TO DOCKED RCS LOGIC
 0762   REF  58  LAST 1435         16,3477  0 4665 0              TC      IBNKCALL
 0763   REF   1                    16,3500   43667 1              CADR    SPSRCS

 0764   REF  11  LAST 1435         16,3501  3 1524 0              CA      TJP
 0765                               16,3502  0 0006 1              EXTEND
 0766   REF   1                    16,3503  1 3442 1              BZF     DKALT           IF TJP = ZERO, CHANGE AORBSYST.
 0767                               16,3504  0 0003 1              RELINT
 0768   REF   2  LAST 1429         16,3505  1 3351 1              TCF     PJETSLEC -6        SELECT AORBSYST AND USE TWO JETS
 0769   REF 295  LAST 1435         16,3506  3 4746 0  HEADTJET CA      ZERO
 0770   REF   1                    16,3507  55'500 1              TS      SENSETYP
 0771                               16,3510  0 0004 0              INHINT
 0772   REF  59  LAST 1436         16,3511  0 4665 0              TC      IBNKCALL
 0773   REF   1                    16,3512   37304 1              CADR    TJETLAW
 0774                               16,3513  0 0003 1              RELINT

 0775   REF   1                    16,3514  4 1740 1              CS      FIREFCT
 0776   REF   1                    16,3515  6 3531 0              AD      -FOURDEG
 0777                               16,3516  0 0006 1              EXTEND
 0778   REF   3  LAST 1436         16,3517  6 3351 0              BZMF    PJETSLEC -6
 0779   REF  12  LAST 1436         16,3520  11'524 1              CCS     TJP
 0780                               16,3521  1 3523 1              TCF     +2
 0781   REF   6  LAST 1434         16,3522  1 3443 0              TCF     JETSOFF
 0782   REF   1                    16,3523  6 3530 1              AD      -160MST6
 0783                               16,3524  0 0006 1              EXTEND
 0784   REF   4  LAST 1436         16,3525  6 3351 0              BZMF    PJETSLEC -6
 0785   REF  32  LAST 1434         16,3526  3 6263 0              CA      SIX
 0786   REF   5  LAST 1436   16,3527  1 3356 0            TCF     PJETSLEC -1
 0787                        16,3530   77377 1  -160MST6 DEC     -256
 0788                        16,3531   75117 1  -FOURDEG DEC     -.08888
```

```
P0789      JET POLICY CONSTRUCTION SUBROUTINE

A0790                                                        INPUT: ROTINDEX, NUMBERT

A0791                                                        OUTPUT: POLYTEMP (JET POLICY)

A0792                                                     THIS SUBROUTINE SELECT A SUBSET OF THE DESIRED JETS WHICH HAS NO FAILURE
 0793    REF  33  LAST 1436    16,3532  3 6263 0  SELECTP   CA      SIX
 0794    REF   1               16,3533  55'741 0            TS      TEMPNUM
 0795    REF   5  LAST 1434    16,3534  51'742 1            INDEX   NUMBERT
 0796    REF   1               16,3535  3 3564 0            CA      TYPEP
 0797    REF   6  LAST 1435    16,3536  51'743 0            INDEX   ROTINDEX
 0798    REF   1               16,3537  7 3555 0            MASK    JETSALL
 0799    REF   3  LAST 1434    16,3540  55'740 1            TS      POLYTEMP
 0800    REF   7  LAST  222    16,3541  7 1260 0            MASK    CH6MASK
 0801    REF 485  LAST 1434    16,3542  10 000 0            CCS     A
 0802.                         16,3543  1 3545 1            TCF     +2
 0803    REF 403  LAST 1436    16,3544  0 0002 0            TC      Q
 0804    REF   2  LAST 1438    16,3545  11'741 0            CCS     TEMPNUM
 0805                          16,3546  1 3552 1            TCF     +4
 0806    REF  48  LAST 1428    16,3547  0 5571 1            TC      ALARM
 0807                          16,3550   02003 0            OCT     02003
 0808    REF   7  LAST 1436    16,3551  1 3443 0            TCF     JETSOFF            *****TCF  ALARMJET ********************
 0809    REF   6  LAST 1438    16,3552  55'742 0  SELECTYZ  TS      NUMBERT
 0810    REF   2  LAST 1434    16,3553  1 3533 0            TCF     SELECTP +1
 0811    REF   1               16,3554  1 2777 0  -1        TCF     ABORTYZ +2
 0812                          16,3555   00252 1  JETSALL   OCT     00252
 0813                          16,3556   00125 1            OCT     00125              +P
 0814                          16,3557   00140 1            OCT     00140              -Y
 0815                          16,3560   00006 1            OCT     00006              -Z
 0816                          16,3561   00220 1            OCT     00220              +Y
 0817                          16,3562   00011 1            OCT     00011              +Z
 0818                          16,3563   00151 1            OCT     00151              +V
 0819                          16,3564   00146 1  TYPEP     OCT     00146              -U
 0820                          16,3565   00226 1            OCT     00226              -V
 0821                          16,3566   00231 1            OCT     00231              +U
 0822                          16,3567   00151 1            OCT     00151              +V
 0823                          16,3570   00132 1            OCT     00132              1-3
 0824                          16,3571   00245 1            OCT     00245              2-4
 0825                          16,3572   00377 1            OCT     00377              ALL
 0826    REF   2  LAST 1435    16,3573            INDXYZ    =       -136MST6
 0827                          16,3573   77445 1  -136MST6  DEC     -218
 0828                          16,3574   00004 0            DEC     4
 0829                          16,3575   00002 0            DEC     2
 0830                          16,3576   07776 0            OCT     07776
 0831                          16,3577   00005 1            DEC     5
 0832                          16,3600   00011 1            DEC     9
 0833                          16,3601   00012 1            DEC     10
 0834                          16,3602   07776 0            OCT     07776
 0835                          16,3603   00003 1            DEC     3
 0836                          16,3604   CCC10 0             DEC     8
 0837                          16,3605   0C007 0             DFC     7
 0838                          16,3606   07776 0             OCT     07776            THESF INDEXES OF  MASK JFTSALL WILL
 0839                          16,3607   C7776 0             OCT     07776            CHANGE THE INSTRUCTION AT  SELFCTP +4
 0840                          16,3610   C7776 0             OCT     07776            TO BE    TC  JETSALL -1
 0841                          16,3611   C7776 0             OCT     07776            ONLY USED FOR TRANSLATION FAILURF
 0842                          16,3612   07776 0             OCT     07776
 0843                          16,3613   C0360 1  +150MST6 DEC     240
 0844                          16,3614   07400 1  074000CT OCT     07400
R0845  T-JET LAW FIXED CONSTANTS

 0846                          16,3615   00266 0  NORMSCL  OCT     266
 0847                          16,3616   74631 0  -100MS   DEC     -.1
 0848                          16,3617   C6315 0  200MS    DEC     .2
 0849  REF   5  LAST  963         7737            25/32    =       PRIO31           (DEC .78125)
 0850                          16,3620   00600 1  BITS8,9  OCTAL   00600
 0851                          16,3621   CC632 0  1/40     DEC     .02500
 0852                          16,3622   77751 1  MINTIMES DEC     -22
 0853                          16,3623   00026 0           DEC     22
 0854  REF   2  LAST 1426      16,3624   02740 0  PSKIPADR GENADR  SKIPPAXS

A0855                                             GOES TO Q,R-AXFS RCS AUTOPILOT
 0856  RFF   8  LAST 1405      16,3625  4 1644 1  QRAXIS   CS      OMEGARD
 0857  REF  11  LAST 1425      16,3626  6 1423 0           AD      OMFGAR
 0858  RFF  11  LAST 1433      16,3627  0 2314 0           TC      OVERSUB
 0859  REF   2  LAST  135      16,3630  55'437 1           TS      EDOTR
 0860  RFF   9  LAST 1405      16,3631  4 1643 0           CS      OMEGAQD
 0861  RFF  18  LAST 1424      16,3632  6 1422 1           AD      OMEGAQ
 0862  RFF  12  LAST 1439      16,3633  0 2314 0           TC      OVERSUB
 0863  REF   3  LAST  135      16,3634  55'436 0           TS      EDOTQ
 0864                          16,3635  0 C006 1           EXTEND
 0865  RFF   1                 16,3636  3 3641 1           DCA     QFRRCALL
 0866                          16,3637  52 006 0           DTCB

 0867  RFF  22  LAST 1425      F6,1536                     FBANK=  AOSQ
 0868  REF   1                 16,3640   02124 1  QERRCALL 2CADR   CALLQERR
 0868  RFF   1                 16,3641   36106 0
 0001                       17,2124                   BANK    17
 0002   REF   3  LAST 1402  17,2000                   SETLOC  DAPS2
 0003                       17,2124                   BANK

 0004   REF  28  LAST 1436  E6,1634                   EBANK=  CDUXD

 0005   REF   1                                       COUNT*  $$/DAPQR

R0006
 00061  REF  50  LAST 1431  17,2124  3 4730 1  CALLQERR CA      BIT13             CALCULATE Q,R ERRORS UNLESS THESE AXES
 00062                      17,2125  0 0006 1           EXTEND                    ARE IN MANUAL RATE COMMAND.
 00063  REF  16  LAST 1431  17,2126  02 031 1           RAND    CHAN31
 00064  REF 486  LAST 1438  17,2127  10 000 0           CCS     A
 00065                      17,2130  1 2135 0           TCF     +5                IN AUTO COMPUTE Q,R ERRORS
 0007   REF  48  LAST 1436  17,2131  4 0111 1           CS      DAPBOOLS          IN MANUAL RATE COMMAND?
 00071  REF   5  LAST 1432  17,2132  7 4731 1           MASK    OURRCBIT
 00072                      17,2133  0 0006 1           EXTEND
 00073  REF   1             17,2134  1 2136 0           BZF     Q,RORGTS          IF SO BYPASS CALCULATION OF ERRORS.
 00074  REF   2  LAST 1410  17,2135  0 2655 0           TC      QERRCALC

R0008
 0009   REF   2  LAST 1409  17,2136  11'630 1  Q,RORGTS CCS     COTROLER          CHOOSE CONTROL SYSTEM FOR THIS DAP PASS:
 0010   REF   1             17,2137  1 2636 1           TCF     GOTOGTS             GTS (ALTERNATES WITH RCS WHEN DOCKED)
 0011   REF   1             17,2140  1 2623 0           TCF     TRYGTS              GTS IF ALLOWED, OTHERWISE RCS
 0012   REF 296  LAST 1436  17,2141  3 4746 0  RCS      CAF     ZERO                RCS (TRYGTS MAY BRANCH TO HERE)
 0013   REF   3  LAST 1440  17,2142  55'630 1           TS      COTROLER

 0014   REF   4  LAST 1439  17,2143  53'437 1           DXCH    EDOTQ
 0015   REF   1             17,2144  0 3200 0           TC      ROT-TOUV
 0016   REF  11  LAST 1422  17,2145  53'427 0           DXCH    OMEGAU

A0017                                          X - TRANSLATION:

A0018                                          INPUT:   BITS 7,8 OF CH31 (TRANSLATION CONTROLLER)
A0019                                                   ULLAGER
A0020                                                   APSFLAG, DRIFTBIT
A0021                                                   ACC4OR2X, AORBTRAN

A0022                                          OUTPUT:  NEXTU, NEXTV        CODES OF TRANSLATION FOR AFTER ROTATION
A0023                                                   SENSETYP            TELL ROTATION DIRECTION AND DESIRE

R0024   X-TRANS POLICIES ARE EITHER 4 JETS OR A DIAGONAL PAIR.  IN 2-JET TRANSLATION THE SYSTEM IS SPECIFIED.  A FAILURE
R0026   WILL OVERRIDE THIS SPECIFICATION.  AN ALARM RESULTS WHEN NO POLICY IS AVAILABLE BECAUSE OF FAILURES.

 0028   REF  37  LAST 1427  17,2146  3 4736 1  SENSEGET CA      BIT7              INPUT BITS OVERRIDE THE INTERNAL BITS
 0029                       17,2147  0 0006 1           EXTEND                    SENSETYP WILL NOT OPPOSE ANYTRANS
 0030   REF  17  LAST 1440  17,2150  02 031 1           RAND    CHAN31
 0031                       17,2151  0 0006 1           EXTEND
 0032   REF   1             17,2152  1 2200 0           BZF     +XORULGE
```

```
0033   REF  46  LAST 1363   17,2153  3 4735 1            CA      BIT8
0034                        17,2154  0 0006 1            EXTEND
0035   REF  18  LAST 1440   17,2155  02 031 1            RAND    CHAN31
0036                        17,2156  0 0006 1            EXTEND
0037   REF   1              17,2157  1 2201 1            BZF     -XTRANS

0038   REF   3  LAST  738   17,2160  3 4737 0            CA      ULLAGER
0039   REF  49  LAST 1440   17,2161  7 0111 1            MASK    DAPBOOLS
0040   REF 487  LAST 1440   17,2162  10 000 0            CCS     A
0041   REF   2  LAST 1440   17,2163  1 2200 0            TCF     +XORULGE

0042   REF   4  LAST 1411   17,2164  55'473 1            TS      NEXTU         STORE NULL TRANSLATION POLICIES
0043   REF   4  LAST 1411   17,2165  55'474 0            TS      NEXTV
0047   REF  50  LAST 1441   17,2166  4 0111 1            CS      DAPBOOLS      BURNING OR DRIFTING?
0048   REF   4  LAST 1425   17,2167  7 4735 0            MASK    DRIFTBIT
0049                        17,2170  0 0006 1            EXTEND
0050   REF   1              17,2171  1 2176 1            BZF     TSENSE
0051   REF  34  LAST 1429   17,2172  3 0106 0            CA      FLGWRD10      DPS (INCLUDING DOCKED) OR APS?
0052   REF  14  LAST  866   17,2173  7 4730 0            MASK    APSFLBIT
0053   REF 488  LAST 1441   17,2174  10 000 0            CCS     A
0054   REF  93  LAST 1434   17,2175  3 4743 0            CAF     TWO           FAVOR +X JETS DURING AN APS BURN.
0055   REF   2  LAST 1436   17,2176  55'500 1  TSENSE    TS      SENSETYP
0056   REF   1              17,2177  1 2232 1            TCF     QRCONTRL

0057   REF 147  LAST 1436   17,2200  3 4744 1  +XORULGE  CAF     ONE
0058   REF  38  LAST 1434   17,2201  6 4742 1  -XTRANS   AD      FOUR
0059   REF   7  LAST 1438   17,2202  55'743 1            TS      ROTINDEX
0060   REF   8  LAST 1390   17,2203  6 7766 1            AD      NEG3
00601  REF   3  LAST 1441   17,2204  55'500 1            TS      SENSETYP      FAVOR APPROPRIATE JETS DURING TRANS.
0061   REF  51  LAST 1441   17,2205  3 0111 0            CA      DAPBOOLS
0062   REF   2  LAST  306   17,2206  7 4732 1            MASK    ACC4OR2X
0063   REF 489  LAST 1441   17,2207  10 000 0            CCS     A
0064   REF   1              17,2210  1 2352 0            TCF     TRANS4

0065   REF  52  LAST 1441   17,2211  3 0111 0            CA      DAPBOOLS
0066   REF   1              17,2212  7 4733 0            MASK    AORBTRAN
0067   REF 490  LAST 1441   17,2213  10 000 0            CCS     A
0068   REF 148  LAST 1441   17,2214  3 4744 1            CA      ONE           THREE FOR B
0069   REF  94  LAST 1441   17,2215  6 4743 0            AD      TWO           TWO FOR A SYSTEM 2 JET X TRANS
0070   REF   7  LAST 1438   17,2216  55'742 0  TSNUMBRT  TS      NUMBERT

0071   REF   1              17,2217  0 3225 1            TC      SELCTSUB

0072   REF   4  LAST 1438   17,2220  11'740 1            CCS     POLYTEMP
0073                        17,2221  1 2224 0            TCF     +3
0074   REF  49  LAST 1438   17,2222  0 5571 1            TC      ALARM
0075                        17,2223   02002 1            OCT     02002
0076   REF   3  LAST 1402   17,2224  3 5770 1            CA      00314OCT
0077   REF   5  LAST 1441   17,2225  7 1740 1            MASK    POLYTEMP
0078   REF   5  LAST 1441   17,2226  55'473 1  TSNEXTS   TS      NEXTU
```

```
 0079   REF   4  LAST 1441   17,2227  4 5770 0             CS      00314OCT
 0080   REF   6  LAST 1441   17,2230  7 1740 1             MASK    POLYTEMP
 0081   REF   5  LAST 1441   17,2231  55'474 0             TS      NEXTV

A0082                                             Q,R-AXES RCS CONTROL MODE SELECTION

A0083                                               SWITCHES                  INDICATION WHEN SET

A0085                                               BIT13/CHAN31              AUTO, GO TO ATTSTEER
A0086                                               PULSES                    MINIMUM IMPULSE MODE
A0087                                               (OTHERWISE)               RATE COMMAND/ATTITUDE HOLD MODE

 0088   REF  51  LAST 1440   17,2232  3 4730 1  QRCONTRL CA      BIT13             CHECK MODE SELECT SWITCH.
 0089                        17,2233  0 0006 1             EXTEND
 0090   REF  19  LAST 1441   17,2234  02 031 1             RAND    CHAN31            BITS INVERTED
 0091   REF 451  LAST 1441   17,2235  10 000 0             CCS     A
 0092   REF   1              17,2236  1 2710 1             TCF     ATTSTEER
 0093   REF   3  LAST 1428   17,2237  3 4726 0  CHKBIT10 CAF     PULSES            PULSES = 1 FOR MIN IMP USE OF RHC
 0094   REF  53  LAST 1441   17,2240  7 0111 1             MASK    DAPBOOLS
 0095                        17,2241  0 0006 1             EXTEND
 0096   REF   1              17,2242  1 2354 0             BZF     CHEKSTIK          IN ATT-HOLD/RATE-COMMAND IF BIT10=0

R0097   MINIMUM IMPULSE MODE

 0098                        17,2243  0 0004 0             INHINT
 0099   REF  60  LAST 1436   17,2244  0 4665 0             TC      IBNKCALL
 0100   REF  11  LAST 1431   17,2245   40154 0             CADR    ZATTEROR
 0101   REF 297  LAST 1440   17,2246  3 4746 0             CA      ZERO
 0102   REF   3  LAST 1413   17,2247  55'450 0             TS      QERROR
 0103   REF   3  LAST 1413   17,2250  55'452 1             TS      RERROR            FOR DISPLAYS
 0104                        17,2251  0 0003 1             RELINT

 0105                        17,2252  0 0006 1             EXTEND
 0106   REF  20  LAST 1442   17,2253  00 031 0             READ    CHAN31
 0107   REF   1              17,2254  55'736 0             TS      TEMP31            IS EQUAL TO DAPTEMP1
 0108   REF   2  LAST 1409   17,2255  11'461 1             CCS     OLDQRMIN
 0109   REF   1              17,2256  1 2300 1             TCF     CHECKIN

 0110   REF   2  LAST 1442   17,2257  3 1736 1  FIREQR   CA      TEMP31
 0111   REF  65  LAST 1430   17,2260  7 4744 0             MASK    BIT1
 0112                        17,2261  0 0006 1             EXTEND
 0113   REF   1              17,2262  1 2304 0             BZF     +QMIN

 0114   REF   3  LAST 1442   17,2263  3 1736 1             CA      TEMP31
 0115   REF  53  LAST 1416   17,2264  7 4743 1             MASK    BIT2
 0116                        17,2265  0 0006 1             EXTEND
 0117   REF   1              17,2266  1 2310 0             BZF     -QMIN

 0118   REF   4  LAST 1442   17,2267  3 1736 1             CA      TEMP31
 0119   REF  52  LAST 1409   17,2270  7 4740 1             MASK    BIT5
```

```
0120                           17,2271  0 0006 1               EXTEND
0121  REF    1                 17,2272  1 2314 1               BZF     +RMIN

0122  REF    5  LAST 1442      17,2273  3 1736 1               CA      TEMP31
0123  REF   62  LAST 1416      17,2274  7 4737 1               MASK    BIT6
0124                           17,2275  0 0006 1               EXTEND
0125  REF    1                 17,2276  1 2316 0               BZF     -RMIN

0126  REF    1                 17,2277  1 3112 1               TCF     XTRANS

0127  REF    6  LAST 1443      17,2300  4 1736 0   CHECKIN     CS      TEMP31
0128  REF    1                 17,2301  7 2351 0               MASK    OCT63
0129  REF    3  LAST 1442      17,2302  55'461 1               TS      OLDQRMIN
0130  REF    2  LAST 1443      17,2303  1 3112 1               TCF     XTRANS

0131  REF    1                 17,2304  3 3136 0   +QMIN       CA      14MS
0132  REF    3  LAST 1409      17,2305  55'525 0               TS      TJU
0133  REF    2  LAST 1443      17,2306  4 3136 1               CS      14MS
0134  REF    1                 17,2307  1 2320 0               TCF     MINQR
0135  REF    3  LAST 1443      17,2310  4 3136 1   -QMIN       CS      14MS
0136  REF    4  LAST 1443      17,2311  55'525 0               TS      TJU
0137  REF    4  LAST 1443      17,2312  3 3136 0               CA      14MS
0138  REF    2  LAST 1443      17,2313  1 2320 0               TCF     MINQR
0139  REF    5  LAST 1443      17,2314  3 3136 0   +RMIN       CA      14MS
0140                           17,2315  1 2317 1               TCF     +2
0141  REF    6  LAST 1443      17,2316  4 3136 1   -RMIN       CS      14MS
0142  REF    5  LAST 1443      17,2317  55'525 0               TS      TJU
0143  REF    2  LAST 1409      17,2320  55'526 0   MINQR       TS      TJV
0144  REF    1                 17,2321  3 2350 0               CA      MINADR
0145  REF    1                 17,2322  55'477 0               TS      RETJADR
0146  REF  149  LAST 1441      17,2323  3 4744 1               CA      ONE
0147  REF    4  LAST 1443      17,2324  55'461 1               TS      OLDQRMIN
0148  REF    3  LAST 1436      17,2325  55'505 1   MINRTN      TS      AXISCTR
0149  REF   54  LAST 1442      17,2326  3 0111 0               CA      DAPBOOLS
0150  REF    9  LAST 1436      17,2327  7 4730 0               MASK    CSMDOCKD
0151                           17,2330  0 0006 1               EXTEND
0152  REF    1                 17,2331  1 2341 1               BZF     MIMRET
0153  REF    4  LAST 1443      17,2332  51'505 0               INDEX   AXISCTR          IF DOCKED,USE 60MS MINIMUM IMPULSE
0154  REF    6  LAST 1443      17,2333  11'525 0               CCS     TJU
0155  REF    1                 17,2334  3 4767 0               CA      60MS
0156                           17,2335  1 2337 0               TCF     +2
0157  REF    2  LAST 1443      17,2336  4 4767 1               CS      60MS
0158  REF    5  LAST 1443      17,2337  51'505 0               INDEX   AXISCTR
0159  REF    7  LAST 1443      17,2340  55'525 0               TS      TJU
0160  REF   55  LAST 1443      17,2341  3 0111 0   MIMRET      CA      DAPBOOLS
0161  REF    2  LAST 1441      17,2342  7 4733 0               MASK    AORBTRAN
0162  REF  492  LAST 1442      17,2343  10 000 0               CCS     A
0163  REF  150  LAST 1443      17,2344  3 4744 1               CA      ONE
0164  REF   95  LAST 1441      17,2345  6 4743 0               AD      TWO
0165  REF    8  LAST 1441      17,2346  55'742 0               TS      NUMBERT
```

```
 0166   REF   1                17,2347  1 2756 0              TCF     AFTERTJ

 0167   REF   2  LAST  269        4767              60MS      =       OCT140
 0168   REF   1                17,2350   02325 1  MINADR    GENADR  MINRTN
 0169                          17,2351   00063 1  OCT63     OCT     63
 0170   REF   1                17,3136              14MS      =       +TJMINT6

 0171   REF  39  LAST 1441     17,2352  3 4742 1  TRANS4    CA      FOUR
 0172   REF   1                17,2353  1 2216 1            TCF     TSNUMBRT

A0173                                             RATE COMMAND MODE:

A0174                                             DESCRIPTION (SAME AS P-AXIS)

 0175   REF   2  LAST 1409     17,2354  55'632 0  CHEKSTIK  TS      INGTS               NOT IN GTS WHEN IN ATT HOLD
 0176   REF 151  LAST 1443     17,2355  4 4744 0            CS      ONE                 1/ACCS WILL DO THE NULLING DRIVES
 0177   REF   4  LAST 1440     17,2356  55'630 1            TS      COTROLER            COME BACK TO RCS NEXT TIME
 0178   REF  53  LAST 1430     17,2357  3 4726 0            CA      BIT15
 0179   REF   2  LAST 1430     17,2360  7 1443 1            MASK    CH31TEMP
 0180                          17,2361  0 0006 1            EXTEND
 0181   REF   1                17,2362  1 2377 1            BZF     RHCACTIV            BRANCH IF OUT OF DETENT.
 0182   REF   6  LAST 1440     17,2363  3 4731 0            CA      OURRCBIT            ***********
 0183   REF  56  LAST 1443     17,2364  7 0111 1            MASK    DAPBOOLS            *IN DETENT*   CHECK FOR MANUAL CONTROL
 0184                          17,2365  0 0006 1            EXTEND                      ***********   LAST TIME.
 0185   REF   1                17,2366  1 2710 1            BZF     STILLRCS
 0186   REF  35  LAST 1432     17,2367  4 4734 1            CS      BIT9
 0187   REF  41  LAST 1435     17,2370  7 1774 0            MASK    RCSFLAGS
 0188   REF  42  LAST 1444     17,2371  55'774 0            TS      RCSFLAGS            BIT 9 IS 0.
 0189   REF   1                17,2372  1 2374 1            TCF     DAMPING
 0190   REF   7  LAST 1430        4762              40CYCL    =       OCT50
 0191   REF  66  LAST 1442        4744              1/10S     =       BIT1
 0192                          17,2373   00056 1  LINRAT    DEC     46
R0193   ==============================
 0194   REF 298  LAST 1442     17,2374  3 4746 0  DAMPING   CA      ZERO
 0195   REF   2  LAST 1431     17,2375  55'462 1            TS      SAVEHAND
 0196   REF   3  LAST 1444     17,2376  55'463 0            TS      SAVEHAND +1
 0197   REF   4  LAST 1444     17,2377  11'462 1  RHCACTIV  CCS     SAVEHAND            ******************
 0198                          17,2400  1 2403 0            TCF     +3                   Q,R MANUAL CONTROL   WC = A*(B+|D|)*D
 0199                          17,2401  1 2403 0            TCF     +2                  ******************
 0200                          17,2402  1 2403 0            TCF     +1
 0201                          17,2403  6 0000 1            DOUBLE                        WHERE
 0202                          17,2404  6 0000 1            DOUBLE
 0203   REF   1                17,2405  6 2373 1            AD      LINRAT                       WC = COMMANDED ROTATIONAL RATE
 0204                          17,2406  0 0006 1            EXTEND                               A  = QUADRATIC SENSITIVITY FACTOR
 0205   REF   5  LAST 1444     17,2407  7 1462 1            MP      SAVEHAND                     B  = LINEAR/QUADRATIC SENSITIVITY
 0206   REF 255  LAST 1435     17,2410  3 0001 0            CA      L                            |D|= ABS. VALUE OF DEFLECTION
 0207                          17,2411  0 0006 1            EXTEND                               D  = HAND CONTROLLER DEFLECTION
 0208   REF   7  LAST 1432     17,2412  7 1444 0            MP      STIKSENS
 0209   REF   3  LAST 1431     17,2413  57'455 1            XCH     QLAST               COMMAND Q RATE     SCALED 45 DEG/SEC
 0210                          17,2414  4 0000 0            COM
 0211    REF   4  LAST 1444   17,2415  6 1455 1            AD      QLAST
 0212    REF   5  LAST 1422   17,2416  55'740 1            TS      DAPTEMP3
 0213    REF   6  LAST 1444   17,2417  11'463 0            CCS     SAVEHAND +1
 0214                         17,2420  1 2423 1            TCF     +3
 0215                         17,2421  1 2423 1            TCF     +2
 0216                         17,2422  1 2423 1            TCF     +1
 0217                         17,2423  6 0000 1            DOUBLE
 0218                         17,2424  6 0000 1            DOUBLE
 0219    REF   2  LAST 1444   17,2425  6 2373 1            AD      LINRAT
 0220                         17,2426  0 0006 1            EXTEND
 0221    REF   7  LAST 1445   17,2427  7 1463 0            MP      SAVEHAND +1
 0222    REF 296  LAST 1444   17,2430  3 0001 0            CA      L
 0223                         17,2431  0 0006 1            EXTEND
 0224    REF   8  LAST 1444   17,2432  7 1444 0            MP      STIKSENS
 0225    REF   3  LAST 1431   17,2433  57'456 1            XCH     RLAST
 0226                         17,2434  4 0000 0            COM
 0227    REF   4  LAST 1445   17,2435  6 1456 1            AD      RLAST
 0228    REF   3  LAST  138   17,2436  55'741 0            TS      DAPTEMP4
 0229    REF   5  LAST 1445   17,2437  4 1455 0            CS      QLAST            INTERVAL.
 0230    REF  19  LAST 1439   17,2440  6 1422 1            AD      OMEGAQ
 0231    REF   1              17,2441  55'436 0            TS      QRATEDIF
 0232    REF   5  LAST 1445   17,2442  4 1456 0            CS      RLAST
 0233    REF  12  LAST 1439   17,2443  6 1423 0            AD      OMEGAR
 0234    REF   1              17,2444  55'437 1            TS      RRATEDIF
 0235    REF   2  LAST 1445   17,2445  53'437 1  ENTERQR   DXCH    QRATEDIF         TRANSFORM RATES FROM Q,R TO U,V AXES
 0236    REF   2  LAST 1440   17,2446  0 3200 0            TC      RCT-TOUV
 0237    REF   1              17,2447  53'427 0            DXCH    URATEDIF
 02371                        17,2450  0 0004 0            INHINT                   SET AUTO DESIRED ATTITUDE TO ACTUAL
 02372   REF  61  LAST 1442   17,2451  0 4665 0            TC      IBNKCALL           ATTITUDE AND ZERO AUTO DESIRED RATE
 02373   REF  12  LAST 1442   17,2452   40154 0            ECADR   ZATTEROR
 02374                        17,2453  0 0003 1            RELINT
 0238    REF   6  LAST 1445   17,2454  11'740 1            CCS     DAPTEMP3         CHECK IF Q COMMAND CHANGE EXCEEDS
 0239                         17,2455  0 2460 1            TC      +3               BREAKOUT LEVEL.  IF NOT, CHECK R.
 0240                         17,2456  0 2460 1            TC      +2
 0241                         17,2457  0 2460 1            TC      +1
 0242    REF   6  LAST 1432   17,2460  6 1476 0            AD      -RATEDB
 0243                         17,2461  0 0006 1            EXTEND
 0244                         17,2462  6 2464 0            BZMF    +2
 0245    REF   1              17,2463  1 2502 0            TCF     ENTERUV -2       BREAKOUT LEVEL EXCEEDED.  DIRECT RATE.
 0246    REF   4  LAST 1445   17,2464  11'741 0            CCS     DAPTEMP4         R COMMAND BREAKOUT CHECK.
 0247                         17,2465  0 2470 0            TC      +3
 0248                         17,2466  0 2470 0            TC      +2
 0249                         17,2467  0 2470 0            TC      +1
 0250    REF   7  LAST 1445   17,2470  6 1476 0            AD      -RATEDB
 0251                         17,2471  0 0006 1            EXTEND
 0252                         17,2472  6 2474 1            BZMF    +2
 0253    REF   2  LAST 1445   17,2473  1 2502 0            TCF     ENTERUV -2       BREAKOUT LEVEL EXCEEDED.  DIRECT RATE.
 0254    REF  43  LAST 1444   17,2474  3 1774 1            CA      RCSFLAGS         BREAKOUT LEVEL NOT EXCEEDED.  CHECK FOR
 0255    REF   2  LAST 1430   17,2475  7 4732 1            MASK    QRBIT            DIRECT RATE CONTROL LAST TIME.
 0256                         17,2476  0 0006 1            EXTEND
 0257                          17,2477  1 2501 0            BZF      +2
 0258   REF   3  LAST 1445     17,2500  1 2504 0            TCF      ENTERUV           CONTINUE DIRECT RATE CONTROL.
 0259   REF   2  LAST 1444     17,2501  1 2710 1            TCF      STILLRCS          PSEUDO-AUTO CONTROL.
 0260   REF   1                17,2502  3 4762 0            CA       40CYCL
 0261   REF   2  LAST 1420     17,2503  55'457 1            TS       TCQR
 0266   REF 299  LAST 1444     17,2504  3 4746 0  ENTERUV   CA       ZERO              *** DIRECT RATE CONTROL ***
 0267   REF   6  LAST 1431     17,2505  55'450 0            TS       DYERROR
 0268   REF   7  LAST 1446     17,2506  55'451 1            TS       DYERROR +1
 0269   REF   6  LAST 1431     17,2507  55'452 1            TS       DZERROR
 0270   REF   7  LAST 1446     17,2510  55'453 0            TS       DZERROR +1
 0271   REF   2  LAST 1445     17,2511  11'426 1            CCS      URATEDIF
 0272                          17,2512  1 2515 0            TCF      +3
 0273                          17,2513  1 2515 0            TCF      +2
 0274                          17,2514  1 2515 0            TCF      +1
 0275   REF   2  LAST 1433     17,2515  6 1476 0            AD       TARGETDB          IF TARGET DB IS EXCEEDED, CONTINUE
 0276                          17,2516  0 0006 1            EXTEND                     DIRECT RATE CONTROL.
 0277   REF   1                17,2517  6 2533 0            BZMF     VDB
 0278   REF   1                17,2520  11'427 0            CCS      VRATEDIF
 0279                          17,2521  1 2524 1            TCF      +3
 0280                          17,2522  1 2524 1            TCF      +2
 0281                          17,2523  1 2524 1            TCF      +1
 0282   REF   3  LAST 1446     17,2524  6 1476 0            AD       TARGETDB
 0283                          17,2525  0 0006 1            EXTEND
 0284                          17,2526  6 2530 0            BZMF     +2
 0285   REF   1                17,2527  1 2544 1            TCF      QRTIME
 0286   REF 300  LAST 1446     17,2530  3 4746 0            CA       ZERO
 0287   REF   2  LAST 1446     17,2531  55'427 0            TS       VRATEDIF
 0288   REF   2  LAST 1446     17,2532  1 2544 1            TCF      QRTIME
 0289   REF   3  LAST 1446     17,2533  11'427 0  VDB       CCS      VRATEDIF
 0290                          17,2534  0 2537 1            TC       +3
 0291                          17,2535  0 2537 1            TC       +2
 0292                          17,2536  0 2537 1            TC       +1
 0293   REF   4  LAST 1446     17,2537  6 1476 0            AD       TARGETDB          IF TARGET DB IS EXCEEDED, CONTINUE
 0294                          17,2540  0 0006 1            EXTEND                     DIRECT RATE CONTROL.  IF NOT, FIRE AND
 0295   REF   1                17,2541  6 2553 0            BZMF     TOPSEUDO          SWITCH TO PSEUDO-AUTO CONTROL ON NEXT
 0296   REF 301  LAST 1446     17,2542  3 4746 0            CA       ZERO              PASS.
 0297   REF   3  LAST 1446     17,2543  55'426 1            TS       URATEDIF
 0298   REF   3  LAST 1446     17,2544  3 1457 0  QRTIME    CA       TCQR              DIRECT RATE TIME CHECK.
 0299                          17,2545  0 0006 1            EXTEND
 0300                          17,2546  6 2553 0            BZMF     +5                BRANCH IF TIME EXCEEDS 4 SEC.
 0301   REF  44  LAST 1445     17,2547  4 1774 0            CS       RCSFLAGS
 0302   REF   3  LAST 1445     17,2550  7 4732 1            MASK     QRBIT
 0303   REF  45  LAST 1446     17,2551  27'774 0            ADS      RCSFLAGS          BIT 11 IS 1.
 0304                          17,2552  0 2556 0            TC       +4
 0305   REF   4  LAST 1446     17,2553  4 4732 1  TOPSEUDO  CS       QRBIT
 0306   REF  46  LAST 1446     17,2554  7 1774 0            MASK     RCSFLAGS
 0307   REF  47  LAST 1446     17,2555  55'774 0            TS       RCSFLAGS          BIT 11 IS 0.
 0308   REF   1                17,2556  3 2622 0            CA       HANDADR
 0309   REF   2  LAST 1443     17,2557  55'477 0            TS       RETJADR
 0310   REF 152  LAST 1444     17,2560  3 4744 1            CA       ONE
 0311   REF   6  LAST 1443   17,2561  55'505 1  BACKHAND TS      AXISCTR

 0312   REF  40  LAST 1444   17,2562  3 4742 1           CA      FOUR
 0313   REF   9  LAST 1443   17,2563  55'742 0           TS      NUMBERT

 0314   REF   7  LAST 1447   17,2564  51'505 0           INDEX   AXISCTR
 0315   REF   3  LAST 1410   17,2565  51'534 1           INDEX   SKIPU
 0316                        17,2566  1 2567 0           TCF     +1
 0317   REF  41  LAST 1447   17,2567  3 4742 1           CA      FOUR
 0318   REF   8  LAST 1447   17,2570  51'505 0           INDEX   AXISCTR
 0319   REF   4  LAST 1447   17,2571  55'534 0           TS      SKIPU
 0320   REF   1              17,2572  1 3034 1           TCF     LOOPER

 0321   REF   9  LAST 1447   17,2573  51'505 0           INDEX   AXISCTR
 0322   REF   4  LAST 1446   17,2574  11'426 1           CCS     URATEDIF        INDEX  AXIS    QUANITY
 0323   REF 302  LAST 1446   17,2575  3 4746 0           CA      ZERO              0     -U     1/JETACC-AOSU
 0324                        17,2576  1 2600 1           TCF     +2                1     +U     1/JETACC+AOSU
 0325   REF 153  LAST 1446   17,2577  3 4744 1           CA      ONE              16     -V     1/JETACC-AOSV
 0326   REF  10  LAST 1447   17,2600  51'505 0           INDEX   AXISCTR          17     +V     1/JETACC+AOSV
 0327   REF   1              17,2601  6 3755 0           AD      AXISDIFF        JETACC = 2 JET ACCELERATION (1 FOR FAIL)

 0328   REF 493  LAST 1443   17,2602  50 000 1           INDEX   A
 0329   REF   1              17,2603  4 1570 0           CS      1/ANET2 +1
 0330                        17,2604  0 0006 1           EXTEND
 0331   REF  11  LAST 1447   17,2605  5 1505 0           INDEX   AXISCTR         URATEDIF IS SCALED AT PI/4 RAD/SEC
 0332   REF   5  LAST 1447   17,2606  7 1426 1           MP      URATEDIF         JET TIME IN A      SCALED 32 SEC
 0333   REF 404  LAST 1438   17,2607  54 002 1           TS      Q
 0334   REF 494  LAST 1447   17,2610  20 001 1           DAS     A
 0335   REF 405  LAST 1447   17,2611  6 0002 0           AD      Q
 0336   REF 495  LAST 1447   17,2612  54 000 0           TS      A                OVERFLOW SKIP
 0337                        17,2613  1 2615 0           TCF     +2
 0338   REF 406  LAST 1447   17,2614  3 0002 0           CA      Q               RIGHT SIGN AND BIGGER THAN 150MS
 0339   REF  12  LAST 1447   17,2615  51'505 0  SETTIME  INDEX   AXISCTR
 0340   REF   8  LAST 1443   17,2616  55'525 0           TS      TJU             SCALED AT 10.67 WHICH IS CLOSE TO 10.24
 0341   REF   2  LAST 1444   17,2617  1 2756 0           TCF     AFTERTJ

 0342   REF 303  LAST 1447   17,2620  3 4746 0  ZEROTJ   CA      ZERO
 0343   REF   1              17,2621  1 2615 0           TCF     SETTIME

 0344   REF   1              17,2622   02561 1  HANDADR  GENADR BACKHAND

A0345                                           GTS WILL BE TRIED IF
A0346                                              1. USEQRJTS= 0,
A0347                                              2. ALLOWGTS POS,
A0348                                              3. JETS ARE OFF(Q,R-AXES)
 0349   REF   4  LAST  867   17,2623  3 4727 1  TRYGTS   CAF     USEQRJTS        IS JET USE MANDATORY.         (AS LONG AS
 0350   REF  57  LAST 1444   17,2624  7 0111 1           MASK    DAPBOOLS        USEQRJTS BIT IS NOT BIT 15, CCS IS SAFE)
 0351   REF 496  LAST 1447   17,2625  10 000 0           CCS     A
 0352   REF   1              17,2626  1 2141 0           TCF     RCS
 0353   REF   2  LAST 1409   17,2627  11'502 0           CCS     ALLOWGTS        NO.  DOES AOSTASK OK CONTROL FOR GTS?
 0354                          17,2630  1 2632 0            TCF     +2
 0355    REF   2  LAST 1447    17,2631  1 2141 0            TCF     RCS
 0356                          17,2632  0 0006 1            EXTEND
 0357    REF   6  LAST 1411    17,2633  00 005 1            READ    CHAN5
 0358    REF 497  LAST 1447    17,2634  10 000 0            CCS     A
 0359    REF   1               17,2635  1 2641 1            TCF     CHKINGTS
 0360                          17,2636  0 0006 1   GOTOGTS  EXTEND
 0361    REF   1               17,2637  3 2654 1            DCA     GTSCADR
 0362                          17,2640  52 006 0            DTCB

 0363    REF   3  LAST 1444    17,2641  11'632 0   CHKINGTS CCS     INGTS              WAS THE TRIM GIMBAL CONTROLLING
 0364                          17,2642  1 2644 1            TCF     +2                   YES.  SET UP A DAMPED NULLING DRIVE.
 0365    REF   3  LAST 1448    17,2643  1 2141 0            TCF     RCS                  NO.  NULLING WAS SET UP BEFORE. DO RCS
 0366                          17,2644  0 0004 0            INHINT
 0367    REF  62  LAST 1445    17,2645  0 4665 0            TC      IBNKCALL
 0368    REF   1               17,2646   43260 1            CADR    TIMEGMBL
 0369                          17,2647  0 0003 1            RELINT
 0370    REF 304  LAST 1447    17,2650  3 4746 0            CAF     ZERO
 0371    REF   4  LAST 1448    17,2651  55'632 0            TS      INGTS
 0372    REF   4  LAST 1448    17,2652  1 2141 0            TCF     RCS

 0373    REF  29  LAST 1440    E6,1634                      EBANK=  CDUXD
 0374    REF   1               17,2653   03027 1   GTSCADR  2CADR   GTS
 0374    REF   1               17,2654   42106 0
```

```
P0375    SUBROUTINE TO COMPUTE Q,R-AXES ATTITUDE ERRORS FOR USE IN THE RCS AND GTS CONTROL LAWS AND THE DISPLAYS.

 0377    REF  17  LAST 1435   17,2655  30 033 1  QERRCALC CAE      CDUY              Q-ERROR CALCULATION
 0378                         17,2656  0 0006 1           EXTEND
 0379    REF  12  LAST 1435   17,2657  21'635 1           MSU      CDUYD             CDU ANGLE - ANGLE DESIRED (Y-AXIS)
 0380    REF  27  LAST 1432   17,2660  55'736 0           TS       DAPTEMP1          SAVE FOR RERRCALC
 0381                         17,2661  0 0006 1           EXTEND
 0382    REF   4  LAST 1422   17,2662  7 1415 1           MP       M21               (CDUY-CDUYD)*M21 SCALED AT PI RADIANS
 0383    REF   4  LAST 1436   17,2663  55'751 1           TS       E
 0384    REF  20  LAST 1419   17,2664  30 034 0           CAE      CDUZ              SECOND TERM CALCULATION:
 0385                         17,2665  0 0006 1           EXTEND
 0386    REF  10  LAST 1420   17,2666  21'636 1           MSU      CDUZD             CDU ANGLE -ANGLE DESIRED (Z-AXIS)
 0387    REF   9  LAST 1425   17,2667  55'737 1           TS       DAPTEMP2          SAVE FOR RERRCALC
 0388                         17,2670  0 0006 1           EXTEND
 0389    REF  10  LAST 1422   17,2671  7 1417 0           MP       M22               (CDUZ-CDUZD)*M22 SCALED AT PI RADIANS
 0390    REF   3  LAST 1405   17,2672  6 1275 0           AD       DELQEROR          KALCMANU INERFACE ERROR
 0391    REF   5  LAST 1449   17,2673  6 1751 0           AD       E
 0392    REF   4  LAST 1442   17,2674  57'450 1           XCH      QERROR            SAVE Q-ERROR FOR EIGHT-BALL DISPLAY.

 0393    REF  28  LAST 1449   17,2675  31'736 1  RERRCALC CAE      DAPTEMP1          R-ERROR CALCULATION:
 0394                         17,2676  0 0006 1           EXTEND                     CDU ANGLE -ANGLE DESIRED (Y-AXIS)
 0395    REF   4  LAST 1422   17,2677  7 1416 1           MP       M31               (CDUY-CDUYD)*M31 SCALED AT PI RADIANS
 0396    REF   6  LAST 1449   17,2700  55'751 1           TS       E
 0397    REF  10  LAST 1449   17,2701  31'737 0           CAE      DAPTEMP2          SECOND TERM CALCULATION:
 0398                         17,2702  0 0006 1           EXTEND                     CDU ANGLE -ANGLE DESIRED (Z-AXIS)
 0399    REF   8  LAST 1422   17,2703  7 1420 1           MP       M32               (CDUZ-CDUZD)*M32 SCALED AT PI RADIANS
 0400    REF   3  LAST 1405   17,2704  6 1276 0           AD       DELREROR          KALCMANU INERFACE ERROR
 0401    REF   7  LAST 1449   17,2705  6 1751 0           AD       E
 0402    REF   4  LAST 1442   17,2706  57'452 0           XCH      RERROR            SAVE R-ERROR FOR EIGHT-BALL DISPLAY.
 0403    REF 407  LAST 1447   17,2707  0 0002 0           TC       Q
```

```
P0404   "ATTSTEER" IS THE ENTRY POINT FOR Q,R-AXES (U,V-AXES) ATTITUDE CONTROL USING THE REACTION CONTROL SYSTEM

 0406   REF   3  LAST 1446   17,2710              ATTSTEER EQUALS STILLRCS        "STILLRCS" IS THE RCS EXIT FROM TRYGTS.

 0407   REF   5  LAST 1449   17,2710  3 1452 0   STILLRCS CA      RERROR
 0408   REF 498  LAST 1448   17,2711  22 000 1            LXCH    A
 0409   REF   5  LAST 1449   17,2712  3 1450 1            CA      QERROR
 0410   REF   3  LAST 1445   17,2713  0 3200 0            TC      ROT-TOUV
 0411   REF   2  LAST  136   17,2714  53'751 1            DXCH    UERROR

A0412                                             PREPARES CALL TO TJETLAW (OR SPSRCS(DOCKED))
A0413                                             PREFORMS SKIP LOGIC ON U OR V AXIS IF NEEDED.
 0414   REF   1              17,2715  3 3142 0   TJLAW    CA      TJLAWADR
 0415   REF   3  LAST 1446   17,2716  55'477 0            TS      RETJADR
 0416   REF 154  LAST 1447   17,2717  3 4744 1            CA      ONE
 0417   REF  13  LAST 1447   17,2720  55'505 1            TS      AXISCTR
 0418   REF  14  LAST 1450   17,2721  51'505 0            INDEX   AXISCTR
 0419   REF   5  LAST 1447   17,2722  51'534 1            INDEX   SKIPU
 0420                        17,2723  1 2724 0            TCF     +1
 0421   REF  42  LAST 1447   17,2724  3 4742 1            CA      FOUR
 0422   REF  15  LAST 1450   17,2725  51'505 0            INDEX   AXISCTR
 0423   REF   6  LAST 1450   17,2726  55'534 0            TS      SKIPU
 0424   REF   2  LAST 1447   17,2727  1 3034 1            TCF     LOOPER
 0425   REF  16  LAST 1450   17,2730  51'505 0            INDEX   AXISCTR
 0426   REF   3  LAST 1450   17,2731  3 1750 1            CA      UERROR
 0427   REF   8  LAST 1449   17,2732  55'751 1            TS      E
 0428   REF  17  LAST 1450   17,2733  51'505 0            INDEX   AXISCTR
 0429   REF  12  LAST 1440   17,2734  3 1426 0            CA      OMEGAU
 0430   REF   2  LAST  135   17,2735  55'427 0            TS      EDOT
 0431   REF  58  LAST 1447   17,2736  3 0111 0            CA      DAPBOOLS
 0432   REF  10  LAST 1443   17,2737  7 4730 0            MASK    CSMDOCKD
 0433   REF 499  LAST 1450   17,2740  10 000 0            CCS     A
 0434                        17,2741  1 2744 0            TCF     +3
 0435   REF   2  LAST 1436   17,2742  0 3304 0            TC      TJETLAW
 0436   REF   3  LAST 1447   17,2743  1 2756 0            TCF     AFTERTJ
 0437   REF  59  LAST 1450   17,2744  4 0111 1    +3      CS      DAPBOOLS        DOCKED.  IF GIMBAL USABLE DO GTS CONTROL
 0438   REF   5  LAST 1447   17,2745  7 4727 0            MASK    USEQRJTS          ON THE NEXT PASS.
 0439   REF 500  LAST 1450   17,2746  10 000 0            CCS     A               USEQRJTS BIT MUST NOT BE BIT 15.
 0440   REF   5  LAST 1444   17,2747  55'630 1            TS      COTROLER        GIMBAL USABLE.  STORE POSITIVE VALUE.
 0441                        17,2750  0 0004 0            INHINT
 0442   REF  63  LAST 1448   17,2751  0 4665 0            TC      IBNKCALL
 0443   REF   2  LAST 1436   17,2752   43667 1            CADR    SPSRCS          DETERMINE RCS CONTROL
 0444                        17,2753  0 0003 1            RELINT
 0445   REF  43  LAST 1450   17,2754  3 4742 1            CAF     FOUR            ALWAYS CALL FOR 2-JET CONTROL ABOUT U,V.
 0446   REF  10  LAST 1447   17,2755  55'742 0            TS      NUMBERT         FALL THROUGH TO JET SELECTION, ETC.

A0447                                             Q,R-JET-SELECTION-LOGIC

A0448                                             INPUT: AXISCTR        0,1 FOR  U,V
A0449                                                    SNUFFBIT       ZERO TJETU,V AND TRANS. ONLY IF SET IN A DPS BURN
```

```
A0450                                                         TJU,TJV         JET TIME SCALED 10.24 SEC.
A0451                                                         NUMBERT         INDICATES NUMBER OF JETS AND TYPE OF POLICY
A0452                                                         RETJADR         WHERE TO RETURN TO

A0453                                                 OUTPUT:  NO.U(V)JETS  RATE DERIVATION FEEDBACK
A0454                                                          CHANNEL 5
A0455                                                          SKIPU,SKIRV FOR LESS THAN 150MS FIRING

A0456                                                 NOTES:  IN CASE OF FAILURE IN DESIRED ROTATION POLICY,"ALL" UNFAILED
A0457                                                         JETS OF THE DESIRED POLICY ARE SELECTED. SINCE THERE ARE ONLY
A0458                                                         TWO JETS, THIS MEANS THE OTHER ONE OR NONE. THE ALARM IS SENT
A0459                                                         IF NONE CAN BE FOUND.

A0460                                                         TIMES LESS THAN 14 MSEC ARE TAKEN TO CALL FOR A SINGLE-JET
A0461                                                         MINIMUM IMPULSE, WITH THE JET CHOSEN SEMI-RANDOMLY.

 0462   REF  34  LAST 1435    17,2756  3 0101 1  AFTERTJ  CA      FLAGWRD5         IF SNUFFBIT SET DURING A DPS BURN GO TO
 0463   REF   1               17,2757  7 4730 0           MASK    SNUFFBIT           XTRANS; THAT IS, INHIBIT CONTROL.
 0464                         17,2760  0 0006 1           EXTEND
 0465   REF   1               17,2761  1 2772 0           BZF     DOROTAT
 0466   REF  35  LAST 1441    17,2762  4 0106 1           CS      FLGWRD10
 0467   REF  15  LAST 1441    17,2763  7 4730 0           MASK    APSFLBIT
 0468                         17,2764  0 0006 1           EXTEND
 0469   REF   2  LAST 1451    17,2765  1 2772 0           BZF     DOROTAT
 0470   REF  60  LAST 1450    17,2766  3 0111 0           CA      DAPBOOLS
 0471   REF   5  LAST 1441    17,2767  7 4735 0           MASK    DRIFTBIT
 0472                         17,2770  0 0006 1           EXTEND
 0473   REF   3  LAST 1443    17,2771  1 3112 1           BZF     XTRANS

 0474   REF  96  LAST 1443    17,2772  3 4743 0  DOROTAT  CAF     TWO
 0475   REF 297  LAST 1445    17,2773  54 001 1           TS      L
 0476   REF  18  LAST 1450    17,2774  51'505 0           INDEX   AXISCTR
 0477   REF   9  LAST 1447    17,2775  11'525 0           CCS     TJU
 0478                         17,2776  1 3003 0           TCF     +5
 0479   REF   1               17,2777  1 3026 1           TCF     NOROTAT
 0480                         17,3000  1 3002 1           TCF     +2
 0481   REF   2  LAST 1451    17,3001  1 3026 1           TCF     NOROTAT
 0482                         17,3002  22 007 0           ZL
 0483   REF 155  LAST 1450    17,3003  6 4744 1           AD      ONE
 0484   REF   5  LAST 1435    17,3004  55'736 0           TS      ABSTJ

 0485   REF  19  LAST 1451    17,3005  3 1505 0           CA      AXISCTR
 0486   REF 298  LAST 1451    17,3006  6 0001 0           AD      L
 0487   REF   8  LAST 1441    17,3007  55'743 1           TS      ROTINDEX         0 1 2 3  = -U -V -+U +V

 0488   REF   6  LAST 1451    17,3010  3 1736 1           CA      ABSTJ
 0489   REF   1               17,3011  6 3137 1           AD      -150MS
 0490                         17,3012  0 0006 1           EXTEND
 0491   REF   1               17,3013  6 3037 0           BZMF    DOSKIP
 0492    REF    2  LAST 1441    17,3014   0 3225 1               TC       SELCTSUB

 0493    REF   20  LAST 1451    17,3015   51'505 0               INDEX    AXISCTR
 0494    REF    1               17,3016   3 3134 1               CA       INDEXES
 0495    REF  299  LAST 1451    17,3017   54 001 1               TS       L

 0496    REF    7  LAST 1442    17,3020   3 1740 0               CA       POLYTEMP
 0497                           17,3021   0 0004 0               INHINT
 0498    REF  300  LAST 1452    17,3022   50 001 0               INDEX    L
 0499    REF    4  LAST 1435    17,3023   0 5750 0               TC       WRITEP

 0500                           17,3024   0 0003 1               RELINT
 0501    REF    1               17,3025   1 3100 1               TCF      FEEDBACK

 0502    REF   21  LAST 1452    17,3026   51'505 0    NOROTAT    INDEX    AXISCTR
 0503    REF    2  LAST 1452    17,3027   3 3134 1               CA       INDEXES
 0504                           17,3030   0 0004 0               INHINT
 0505    REF  501  LAST 1450    17,3031   50 000 1               INDEX    A
 0506    REF    5  LAST 1452    17,3032   0 5747 0               TC       WRITEP -1

 0507                           17,3033   0 0003 1               RELINT
 0508    REF   22  LAST 1452    17,3034   11'505 1    LOOPER     CCS      AXISCTR
 0509    REF    4  LAST 1450    17,3035   0 1477 1               TC       RETJADR
 0510    REF    1               17,3036   1 3270 0               TCF      CLOSEOUT
 0511    REF    7  LAST 1451    17,3037   4 1736 0    DOSKIP     CS       ABSTJ
 0512    REF    2  LAST 1444    17,3040   6 3136 0               AD       +TJMINT6        14MS
 0513                           17,3041   0 0006 1               EXTEND
 0514    REF    1               17,3042   6 3061 0               BZMF     NOTMIN

 0515    REF    8  LAST 1452    17,3043   27'736 0               ADS      ABSTJ
 0516    REF   23  LAST 1452    17,3044   51'505 0               INDEX    AXISCTR
 0517    REF   10  LAST 1451    17,3045   11'525 0               CCS      TJU
 0518    REF    3  LAST 1452    17,3046   3 3136 0               CA       +TJMINT6
 0519                           17,3047   1 3051 1               TCF      +2
 0520    REF    4  LAST 1452    17,3050   4 3136 1               CS       +TJMINT6
 0521    REF   24  LAST 1452    17,3051   51'505 0               INDEX    AXISCTR
 0522    REF   11  LAST 1452    17,3052   55'525 0               TS       TJU

 0523    REF    4  LAST 1441    17,3053   11'500 1               CCS      SENSETYP        ENSURE MIN-IMPULSE NOT AGAINST TRANS
 0524    REF    2  LAST 1452    17,3054   1 3060 0               TCF      NOTMIN -1
 0525                           17,3055   0 0006 1               EXTEND
 0526    REF    6  LAST  577    17,3056   00 004 0               READ     LOSCALAR
 0527    REF  156  LAST 1451    17,3057   7 4744 0               MASK     ONE
 0528    REF   11  LAST 1450    17,3060   55'742 0               TS       NUMBERT

 0529    REF    3  LAST 1452    17,3061   0 3225 1    NOTMIN     TC       SELCTSUB

 0530    REF   25  LAST 1452    17,3062   51'505 0               INDEX    AXISCTR
 0531    REF    3  LAST 1452    17,3063   3 3134 1               CA       INDEXES
 0532                           17,3064   0 0004 0               INHINT
```

```
0533   REF   5  LAST 1435   17,3065  55'471 0                TS      T6FURTHA +1
0534   REF   8  LAST 1452   17,3066  3 1740 0                CA      POLYTEMP
0535   REF   6  LAST 1453   17,3067  51'471 1                INDEX   T6FURTHA +1
0536   REF   6  LAST 1452   17,3070  0 5750 0                TC      WRITEP

0537   REF   9  LAST 1452   17,3071  3 1736 1                CA      ABSTJ
0538   REF   7  LAST 1453   17,3072  55'470 1                TS      T6FURTHA
0539   REF   2  LAST 1435   17,3073  0 3143 1                TC      JTLST              IN QR BANK BY NOW

0540                        17,3074  0 0003 1                RELINT

0541   REF 305  LAST 1448   17,3075  3 4746 0                CA      ZERO
0542   REF  26  LAST 1452   17,3076  51'505 0                INDEX   AXISCTR
0543   REF   7  LAST 1450   17,3077  55'534 0                TS      SKIPU

0544   REF  43  LAST 1385   17,3100  4 6266 1   FEEDBACK     CS      THREE
0545   REF  12  LAST 1452   17,3101  6 1742 1                AD      NUMBERT
0546                        17,3102  0 0006 1                EXTEND
0547                        17,3103  6 3106 0                BZMF    +3

0548   REF  57  LAST 1451   17,3104  3 4743 0                CA      TWO
0549                        17,3105  1 3107 0                TCF     +2
0550   REF 157  LAST 1452   17,3106  3 4744 1                CA      ONE
0551   REF  27  LAST 1453   17,3107  51'505 0                INDEX   AXISCTR
0552   REF   2  LAST  138   17,3110  55'522 1                TS      NO.UJETS
0553   REF   3  LAST 1450   17,3111  1 3034 1                TCF     LOOPER

0554   REF 306  LAST 1453   17,3112  3 4746 0   XTRANS       CA      ZERO
0555   REF  12  LAST 1452   17,3113  55'525 0                TS      TJU
0556   REF   3  LAST 1443   17,3114  55'526 0                TS      TJV
0557   REF  44  LAST 1450   17,3115  3 4742 1                CA      FOUR
0558                        17,3116  0 0004 0                INHINT
0559   REF   8  LAST 1453   17,3117  57'534 1                XCH     SKIPU
0560                        17,3120  0 0006 1                EXTEND
0561                        17,3121  1 3123 0                BZF     +2
0562   REF   1              17,3122  0 5753 0                TC      WRITEU -1
0563   REF  45  LAST 1453   17,3123  3 4742 1                CA      FOUR
0564   REF   2  LAST 1410   17,3124  57'535 0                XCH     SKIPV
0565                        17,3125  0 0003 1                RELINT

0566                        17,3126  0 0006 1                EXTEND
0567   REF   2  LAST 1452   17,3127  1 3270 0                BZF     CLOSEOUT
0568                        17,3130  0 0004 0                INHINT
0569   REF   1              17,3131  0 5764 1                TC      WRITEV -1
0570                        17,3132  0 0003 1                RELINT

0571   REF   3  LAST 1453   17,3133  1 3270 0                TCF     CLOSEOUT
0572                        17,3134   00004 0   INDEXES      DEC     4
0573                        17,3135   00015 0                DEC     13
0574                        17,3136   00026 0   +TJMINT6     DEC     22
```

```
 0575                            17,3137   77417 0  -150MS   DEC     -240
 0576                            17,3140   00600 1  BIT8,9   OCT     00600
 0577                            17,3141   00266 0  SCLNORM  OCT     266
 0578   REF   1                  17,3142   02720 0  TJLAWADR GENADR TJLAW +3         RETURN ADDRESS FOR RCS ATTITUDE CONTROL

A0579                                               THE JET LIST:
A0580                                               THIS IS A WAITLIST FOR T6RUPTS.

A0581                                               CALLED BY:
A0582                                                        CA   TJ             TIME WHEN NEXT JETS WILL BE WRITTEN
A0583                                                        TS   T6FURTHA
A0584                                                        CA   INDEX          AXIS TO BE WIRTTEN AT TJ (FROM NOW)
A0585                                                        TS   T6FURTHA +1
A0586                                                        TC JTLST

A0587                                               EXAMPLE-  U-AXIS AUTOPILOT WILL WRITE ITS ROTATION CODE OF
A0588                                               JETS INTO CHANNEL 5.   IF IT DESIRES TO TURN OFF THIS POLICY WITHIN
A0589                                               150MS AND THEN FIRE NEXTU, A CALL TO JTLST IS MADE WITH T6FURTHA
A0590                                               CONTAINING THE TIME TO TURN OFF THE POLICY, T6FURTHA +1 THE INDEX
A0591                                               OF THE U-AXIS(4), AND NEXTU WILL CONTAIN THE "U-TRANS" POLICY OR ZERO.

A0592                                               THE LIST IS EXACTLY 3 LONG.(THIS LEADS TO SKIP LOGIC AND 150MS LIMIT)
A0593                                                THE INPUT IS THE LAST MEMBER OF THE LIST

A0594                                               RETURNS BY:
A0595                                                     +  TC  Q

A0596                                               DEFINITIONS:(OUTPUT)
A0597                                               TIME6               TIME OF NEXT RUPT
A0598                                               T6NEXT              DELTA TIME TO NEXT RUPT
A0599                                               T6FURTHA            DELTA TIME FROM 2ND TO LAST RUPT
A0600                                               NXT6ADR             AXIS INDEX       0 - P-AXIS
A0601                                               T6NEXT +1           AXIS INDEX       4 - U-AXIS
A0602                                               T6FURTHA +1         AXIS INDEX      13 - V-AXIS
 0603   REF   8  LAST 1453      17,3143   4 1470 1  JTLST    CS      T6FURTHA
 0604   REF   5  LAST 1410      17,3144   6 0031 0           AD      TIME6
 0605                           17,3145   0 0006 1           EXTEND
 0606   REF   1                 17,3146   6 3163 0           BZMF    MIDORLST        TIME6 - T IS IN A

 0607   REF   4  LAST 1410      17,3147   23'465 1           LXCH    NXT6ADR
 0608   REF   9  LAST 1410      17,3150   53'467 1           DXCH    T6NEXT
 0609   REF   9  LAST 1454      17,3151   53'471 0           DXCH    T6FURTHA
 0610   REF   6  LAST 1454      17,3152   54 031 1           TS      TIME6
 0611   REF   5  LAST 1454      17,3153   23'465 1           LXCH    NXT6ADR

 0612                           17,3154   0 0006 1  TURNON   EXTEND
 06121  REF   7  LAST 1432      17,3155   23'265 1           QXCH    C13QSAV
 06122  REF  10  LAST 1432      17,3156   0 6040 0           TC      C13STALL

 06123  REF  54  LAST 1444      17,3157   3 4726 0           CA      BIT15
 0613                          17,3160  0 0006 1           EXTEND
 0614   REF  22  LAST 1432     17,3161  05 013 0           WOR     CHAN13
 0615   REF   8  LAST 1454     17,3162  0 1265 1           TC      C13QSAV

 0616   REF  10  LAST 1454     17,3163  6 1466 1  MIDORLST AD      T6NEXT
 0617                          17,3164  0 0006 1           EXTEND
 0618   REF   1                17,3165  6 3174 0           BZMF    LASTCHG          TIME6 + T6NEXT - T  IS IN A

 0619   REF  11  LAST 1455     17,3166  23'467 0           LXCH    T6NEXT +1
 0620   REF  10  LAST 1454     17,3167  53'471 0           DXCH    T6FURTHA
 0621                          17,3170  0 0006 1           EXTEND
 0622   REF   7  LAST 1454     17,3171  60 031 0           SU      TIME6
 0623   REF  12  LAST 1455     17,3172  53'467 1           DXCH    T6NEXT

 0624   REF 408  LAST 1449     17,3173  0 0002 0           TC      Q

 0625   REF 502  LAST 1452     17,3174  4 0000 0  LASTCHG  CS      A
 0626   REF  28  LAST 1392     17,3175  6 4745 0           AD      NEG0
 0627   REF  11  LAST 1455     17,3176  55'470 1           TS      T6FURTHA

 0628   REF 409  LAST 1455     17,3177  0 0002 0           TC      Q


R0629     ROT-TOUV IS ENTERED WITH THE Q-COMPONENT OF THE QUANTITY TO BE TRANSFORMED IN A AND THE R-COMPONENT IN L.
R0631   ROT-TOUV TRANSFORMS THE QUANTITY INTO THE NON-ORTHOGONAL U-V AXIS SYSTEM. IN THE U-V SYSTEM NO CROSS-COUPLING IS
R0633   PRODUCED FROM RCS JET FIRINGS. AT THE COMPLETION OF ROT-TOUV, THE U-COMPONENT OF THE TRANSFORMED QUANTITY IS IN
R0635   A AND THE V-COMPONENT IS IN L.

 0636   REF   1                17,3200  23'737 0  ROT-TOUV LXCH    ROTEMP2          (R) IS PUT INTO ROTEMP2
 0637                          17,3201  0 0006 1           EXTEND
 0638   REF   2  LAST  139     17,3202  7 1626 0           MP      COEFFQ
 0639   REF   2  LAST 1455     17,3203  57'737 0           XCH     ROTEMP2          (R) GOES TO A AND COEFFQ.(Q) TO ROTEMP2
 0640                          17,3204  0 0006 1           EXTEND
 0641   REF   1                17,3205  7 1627 1           MP      COEFFR
 0642   REF 301  LAST 1452     17,3206  54 001 1           TS      L                COEFFR.(R) IS PUT INTO L
 0643   REF   3  LAST 1455     17,3207  6 1737 0           AD      ROTEMP2
 0644   REF   1                17,3210  55'736 0           TS      ROTEMP1          COEFFQ.(Q)+COEFFR.(R) IS PUT IN ROTEMP1
 0645                          17,3211  1 3215 0           TCF     +4
 0646   REF 503  LAST 1455     17,3212  50 000 1           INDEX   A                COEFFQ.(Q) + COEFFR.(R) HAS OVERFLOWED
 0647   REF   8  LAST 1418     17,3213  4 4725 1           CS      LIMITS           AND IS LIMITED TO POSMAX OR NEGMAX
 0648   REF   2  LAST 1455     17,3214  55'736 0           TS      ROTEMP1
 0649   REF   4  LAST 1455     17,3215  4 1737 1           CS      ROTEMP2
 0650   REF 302  LAST 1455     17,3216  6 0001 0           AD      L                -COEFFQ.(Q) + COEFFR.(R) IS NOW IN A
 0651                          17,3217  54 007 1           TS      7
 0652                          17,3220  1 3223 0           TCF     +3
 0653   REF 504  LAST 1455     17,3221  50 000 1           INDEX   A                -COEFFQ.(Q) + COEFFR.(R) HAS OVERFLOWED
 0654   REF   9  LAST 1455     17,3222  4 4725 1           CS      LIMITS           AND IS LIMITED TO POSMAX OR NEGMAX
 0655   REF   3  LAST 1455     17,3223  23'736 1           LXCH    ROTEMP1          COEFFQ.(Q) + COEFFR.(R) IS PUT INTO L
 0656   REF 410  LAST 1455     17,3224  0 0002 0           TC      Q
 0657   REF   9  LAST 1451     17,3225  51'743 0  SELCTSUB INDEX   ROTINDEX
 0658   REF   1              17,3226  3 3257 1            CA      ALLJETS
 0659   REF  13  LAST 1453   17,3227  51'742 1            INDEX   NUMBERT
 0660   REF   1              17,3230  7 3263 1            MASK    TYPEPOLY
 0661   REF   9  LAST 1453   17,3231  55'740 1            TS      POLYTEMP

 0662   REF   9  LAST  272   17,3232  7 1257 1            MASK    CH5MASK
 0663   REF 505  LAST 1455   17,3233  10 000 0            CCS     A
 0664                        17,3234  1 3236 1            TCF     +2

 0665   REF 411  LAST 1455   17,3235  0 0002 0            TC      Q

 0666   REF  44  LAST 1453   17,3236  3 6266 0            CA      THREE
 0667   REF  14  LAST 1456   17,3237  55'742 0  FAILOOP   TS      NUMBERT
 0668   REF  10  LAST 1455   17,3240  51'743 0            INDEX   POTINDEX
 0669   REF   2  LAST 1456   17,3241  3 3257 1            CA      ALLJETS
 0670   REF  15  LAST 1456   17,3242  51'742 1            INDEX   NUMBERT
 0671   REF   2  LAST 1456   17,3243  7 3263 1            MASK    TYPEPOLY
 0672   REF  10  LAST 1456   17,3244  55'740 1            TS      POLYTEMP
 0673   REF  10  LAST 1456   17,3245  7 1257 1            MASK    CH5MASK
 0674                        17,3246  0 0006 1            EXTEND
 0675   REF   1              17,3247  1 3235 1            BZF     FAILOOP -2
 0676   REF  16  LAST 1456   17,3250  11'742 0            CCS     NUMBERT
 0677   REF   2  LAST 1456   17,3251  1 3237 0            TCF     FAILOOP
 0678   REF  28  LAST 1453   17,3252  51'505 0            INDEX   AXISCTR
 0679   REF  13  LAST 1453   17,3253  55'525 0            TS      TJU
 0680   REF  50  LAST 1441   17,3254  0 5571 1            TC      ALARM
 0681                        17,3255   02004 1            OCT     02004
 0682   REF   3  LAST 1451   17,3256  1 3026 1            TCF     NOROTAT
 0683                        17,3257   00110 1  ALLJETS   OCT     00110             -U        6 13
 0684                        17,3260   00022 1            OCT     00022             -V        2  9
 0685                        17,3261   00204 1            OCT     00204             +U        5 14

 0686                        17,3262   00041 1            OCT     00041             +V        1 10
 0687                        17,3263   00125 1  TYPEPOLY  OCT     00125             -X  1 5 9  13
 0688                        17,3264   00252 1            OCT     00252             +X 2 6 10 14
 0689                        17,3265   00146 1            OCT     00146             A   2 5 10 13
 0690                        17,3266   00231 1            OCT     00231             B   1 6 9 14
 0691                        17,3267   00377 1            OCT     00377             ALL 1 2 5 6 9 10 13 14
R0692     THE FOLLOWING SETS THE INTERRUPT FLIP-FLOP AS SOON AS POSSIBLE, WHICH PERMITS A RETURN TO THE INTERRUPTED JOB.

 0694   REF   1              17,3270  3 3272 0  CLOSEOUT  CA      ADRRUPT
 0695   REF   1              17,3271  0 7775 0            TC      MAKERUPT

 0696   REF   1              17,3272   03273 1  ADRRUPT   ADRES   ENDJASK

 0697   REF   5  LAST 1426   17,3273  53'753 0  ENDJASK   DXCH    DAPARUPT
 0698   REF  13  LAST 1426   17,3274  52 011 0            DXCH    ARUPT
 0699   REF   2  LAST 1426   17,3275  53'755 0            DXCH    DAPBQRPT
 0700   REF   4  LAST 1426   17,3276  56 017 1            XCH     BRUPT
 0701    REF 412  LAST 1456    17,3277  22 002 0                LXCH    Q
 0702    REF  10  LAST 1427    17,3300  3 4726 0                CAF     NEGMAX            NEGATIVE DAPZRUPT SIGNALS JASK IS OVER.
 0703    REF   4  LAST 1426    17,3301  53 757 1                DXCH    DAPZRUPT
 0704    REF   2  LAST 1426    17,3302  52 016 1                DXCH    ZRUPT
 0705    REF   1               17,3303  1 5274 1                TCF     NOQRSM
 0706                             7775                          BLOCK   3
 0707    REF   5  LAST 1299       6000                          SETLOC  FFTAG6
 0708                             7775                          BANK

 0709    REF   1                                                COUNT*  $$/DAP

 0710                             7775  0 0006 1  MAKERUPT EXTEND
 0711    REF   2  LAST 1456       7776  07 775 0                EDRUPT  MAKERUPT
```

```
R0001    PROGRAM DESCRIPTION

R0002    DESIGNED BY: R. D. GOSS AND P. S. WEISSMAN

R0003    CODED BY: P. S. WEISSMAN 28 FEBRUARY 1968

R0004        TJETLAW IS CALLED AS A SUBROUTINE WHEN THE LEM IS NOT DOCKED AND THE  AUTOPILOT IS IN THE AUTOMATIC OR
R0006    ATTITUDE-HOLD MODE TO CALCULATE THE JET-FIRING-TIME (TJET) REQUIRED FOR THE AXIS INDICATED BY AXISCTR:
R0008                        -1 INDICATES THE P-AXIS
R0009                        +0 INDICATES THE U-AXIS
R0010                        +1 INDICATES THE V-AXIS.
R0011    THE REGISTERS E AND EDOT CONTAIN THE APPROPRIATE ATTITUDE ERROR AND ERROR RATE AND SENSETYP SHOWS WHETHER
R0013    UNBALANCED COUPLES ARE PREFERRED.  TJETLAW ALSO USES VARIOUS FUNCTIONS OF ACCELERATION AND DEADBAND WHICH ARE
R0015    COMPUTED IN THE 1/ACCONT SECTION OF 1/ACCS AND ARE STORED IN SUCH AN ORDER THAT THEY CAN BE CONVENIENTLY
R0017    ACCESSED BY INDEXING.
R0018        THE SIGN OF THE REQUIRED ROTATION IS CARRIED THROUGH TJETLAW AS ROTSENSE AND IS FINALLY APPLIED TO TJET JUST
R0020    PREVIOUS TO ITS STORAGE IN THE LOCATION CORRESPONDING TO THE AXIS (TJP, TJU OR TJV).  THE NUMBER OF JETS THAT
R0022    TJETLAW ASSUMES WILL BE USED IS INDICATED BY THE SETTING OF NUMBERT FOR THE U- OR V-AXIS.  TWO JETS ARE ALWAYS
R0024    ASSUMED FOR THE P-AXIS  ALTHOUGH FOUR JETS WILL BE FIRED WHEN FIREFCT IS MORE NEGATIVE THAN -4.0 DEGREES
R0026    (FIREFCT IS THE DISTANCE TO A SWITCH CURVE IN THE PHASE PLANE) AND A LONG FIRING IS CALLED FOR.
R0028        IN ORDER TO AVOID SCALING DIFFICULTIES, SIMPLE ALGORITHMS TAGGED ROUGHLAW1, -2 AND -3 ARE RESORTED TO WHEN THE
R0030    ERROR AND/OR ERROR RATE ARE LARGE.

R0031    CALLING SEQUENCE:
R0032                 TC      TJETLAW          (MUST BE IN JASK)
R0033        OR
R0034                 INHINT                   (MUST BE IN JASK)
R0035                 TC      IBNKCALL
R0036                 CADR    TJETLAW
R0037                 RELINT

R0038    EXIT: RETURN TO Q.

R0039    INPUT:
R0040       FROM THE CALLER: E, EDOT, AXISCTR, SENSETYP, TJP,-U,-V.
R0041       FROM 1/ACCONT: 48 ERASABLES BEGINNING AT BLOCKTOP (INCLUDING FLAT, ZONE3LIM AND ACCSWU,-V).

R0043    OUTPUT:
R0044       TJP,-U OR -V, NUMBERT (DAPTEMP5), FIREFCT (DAPTEMP3).

R0045    DEBRIS:
R0046       A, L, Q, E, EDOT, DAPTEMP1-6, DAPTREG1-4.

R0047    ALARM: NONE


 0048                         17,3304                     BANK    17
 0049    REF    4  LAST 1440  17,2000                     SETLOC DAPS2
 0050                         17,3304                     BANK
 0051    REF   13  LAST 1436  E6,1524                     EBANK= TJP
 0052    REF   1                                        COUNT*  $$/DAPTJ

 0053                       17,3304  0 0006 1  TJETLAW  EXTEND                   SAVE Q FOR RETURN.
 0054    REF   1            17,3305  23'744 1           QXCH    HOLDQ

R0055    SET INDEXERS TO CORRESPOND TO THE AXIS AND TO THE SIGN OF EDOT

 0056    REF  29  LAST 1456  17,3306  51'505 0           INDEX   AXISCTR          AXISDIFF(-1)=NO OF LOCATIONS BER P AND U
 0057    REF   2  LAST 1447  17,3307  3 3755 0           CAE     AXISDIFF         AXISDIFF(0) = 0
 0058    REF   1             17,3310  55'745 1           TS      ADRSDIF1         AXISDIFF(+1)=NO OF LOCATIONS BET V AND U

 0059    REF   3  LAST 1450  17,3311  31'427 1           CAE     EDOT             IF EDOT NEGATIVE, PICK UP SET OF VALUES
 0060                        17,3312  0 0006 1           EXTEND                     THAT ALLOW USE OF SAME CODING AS FOR
 0061    REF   1             17,3313  6 3320 0           BZMF    NEGEDOT            POSITIVE EDOT.
 0062    REF   2  LAST 1459  17,3314  31'745 0           CAE     ADRSDIF1         SET A SECOND INDEXER WHICH MAY BE
 0063    REF   1             17,3315  55'743 1           TS      ADRSDIF2           MODIFIED BY A DECISION FOR MAX JETS.
 0064    REF   1             17,3316  3 3757 1           CAF     SENSOR           FOR POSITIVE EDOT, ROTSENSE IS
 0065    REF   1             17,3317  1 3330 0           TCF     SETSENSE           INITIALIZED POSITIVE.

 0066    REF   9  LAST 1450  17,3320  4 1751 1  NEGEDOT  CS      E                IN ORDER FOR NEG EDOT CASE TO USE CODING
 0067    REF  10  LAST 1459  17,3321  55'751 1           TS      E                  OF POS EDOT, MUST MODIFY AS FOLLOWS:
 0068    REF   4  LAST 1459  17,3322  4 1427 0           CS      EDOT               1.COMPLEMENT E AND EDOT.
 0069    REF   5  LAST 1459  17,3323  55'427 0           TS      EDOT               2.SET SENSE OF ROTATION TO NEGATIVE
 0070    REF  67  LAST 1444  17,3324  3 4744 1           CAF     BIT1                 (REVERSED LATER IF NECESSARY).
 0071    REF   3  LAST 1459  17,3325  27'745 1           ADS     ADRSDIF1           3.INCREMENT INDEXERS BY ONE SO THAT
 0072    REF   2  LAST 1459  17,3326  55'743 1           TS      ADRSDIF2             THE PROPER PARAMETERS ARE ACCESSED.
 0073    REF   2  LAST 1459  17,3327  4 3757 0           CS      SENSOR
 0074    REF   1             17,3330  55'737 1  SETSENSE TS      ROTSENSE

R0075    TEST MAGNITUDE OF E (ATTITUDE ERROR, SINGLE-PRECISION, SCALED AT PI RADIANS):
R0077              IF GREATER THAN (OR EQUAL TO) PI/16 RADIANS, GO TO THE SIMPLIFIED TJET ROUTINE.
R0079              IF LESS THAN PI/16 RADIANS. RESCALE TO PI/4.

 0080    REF  11  LAST 1459  17,3331  31'751 0           CAE     E                PICK UP ATTITUDE ERROR FOR THIS AXIS
 0081                        17,3332  0 0006 1           EXTEND
 0082    REF  51  LAST 1442  17,3333  7 4740 1           MP      BIT5             SHIFT RIGHT TEN BITS; IF A-REGISTER IS
 0083    REF 506  LAST 1456  17,3334  10 000 0           CCS     A                  ZERO, RESCALE AND TEST EDOT.
 0084    REF   1             17,3335  1 3717 1           TCF     RUFLAW2
 0085    REF   1             17,3336  1 3340 1           TCF     SCALEE
 0086    REF   1             17,3337  1 3663 0           TCF     RUFLAW1
 0087    REF  52  LAST 1442  17,3340  3 4730 1  SCALEE   CAF     BIT13            ERROR IS IN E SCALED AT PI/16.  RESCALE
 0088                        17,3341  0 0006 1           EXTEND                     IT TO PI/4 AND SAVE IT.
 0089    REF 303  LAST 1455  17,3342  7 0001 1           MP      L
 0090    REF  12  LAST 1459  17,3343  55'751 1           TS      E

R0091    TEST MAGNITUDE OF EDOT (ERROR RATE SCALED AT PI/4 RADIANS/SECOND)
R0092              IF GREATER THAN (OR EQUAL TO) PI/32 RADIANS/SECOND, GO TO THE SIMPLIFIED TJET ROUTINE.
R0094              IF LESS THAN PI/32 RADIANS/SECOND, THEN RESCALE TO PI/32 RADIANS/SECOND.

 0096    REF   6  LAST 1459  17,3344  31'427 1           CAE     EDOT             PICK UP SINGLE-PRECISION ERROR-RATE
```

```
L        TJET LAW                                                                  USER'S PAGE NO.   3       E6 S4

 0097                          17,3345  0 0006 1           EXTEND             FOR THIS AXIS=
 0098    REF  62  LAST 1417    17,3346  7 4741 0           MP       BIT4      SHIFT RIGHT ELEVEN BITS, IF THE A-REG IS
 0099                          17,3347  0 0006 1           EXTEND             ZERO, THEN RESCALE AND USE FINELAW.
 0100    REF   1               17,3350  1 3352 1           BZF      SCALEDOT
 0101    REF   1               17,3351  1 3725 0           TCF      RUFLAW3
R0102    *** FINELAW STARTS HERE ***

 0103    REF   7  LAST 1459    17,3352  23'427 1  SCALEDOT LXCH     EDOT      EDOT IS SCALED AT PI/32 RADIANS/SECOND.

 0104    REF   8  LAST 1460    17,3353  31'427 1           CAE      EDOT      COMPUTE (EDOT)(EDOT)
 0105                          17,3354  0 0006 1           EXTEND
 0106                          17,3355  7 0000 0           SQUARE             PRODUCT SCALED AT PI(2)/2(10) RAD/SEC.
 0107                          17,3356  0 0006 1           EXTEND
 0108    REF  53  LAST 1459    17,3357  7 4730 0           MP       BIT13     SHIFT RIGHT TWO BITS TO RESCALE EDOTSQ
 0109    REF   1               17,3360  55'736 0           TS       EDOTSQ      TO PI(2)/2(8) RAD(2)/SEC(2).

 0110    REF  13  LAST 1459    17,3361  11'751 1  ERRTEST  CCS      E         DOES BIG ERROR (THREE DEG BEYOND THE
 0111                          17,3362  1 3365 0           TCF      +3        DEADBAND) REQUIRE MAXIMUM JETS?
 0112                          17,3363  1 3365 0           TCF      +2
 01125                         17,3364  1 3365 0           TCF      +1
 0113    REF   1               17,3365  6 3760 0           AD       -3DEG
 0114                          17,3366  0 0006 1           EXTEND
 0115    REF   4  LAST 1459    17,3367  5 1745 0           INDEX    ADRSDIF1
 0116    REF   1               17,3370  61'600 0           SU       FIREDB
 0117                          17,3371  0 0006 1           EXTEND
 0118    REF   1               17,3372  6 3377 1           BZMF     SENSTEST  IF NOT: ARE UNBALANCED JETS PREFERRED?
 0119    REF  58  LAST 1453    17,3373  3 4743 0  MAXJETS  CAF      TWO       IF YES : INCREMENT ADDRESS LOCATOR AND
 0120    REF   3  LAST 1459    17,3374  27'743 1           ADS      ADRSDIF2    SET SWITCH FOR JET SELECT LOGIC TO 4.
 0121    REF  46  LAST 1453    17,3375  3 4742 1           CAF      FOUR        (ALWAYS DO THIS FOR P-AXIS)
 0122    REF   1               17,3376  1 3402 0           TCF      TJCALC
 0123    REF   5  LAST 1452    17,3377  11'500 1  SENSTEST CCS      SENSETYP  DOES TRANSLATION PREFER MIN JETS.
 0124    REF   2  LAST 1460    17,3400  1 3402 0           TCF      TJCALC    YES.  USE MIN-JET PARAMETERS.
 0125    REF   1               17,3401  1 3373 1           TCF      MAXJETS   NO.  GET MAX-JET PARAMETERS.
 0126    REF  17  LAST 1456    17,3402  55'742 0  TJCALC   TS       NUMBERT   SET TO +0,1,4 FOR (U,V-AXES) JET SELECT.

R0127    BEGINNING OF TJET CALCULATIONS:

 0128    REF   2  LAST 1460    17,3403  4 1736 0           CS       EDOTSQ    SCALED AT PI(2)/2(8).
 0129                          17,3404  0 0006 1           EXTEND
 0130    REF   4  LAST 1460    17,3405  5 1743 0           INDEX    ADRSDIF2
 0131    REF   8  LAST  139    17,3406  7 1566 1           MP       1/ANET1   .5/ACC SCALED AT 2(6)/PI SEC(2)/RADIAN.
 0132    REF   5  LAST 1460    17,3407  51'745 0           INDEX    ADRSDIF1
 0133    REF   2  LAST 1460    17,3410  6 1600 0           AD       FIREDB    DEADBAND SCALED AT PI/4 RADIAN.
 0134                          17,3411  0 0006 1           EXTEND
 0135    REF  14  LAST 1460    17,3412  61'751 0           SU       E         ATTITUDE ERROR SCALED AT PI/4 RADIAN.
 0136    REF   2  LAST 1436    17,3413  55'740 1           TS       FIREFCT   -E-.5(EDOTSQ)/ACC-DB AT PI/4 RADIAN.
 0137                          17,3414  0 0006 1           EXTEND
 0138    REF   1               17,3415  6 3575 0           BZMF     ZON1,2,3

 0139    REF   6  LAST 1460    17,3416  51'745 0  ZONE4,5  INDEX    ADRSDIF1
 0140   REF   1              17,3417  31'572 0            CAE     1/ACOAST          .5/ACC SCALED AT  2(6)/PI WHERE
 0141                        17,3420  0 0006 1            EXTEND                       ACC = MAX(AMIN, AOS-).
 0142   REF   3  LAST 1460   17,3421  7 1736 0            MP      EDOTSQ            SCALED AT PI/2(8).
 0143   REF  15  LAST 1460   17,3422  6 1751 0            AD      E                 SCALED AT PI/4
 0144   REF   7  LAST 1460   17,3423  51'745 0            INDEX   ADRSDIF1
 0145   REF   1              17,3424  6 1602 1            AD      COASTDB           SCALED AT PI/4  POS. FOR NEG. INTERCEPT.
 0146                        17,3425  0 0006 1            EXTEND                    TEST E+.5(EDOTSQ)/ACC+DB AT PI/4 RADIAN.
 0147   REF   1              17,3426  6 3461 1            BZMF    ZONE5             IF FUNCTION NEGATIVE, FIND TJET.
A0148                                                                               IF FUNCTION POSITIVE, IN ZONE 4.

R0149     ZONE 4 IS THE COAST REGION.  HOWEVER, IF THE JETS ARE ON AND DRIVING TOWARD
R0151       A. THE AXIS WITHIN + OR - (DB + FLAT) FOR DRIFTING FLIGHT, OR
R0152       B. THE USUAL TARGET PARABOLA FOR POWERED FLIGHT
R0153   THEN THE THRUSTERS ARE KEPT ON.

 0154   REF  30  LAST 1459   17,3427  51'505 0  ZONE4     INDEX   AXISCTR           IS THE CURRENT VALUE IN TJET NON-ZERO
 0155   REF   1              17,3430  4 1525 0            CS      TJETU               WITH SENSE OPPOSITE TO EDOT,
 0156                        17,3431  0 0006 1            EXTEND                      (I.E., ARE JETS ON AND FIRING TOWARD
 0157   REF   2  LAST 1459   17,3432  7 1737 1            MP      ROTSENSE            THE DESIRABLE STATE).
 0158                        17,3433  0 0006 1            EXTEND
 0159   REF   1              17,3434  6 3455 0            BZMF    COASTTJ           NO.  COAST.

 0160   REF   1              17,3435  11'554 0  JETSON    CCS     FLAT              YES. IS THIS DRIFTING OR POWERED FLIGHT|
 0161   REF   1              17,3436  1 3447 1            TCF     DRIFT/ON          DRIFTING. GO MAKE FURTHER TEST.

 0162   REF   3  LAST 1460   17,3437  4 1740 1            CS      FIREFCT           POWERED (OR ULLAGE). CAN TARGET PARABOLA
 0163   REF   8  LAST 1461   17,3440  51'745 0            INDEX   ADRSDIF1            BE REACHED FROM THIS POINT IN THE
 0164   REF   1              17,3441  6 1604 1            AD      AXISDIST            PHASE PLANE|
 0165                        17,3442  0 0006 1            EXTEND
 0166   REF   2  LAST 1461   17,3443  6 3455 0            BZMF    COASTTJ           NO. SET TJET = 0.
 0167   REF   1              17,3444  0 3561 0            TC      Z123COMP          YES. CALCULATE TJET AS THOUGH IN ZONE 1
 0168   REF   4  LAST 1461   17,3445  31'740 0            CAE     FIREFCT             AFTER COMPUTING THE REQUIRED
 0169   REF   1              17,3446  1 3615 1            TCF     ZONE1               PARAMETERS.

 0170   REF   9  LAST 1461   17,3447  51'745 0  DRIFT/ON  INDEX   ADRSDIF1          CAN TARGET STRIP OF AXIS BE REACHED FROM
 0171   REF   3  LAST 1460   17,3450  4 1600 1            CS      FIREDB              THIS POINT IN THE PHASE PLANE|
 0172                        17,3451  6 0000 1            DOUBLE
 0173   REF   5  LAST 1461   17,3452  6 1740 0            AD      FIREFCT
 0174                        17,3453  0 0006 1            EXTEND
 0175                        17,3454  6 3457 1            BZMF    +3
 0176   REF 307  LAST 1453   17,3455  3 4746 0  COASTTJ   CAF     ZERO              NO.  SET TJET = 0.
 0177   REF   1              17,3456  1 3521 0            TCF     RETURNTJ

 0178   REF   2  LAST 1461   17,3457  0 3561 0            TC      Z123COMP          YES. CALCULATE TJET AS THOUGH IN ZONE 2
 0179   REF   1              17,3460  1 3602 1            TCF     ZONE2,3             OR 3 AFTER COMPUTING REQUIRED VALUES.

 0180   REF 304  LAST 1459   17,3461  54 001 1  ZONE5     TS      L                 TEMPORARILY STORE FUNCTION IN L.
 0181   REF   3  LAST 1461   17,3462  11'737 1            CCS     ROTSENSE          MODIFY ADRSDIF2 FOR ACCESSING 1/ANET2
 0182                        17,3463  1 3467 0            TCF     +4                AND ACCFCTZ5, WHICH MUST BE PICKED UP
 0183   REF  22  LAST 1461   17,3464  0 5701 1            TC      CCSHOLE           FROM THE NEXT LOWER REGISTER IF THE
 0184   REF  99  LAST 1460   17,3465  4 4743 1             CS      TWO                (ACTUAL) ERROR RATE IS NEGATIVE.
 0185   REF   5  LAST 1460   17,3466  27'743 1             ADS     ADRSDIF2

 0186   REF 305  LAST 1461   17,3467  30 001 0    +4       CAE     L
 0187                        17,3470  0 0006 1             EXTEND
 0188   REF   6  LAST 1462   17,3471  5 1743 0             INDEX   ADRSDIF2           TTOAXIS AND HH ARE THE PARAMETERS UPON
 0189   REE   1              17,3472  7 1575 0             MP      ACCFCTZ5             WHICH THE APPROXIMATIONS TO TJET ARE
 0190                        17,3473  20 001 1             DDOUBL                       BASED.
 0191                        17,3474  20 001 1             DDOUBL
 0192   REF   1              17,3475  53'747 0             DXCH    HH                 DOUBLE PRECISION H SCALED AT 8 SEC(2).
 0193   REF   7  LAST 1462   17,3476  51'743 0             INDEX   ADRSDIF2
 0194   REF   2  LAST 1447   17,3477  31'567 1             CAE     1/ANET2            SCALED AT 2(7)/PI SEC(2)/RAD.
 0195                        17,3500  0 0006 1             EXTEND
 0196   REF   9  LAST 1460   17,3501  7 1427 0             MP      EDOT               SCALED AT PI/2(5)
 0197   REF   1              17,3502  55'741 0             TS      TTOAXIS            SCALED AT 4 SEC.

R0198   TEST WHETHER TJET GREATER THAN 50 MSEC.
 0199                        17,3503  0 0006 1             EXTEND
 0200   REF   1              17,3504  7 3767 0             MP      -.05AT2            H - .05 TTOAXIS - .00125 G.T. ZERO
 0201   REF   2  LAST 1462   17,3505  6 1746 0             AD      HH                   (SCALED AT 8 SEC(2) ).
 0202   REF   9  LAST 1305   17,3506  6 7767 0             AD      NEG2
 0203                        17,3507  0 0006 1             EXTEND
 0204   REF   1              17,3510  6 3536 1             BZMF    FORMULA1

R0205   TEST WHETHER TJET GREATER THAN 150 MSEC.
 0206   REF   2  LAST 1462   17,3511  31'741 1             CAE     TTOAXIS
 0207                        17,3512  0 0006 1             EXTEND
 0208   REF   1              17,3513  7 3770 0             MP      -.15AT2            H - .15 TTOAXIS - .01125 G.T. ZERO
 0209   REF   3  LAST 1462   17,3514  6 1746 0             AD      HH                   (SCALED AT 8 SEC(2) )
 0210   REF   1              17,3515  6 3761 1             AD      -.0112A8
 0211                        17,3516  0 0006 1             EXTEND
 0212   REF   1              17,3517  6 3546 0             BZMF    FORMULA2

R0213   IF TJET GREATER THAN 150 MSEC, ASSIGN IT VALUE OF 250 MSEC, SINCE THIS
R0214     IS ENOUGH TO ASSURE NO SKIP NEXT CSP (100 MSEC).

 0215   REF  21  LAST 1333   17,3520  3 4732 0  FULLTIME CAE     BIT11              250 MSEC SCALED AT 4 SEC.

R0216   RETURN TO CALLING PROGRAM WITH JET TIME SCALED AS TIME6 AND SIGNED.

 0217                        17,3521  0 0006 1  RETURNTJ EXTEND                     ALL BRANCHES TERMINATE HERE WITH TJET
 0218   REF   4  LAST 1461   17,3522  7 1737 1             MP      ROTSENSE             (SCALED AT 4 SEC) IN THE ACCUMULATOR.
 0219   REF  31  LAST 1461   17,3523  51'505 0             INDEX   AXISCTR            ROTSENSE APPLIES SIGN AND CHANGES SCALE.
 0220   REF   2  LAST 1461   17,3524  55'525 0             TS      TJETU
 0221                        17,3525  0 0006 1             EXTEND
 0222   REF  32  LAST 1462   17,3526  5 1505 0             INDEX   AXISCTR
 0223   REF   2  LAST  139   17,3527  7 1546 0             MP      ACCSWU             SET SWITCH FOR JET SELECT IF ROTATION IS
 0224   REF 306  LAST 1462   17,3530  30 001 0             CAE     L
 0225                        17,3531  0 0006 1             EXTEND                       IN A SENSE FOR WHICH 1/ACCS HAS FORCED
 0226                        17,3532  6 3535 1             BZMF    +3                   A MAX-JET CALCULATION.
```

```
L        TJET LAW                                                                            USER'S PAGE NO.   6       E6 S4

 0227   REF  47  LAST 1460   17,3533  3 4742 1            CAF     FOUR
 0228   REF  18  LAST 1460   17,3534  55'742 0            TS      NUMBERT
 0229   REF   2  LAST 1459   17,3535  0 1744 1            TC      HOLDQ            RETURN VIA SAVED Q.

R0230      TJET = H/(.025 + TTOAXIS)    FOR TJET LESS THAN 50 MSEC.

 0231   REF   1              17,3536  4 3766 1  FORMULA1 CS      -.025AT4         .025 SEC SCALED AT 4.
 0232   REF   3  LAST 1462   17,3537  6 1741 1            AD      TTOAXIS          SCALED AT 4 SECONDS.
 0233   REF   4  LAST 1462   17,3540  53'747 0            DXCH    HH               STORE DENOMINATOR IN FIRST WORD OF H,
 0234                        17,3541  0 0006 1            EXTEND                     WHICH NEED NOT BE PRESERVED. PICK UP
 0235   REF   5  LAST 1463   17,3542  11'746 1            DV      HH                 DP H AND DIVIDE BY DENOMINATOR.
 0236                        17,3543  0 0006 1            EXTEND
 0237   REF  83  LAST 1421   17,3544  7 4727 0            MP      BIT14            RESCALE TJET FROM 2 TO USUAL 4 SEC.
 0238   REF   1              17,3545  1 3656 0            TCF     CHKMINTJ         CHECK THAT TJET IS NOT LESS THAN MINIMUM

R0239      TJET = (H + .00375)/(0.1 + TTOAXIS)    FOR TJET GREATER THAN 50 MSEC.

 0240                        17,3546  0 0006 1  FORMULA2 EXTEND
 0241   REF   1              17,3547  3 3772 0            DCA     .00375A8         .00375 SEC(2) SCALED AT 8.
 0242   REF   6  LAST 1463   17,3550  21'747 0            DAS     HH               STORE NUMERATORIN DP H, WHICH NEED NOT
A0243                                                                                BE PRESERVED.
 0244   REF   4  LAST 1463   17,3551  31'741 1            CAE     TTOAXIS          SCALED AT 4 SEC.
 0245   REF   1              17,3552  6 3762 1            AD      .1AT4            0.1 SEC SCALED AT 4.
 0246   REF   7  LAST 1463   17,3553  53'747 0            DXCH    HH               STORE DENOMINATOR IN FIRST WORD OF H,
 0247                        17,3554  0 0006 1            EXTEND                     WHICH NEED NOT BE PRESERVED.  PICK UP
 0248   REF   8  LAST 1463   17,3555  11'746 1            DV      HH                 DP NUMERATOR AND DIVIDE BY DENOMINATOR
 0249                        17,3556  0 0006 1            EXTEND
 0250   REF  84  LAST 1463   17,3557  7 4727 0            MP      BIT14            RESCALE TJET FROM 2 TO USUAL 4 SEC.
 0251   REF   2  LAST 1461   17,3560  1 3521 0            TCF     RETURNTJ         END SUBROUTINE.

R0252   SUBROUTINIZED COMPUTATIONS REQUIRED FOR ALL ENTRIES INTO CODING FOR ZONES 1, 2, AND 3.

R0254   REACHED BY TC FROM 3 POINTS IN TJETLAW.

 0255   REF   5  LAST 1462   17,3561  4 1737 1  Z123COMP CS      ROTSENSE         USED IN RETURNTJ SECTION TO RESCALE TJET
 0256   REF   6  LAST 1463   17,3562  55'737 1            TS      ROTSENSE           AS TIME6 AND GIVE IT PROPER SIGN.
 0257   REF  10  LAST 1462   17,3563  31'427 1            CAE     EDOT             SCALED AT PI/2(5) RAD/SEC.
 0258                        17,3564  0 0006 1            EXTEND
 0259   REF   8  LAST 1462   17,3565  5 1743 0            INDEX   ADRSDIF2
 0260   REF   9  LAST 1460   17,3566  7 1566 1            MP      1/ANET1          SCALED AT 2(7)/PI SEC(2)/RAD.
 0261   REF   5  LAST 1463   17,3567  55'741 0            TS      TTOAXIS          STORE TIME-TO-AXIS SCALED AT 4 SECONDS.
 0262   REF   1              17,3570  6 3773 1            AD      -TJMAX
 0263                        17,3571  0 0006 1            EXTEND                   IS TIME TO AXIS LESS THAN 150 MSEC.
 0264                        17,3572  6 3574 1            BZMF    +2
 0265   REF   1              17,3573  1 3520 1            TCF     FULLTIME         NO.  FIRE JETS, DO NOT CALCULATE TJET.
 0266                        17,3574  0 0002 0            RETURN                   YES.  GO ON TO FIND TJET

 0267   REF   3  LAST 1461   17,3575  0 3561 0  ZON1,2,3 TC      Z123COMP         SUBROUTINIZED PREPARATION FOR ZONE1,2,3.

R0268   IF THE (NEG) DISTANCE BEYOND PARABOLA IS LESS THAN FLAT, USE SPECIAL
```

```
R0269    LOGIC TO ACQUIRE MINIMUM IMPULSE LIMIT CYCLE.  DURING POWERED FLIGHT
R0270    OR ULLAGE, FLAT = 0

 0271    REF   6  LAST 1461   17,3576  31'740 0            CAE     FIREFCT          SCALED AT PI/4 RAD.
 0272    REF   2  LAST 1461   17,3577  6 1554 1            AD      FLAT
 0273                         17,3600  0 0006 1            EXTEND
 0274    REF   2  LAST 1461   17,3601  6 3615 0            BZMF    ZONE1            NOT IN SPECIAL ZONES.

R0275    FIRE FOR AXIS OR, IF CLOSE, FIRE MINIMUM IMPULSE.  IF ON AXIS, COAST.

 0276    REF   1              17,3602  4 1555 1  ZONE2,3   CS      ZONE3LIM         HEIGHT OF MIN-IMPULSE ZONE SET BY 1/ACCS
 0277    REF   6  LAST 1463   17,3603  6 1741 1            AD      TTOAXIS            35 MSEC IN DRIFTING FLIGHT
 0278                         17,3604  0 0006 1            EXTEND                     ZERO WHEN TRYING TO ENTER GTS CONTROL.
 0279    REF   1              17,3605  6 3610 0            BZMF    ZONE3
 0280    REF   7  LAST 1464   17,3606  31'741 1  ZONE2     CAE     TTOAXIS          FIRE TO AXIS.
 0281    REF   3  LAST 1463   17,3607  1 3521 0            TCF     RETURNTJ
 0282    REF  11  LAST 1463   17,3610  11'427 0  ZONE3     CCS     EDOT             CHECK IF EDOT IS ZERO.
 0283    REF  63  LAST 1443   17,3611  3 4737 0            CAF     BIT6             FIRE A ONE-JET MINIMUM IMPULSE.
 0284    REF   4  LAST 1464   17,3612  1 3521 0            TCF     RETURNTJ         TJET = +C.
 0285    REF  23  LAST 1461   17,3613  0 5701 1            TC      CCSHOLE          CANNOT BE BECAUSE NEG EDOT COMPLEMENTED.
 0286    REF   5  LAST 1464   17,3614  1 3521 0            TCF     RETURNTJ         TJET = +0.

 0287                         17,3615  0 0006 1  ZONE1     EXTEND
 0288    REF  10  LAST 1461   17,3616  5 1745 0            INDEX   ADRSDIF1
 0289    REF   2  LAST 1461   17,3617  61'604 1            SU      AXISDIST         SCALED AT PI/4 RAD.
 0290                         17,3620  0 0006 1            EXTEND
 0291    REF   9  LAST 1463   17,3621  5 1743 0            INDEX   ADRSDIF2
 0292    REF   1              17,3622  7 1574 1            MP      ACCFCTZ1         SCALED AT 2(7)/PI SEC(2)/RAD.
 0293                         17,3623  20 001 1            DDOUBL
 0294                         17,3624  20 001 1            DDOUBL
 0295    REF   9  LAST 1463   17,3625  53'747 0            DXCH    HH               DOUBLE PRECISION H SCALED AT 8 SEC(2).

R0296    TEST WHETHER TOTAL TIME REQUIREO GREATER THAN 150 MSEC:
R0297                                    2                                     2
R0298       IS .5(.150 - TTOAXIS)  - H   NEGATIVE (SCALED AT 8 SECONDS )

 0299    REF   8  LAST 1464   17,3626  31'741 1            CAE     TTOAXIS          TTOAXIS SCALED AT 4 SECONDS.
 0300    REF   2  LAST 1463   17,3627  6 3773 1            AD      -TJMAX           -.150 SECOND SCALED AT 4.
 0301                         17,3630  0 0006 1            EXTEND
 0302                         17,3631  7 0000 0            SQUARE
 0303                         17,3632  0 0006 1            EXTEND
 0304    REF  10  LAST 1464   17,3633  61'746 0            SU      HH               HIGH WORD OF H SCALED AT 8 SEC(2).
 0305                         17,3634  0 0006 1            EXTEND
 0306    REF   2  LAST 1463   17,3635  6 3520 0            BZMF    FULLTIME         YES. NEED NOT CALCULATE TJET.

R0307    TEST WHETHER TIME BEYOND AXIS GREATER THAN 50 MSEC TO DETERMINE WHICH APPROXIMATION TO USE.

 0309    REF  11  LAST 1464   17,3636  31'746 0            CAE     HH
 0310    REF  10  LAST 1462   17,3637  6 7767 0            AD      NEG2
 0311                         17,3640  0 0006 1            EXTEND
 0312   REF   1                17,3641  6 3651 0           BZMF    FORMULA3

R0313      TJET = H/0.1 + TTOAXIS + .0375   FOR APPROXIMATION OVER MORE THAN 50 MSEC.

 0315   REF   1                17,3642  3 3763 0           CAF     .1AT2            STORE .1 SEC SCALED AT 2 FOR DIVISION.
 0316   REF  12  LAST 1464     17,3643  53'747 0           DXCH    HH               DP H SCALED AT 8 SEC(2) NEED NOT BE
 0317                          17,3644  0 0006 1           EXTEND                     PRESERVED.
 0318   REF  13  LAST 1465     17,3645  11'746 1           DV      HH               QUOTIENT SCALED AT 4 SECONDS.
 0319   REF   9  LAST 1464     17,3646  6 1741 1           AD      TTOAXIS          SCALED AT 4 SEC.
 0320   REF   1                17,3647  6 3764 1           AD      .0375AT4         .0375 SEC SCALED AT 4.
 0321   REF   6  LAST 1464     17,3650  1 3521 0           TCF     RETURNTJ         END COMPUTATION.

R0322      TJET = H/.025  + TTOAXIS   FOR APPROXIMATION OVER LESS THAN 50 MSEC.

 0323   REF   1                17,3651  4 3765 1  FORMULA3 CS      -.025AT2         STORE +.025 SEC SCALED AT 2 FOR DIVISION
 0324   REF  14  LAST 1465     17,3652  53'747 0           DXCH    HH               PICK UP DP H AT 8, WHICH NEED NOT BE
 0325                          17,3653  0 0006 1           EXTEND                     PRESERVED.
 0326   REF  15  LAST 1465     17,3654  11'746 1           DV      HH               QUOTIENT SCALED AT 4 SECONDS.
 0327   REF  10  LAST 1465     17,3655  6 1741 1           AD      TTOAXIS          SCALED AT 4 SEC.

R0328   IF COMPUTED JET TIME IS LESS THAN TJMIN, TJET IS SET TO ZERO.
R0329   MINIMUM IMPULSES REQUIRED IN ZONE 3 ARE NOT SUBJECT TO THIS CONSTRAINT, NATURALLY.
 0331   REF   1                17,3656  6 3775 1  CHKMINTJ AD      -TJMIN           IS COMPUTED TIME LESS THAN THE MINIMUM.
 0332                          17,3657  0 0006 1           EXTEND
 0333   REF   3  LAST 1461     17,3660  6 3455 0           BZMF    COASTTJ          YES, SET TIME TO ZERO.
 0334   REF   1                17,3661  6 3774 0           AD      TJMIN            NO, RESTORE COMPUTED TIME.
 0335   REF   7  LAST 1465     17,3662  1 3521 0           TCF     RETURNTJ         END COMPUTATION.
```

```
P0336    *** ROUGHLAW ***

R0337      BEFORE ENTRY TO RUFLAW:
R0338        1. INDEXERS ADRSDIF1 AND ADRSDIF2 ARE SET ON BASIS OF AXIS, AND SIGN OF EDOT.
R0340        2. IF EDOT WAS NEGATIVE. E AND EDOT ARE ROTATED INTO UPPER HALF-PLANE AND ROTSENSE IS MADE NEGATIVE.
R0342        3. E IS SCALED AT PI RADIANS AND EDOT AT PI/4 RAD/SEC.
R0343           (EXCEPT THE RUFLAW3 ENTRY WHEN E IS AT PI/4)

R0344      RUFLAW1: ERROR MORE NEGATIVE THAN PI/16 RAD.  FIRE TO A RATE OF 6.5 DEG/SEC (IF JET TIME EXCEEDS 20 MSEC.).
R0346      RUFLAW2: ERROR MORE POSITIVE THAN PI/16 RAD.  FIRE TO AN OPPOSING RATE OF 6.5 DEG/SEC.
R0348      RUFLAW3: ERROR RATE GREATER THAN PI/32 RAD/SEC AND ERROR WITHIN BOUNDS.  COAST IF BELOW FIREFCT, FIRE IF ABOVE

 0350    REF   1              17,3663  4 3776 0  RUFLAW1   CS      RUFRATE           DECREMENT EDOT BY .1444 RAD/SEC AT PI/4
 0351    REF  12  LAST 1464   17,3664  27'427 0            ADS     EDOT                WHICH IS THE TARGET RATE
 0352                         17,3665  0 0006 1            EXTEND
 0353    REF   1              17,3666  6 3707 1            BZMF    SMALRATE          BRANCH IF RATE LESS THAN TARGET.
 0354    REF   1              17,3667  0 3745 1            TC      RUFSETUP          REVERSE ROTSENSE AND INDICATE MAX JETS.
 0355    REF  13  LAST 1466   17,3670  31'427 1            CAE     EDOT              PICK UP DESIRED RATE CHANGE.

 0356                         17,3671  0 0006 1  RUFLAW12 EXTEND                     COMPUTE TJET
 0357    REF  10  LAST 1464   17,3672  5 1743 0            INDEX   ADRSDIF2            =(DESIRED RATE CHANGE)/(2-JET ACCEL.)
 0358    REF  10  LAST 1463   17,3673  7 1570 0            MP      1/ANET1 +2
 0359    REF   3  LAST  993   17,3674  6 7762 0            AD      -1/8              IF TJET, SCALED AT 32 SEC, EXCEEDS
 0360                         17,3675  0 0006 1            EXTEND                      4 SECONDS, SET TJET TO TJMAX.
 0361                         17,3676  6 3700 0            BZMF    +2
 0362    REF   3  LAST 1464   17,3677  1 3520 1            TCF     FULLTIME
 03621                        17,3700  0 0006 1            EXTEND
 03622   REF   4  LAST 1466   17,3701  1 3520 1            BZF     FULLTIME
 0363    REF  39  LAST 1435   17,3702  6 4731 0            AD      BIT12             RESTORE COMPUTED TJET TO ACCUMULATOR.
 0364    REF 507  LAST 1459   17,3703  20 001 1            DAS     A
 0365    REF 508  LAST 1466   17,3704  20 001 1            DAS     A
 0366    REF 509  LAST 1466   17,3705  20 001 1            DAS     A                 RESCALED TJET AT 4 SECONDS.
 0367    REF   2  LAST 1463   17,3706  1 3656 0            TCF     CHKMINTJ          RETURN AS FROM FINELAW.

 0368    REF   2  LAST 1466   17,3707  0 3747 0  SMALRATE TC      RUFSETUP +2       SET NUMBERT AND FIREFCT FOR MAXIMUM JETS
 0369    REF   7  LAST 1463   17,3710  11'737 1            CCS     ROTSENSE
 0370    REF 158  LAST 1453   17,3711  3 4744 1            CAF     ONE               MODIFY INDEXER TO POINT TO 1/ANET
 0371                         17,3712  1 3714 1            TCF     +2                  CORRESPONDING TO THE PROPER SENSE.
 0372    REF  14  LAST 1233   17,3713  3 7770 0            CAF     NEGONE
 0373    REF  11  LAST 1466   17,3714  27'743 1            ADS     ADRSDIF2

 0374    REF  14  LAST 1466   17,3715  4 1427 0            CS      EDOT              (.144 AT PI/4 - EDOT)=DESIRED RATE CHNG.
 0375    REF   1              17,3716  1 3671 0            TCF     RUFLAW12

 0376    REF   3  LAST 1466   17,3717  0 3745 1  RUFLAW2   TC      RUFSETUP          REVERSE ROTSENSE AND INDICATE MAX JETS.
 0377    REF   2  LAST 1466   17,3720  3 3776 1            CAF     RUFRATE
 0378    REF  15  LAST 1466   17,3721  6 1427 1            AD      EDOT              (.144 AT PI/4 + EDOT)=DESIRED RATE CHNG.
 0379    REF 510  LAST 1466   17,3722  54 000 0            TS      A                 IF OVERFLOW SKIP, FIRE FOR FULL TIME.
 0380    REF   2  LAST 1466   17,3723  1 3671 0            TCF     RUFLAW12            OTHERWISE, COMPUTE JET TIME.
 0381    REF   5  LAST 1466   17,3724  1 3520 1            TCF     FULLTIME
 0382    REF   4  LAST 1466    17,3725   0 3745 1  RUFLAW3  TC       RUFSETUP         EXECUTE COMMON RUFLAW SUBROUTINE.
 0383    REF  11  LAST 1464    17,3726  51'745 0            INDEX    ADRSDIF1
 0384    REF   4  LAST 1461    17,3727   4 1600 1            CS       FIREDB           CALCULATE DISTANCE FROM SWITCH CURVE
 0385    REF  16  LAST 1461    17,3730   6 1751 0            AD       E                     1/ANET1*EDOT*EDOT +E - FIREDB = 0
 0386                          17,3731   0 0006 1            EXTEND                               SCALED AT 4 PI RADIANS
 0387    REF  32  LAST 1462    17,3732   7 4732 1            MP       BIT11
 0388    REF  16  LAST 1466    17,3733  57'427 1            XCH      EDOT
 0389                          17,3734   0 0006 1            EXTEND
 0390                          17,3735   7 0000 0            SQUARE
 0391                          17,3736   0 0006 1            EXTEND
 0392    REF  12  LAST 1467    17,3737   5 1745 0            INDEX    ADRSDIF1
 0393    REF  11  LAST 1466    17,3740   7 1570 0            MP       1/ANET1 +2
 0394    REF  17  LAST 1467    17,3741   6 1427 1            AD       EDOT
 0395                          17,3742   0 0006 1            EXTEND
 0396    REF   4  LAST 1465    17,3743   6 3455 0            BZMF     COASTTJ            COAST IF BELOW IT.
 0397    REF   6  LAST 1466    17,3744   1 3520 1            TCF      FULLTIME           FIRE FOR FULL PERIOD IF ABOVE IT.

R0398    SUBROUTINE USED IN ALL ENTRIES TO ROUGHLAW.

 0399    REF   8  LAST 1466    17,3745   4 1737 1  RUFSETUP CS       ROTSENSE         REVERSE ROTSENSE WHEN ENTER HERE.
 0400    REF   9  LAST 1467    17,3746  55'737 1            TS       ROTSENSE
 0401    REF  48  LAST 1463    17,3747   3 4742 1    +2     CAF      FOUR             REQUIRE MAXIMUM (2) JETS IN U,V-AXES.
 0402    REF  19  LAST 1463    17,3750  55'742 0            TS       NUMBERT
 0403    REF  11  LAST 1457    17,3751   3 4726 0            CAF      NEGMAX           SUGGEST MAXIMUM (4) JETS IN P-AXIS.
 0404    REF   7  LAST 1464    17,3752  55'740 1            TS       FIREFCT
 0405    REF 413  LAST 1457    17,3753   0 0002 0            TC       Q

R0406    CONSTANTS FOR TJETLAW

 0407                          17,3754    77757 1            DEC      -16              AXISDIFF(INDEX) = NUMBER OF REGISTERS
 0408                          17,3755    00000 1  AXISDIFF DEC      +0                 BETWEEN STORED 1/ACCS PARAMETERS FOR
 0409                          17,3756    00020 0            DEC      16                 THE INDEXED AXIS AND THE U-AXIS.
 0410                          17,3757    14400 0  SENSOR   OCT      14400            RATIO OF TJET SCALING WITHIN TJETLAW
A0411                                                                                    (4 SEC) TO SCALING FOR T6 (10.24 SEC).
 0412                          17,3760    75673 1  -3DEG    DEC      -.06667          -3.0 DEGREES SCALED AT 45.
 0413                          17,3761    77750 0  -.0112A8 DEC      -.00141          -.01125 SEC(2) SCALED AT 8.
 0414                          17,3762    00632 0  .1AT4    DEC      .025             0.1 SECOND SCALED AT 4.
 0415                          17,3763    01463 1  .1AT2    DEC      .05              0.1 SEC SCALED AT 2.
 0416                          17,3764    00232 1  .0375AT4 DEC      .00938           .0375 SEC SCALED AT 4.
 0417                          17,3765    77462 1  -.025AT2 DEC      -.0125           -.025 SEC SCALED AT 2.
 0418                          17,3766    77631 0  -.025AT4 DEC      -.00625
 0419                          17,3767    77145 1  -.05AT2  DEC      -.025
 0420                          17,3770    75462 0  -.15AT2  DEC      -.075
 0421                          17,3771    00007 0  .00375A8 2DEC     .00375 B-3
 0421                          17,3772    25605 0
 0422                          17,3773    76631 1  -TJMAX   DEC      -.0375           LARGEST CALCULATED TIME. .150 SEC AT 4.
 0423                          17,3774    00122 0  TJMIN    DEC      .005             SMALLEST ALLOWABLE TIME.  .020 SEC AT 4.
 0424                          17,3775    77655 1  -TJMIN   DEC      -.005
 0425                          17,3776    04476 0  RUFRATE  DEC      .1444            CORRESPONDS TO TARGET RATE OF 6.5 DEG/S.
```

```
0001   REF   3  LAST 1453   E6,1522                     EBANK= NO.UJETS
0002                        16,3642                     BANK   16
0003   REF   3  LAST 1419   16,2000                     SETLOC DAPS1
0004                        16,3642                     BANK

0005   REF   1                                          COUNT* $$/DAP

0006   REF 100  LAST 1462   16,3642  3 4743 0  RATELOOP CA     TWO
0007   REF   3  LAST  138   16,3643  55'743 1           TS     DAPTEMP6
00071                       16,3644  6 0000 1           DOUBLE
00072  REF 414  LAST 1467   16,3645  54 002 1           TS     Q
0008   REF   4  LAST 1468   16,3646  51'743 0           INDEX  DAPTEMP6
0009   REF  14  LAST 1458   16,3647  11'524 1           CCS    TJP
0010                        16,3650  1 3652 1           TCF    +2
0011   REF   1              16,3651  1 3671 0           TCF    LOOPRATE
0012   REF   1              16,3652  6 3732 1           AD     -100MST6
0013                        16,3653  0 0006 1           EXTEND
0014   REF   1              16,3654  6 3710 1           BZMF   SMALLTJU
0015   REF   5  LAST 1468   16,3655  51'743 0           INDEX  DAPTEMP6
0016   REF  15  LAST 1468   16,3656  11'524 1           CCS    TJP
0017   REF   2  LAST 1468   16,3657  3 3732 1           CA     -100MST6
0018                        16,3660  1 3662 1           TCF    +2
0019   REF   3  LAST 1468   16,3661  4 3732 0           CS     -100MST6
0020   REF   6  LAST 1468   16,3662  51'743 0           INDEX  DAPTEMP6
0021   REF  16  LAST 1468   16,3663  27'524 1           ADS    TJP
0022   REF   7  LAST 1468   16,3664  51'743 0           INDEX  DAPTEMP6
0023   REF  17  LAST 1468   16,3665  11'524 1           CCS    TJP
0024   REF   1              16,3666  4 3616 1           CS     -100MS           0.1 AT 1
0025                        16,3667  1 3671 0           TCF    +2
0026   REF   2  LAST 1468   16,3670  3 3616 0           CA     -100MS
0027                        16,3671  0 0006 1  LOOPRATE EXTEND
0028   REF   8  LAST 1468   16,3672  5 1743 0           INDEX  DAPTEMP6
0029   REF   3  LAST 1434   16,3673  7 1521 1           MP     NO.PJETS
0030   REF 307  LAST 1462   16,3674  3 0001 0           CA     L
0031   REF   9  LAST 1468   16,3675  51'743 0           INDEX  DAPTEMP6
00311  REF  29  LAST 1449   16,3676  55'736 0           TS     DAPTEMP1         SIGNED TORQUE AT 1 JET-SEC FOR FILTER
00312                       16,3677  0 0006 1           EXTEND
00313  REF  49  LAST 1407   16,3700  7 4733 0           MP     BIT10            RESCALE TO 32; ONE BIT ABOUT 2 JET-MSEC
00314                       16,3701  0 0006 1           EXTEND
00315  REF   1              16,3702  6 3733 0           BZMF   NEGTORK
00316  REF 415  LAST 1468   16,3703  50 002 0  STORTORK INDEX  Q                INCREMENT DOWNLIST REGISTER.
00317  REF   7  LAST  138   16,3704  27'513 0           ADS    DOWNTORK           NOTE: NOT INITIALIZED; OVERFLOWS.

0032   REF  10  LAST 1468   16,3705  11'743 1           CCS    DAPTEMP6
0033   REF   2  LAST 1426   16,3706  1 3643 1           TCF    RATELOOP +1
0034   REF   1              16,3707  1 3717 1           TCF    ROTORQUF
0035   REF 308  LAST 1461   16,3710  3 4746 0  SMALLTJU CA     ZERO
0036   REF  11  LAST 1468   16,3711  51'743 0           INDEX  DAPTEMP6
0037   REF  18  LAST 1468   16,3712  57'524 0           XCH    TJP
0038                        16,3713  0 0006 1           EXTEND
```

```
 0039    REF   4  LAST 1097   16,3714   7 4751 1                MP       ELEVEN             10.24 PLUS
 0040    REF 308  LAST 1468   16,3715   3 0001 0                CA       L
 0041    REF   2  LAST 1468   16,3716   1 3671 0                TCF      LOOPRATE
 0042    REF  11  LAST 1449   16,3717   3 1737 0  ROTORQUE CA       DAPTEMP2
 0043    REF   7  LAST 1445   16,3720   6 1740 0                AD       DAPTEMP3
 0044                         16,3721   0 0006 1                EXTEND
 0045    REF   1              16,3722   7 1532 0                MP       1JACCR
 0046    REF   3  LAST 1425   16,3723   55'746 1                TS       JETRATER
 0047    REF   8  LAST 1469   16,3724   4 1740 1                CS       DAPTEMP3
 0048    REF  12  LAST 1469   16,3725   6 1737 0                AD       DAPTEMP2
 0049                         16,3726   0 0006 1                EXTEND
 0050    REF   1              16,3727   7 1531 0                MP       1JACCQ
 0051    REF   3  LAST 1424   16,3730   55'745 1                TS       JETRATEQ
 0052    REF   1              16,3731   1 2322 1                TCF      BACKP
 0053                         16,3732     77537 0  -100MST6 DEC      -160
R0054
 0055                         16,3733   4 0000 0  NEGTORK  COM
 0056    REF 416  LAST 1468   16,3734   24 002 0                INCR     Q
 0057    REF   1              16,3735   1 3703 1                TCF      STORTORK
 0001                         21,3027                          BANK    21
 0002   REF    1              E6,1450                          EBANK=  QDIFF
 0003   REF    1              21,2000                          SETLOC  DAPS4
 0004                         21,3027                          BANK

 00045  REF    1                                               COUNT*  $$/DAPGT

R0005   CONTROL REACHES THIS POINT UNDER EITHER OF THE FOLLOWING TWO CONDITIONS ONCE THE DESCENT ENGINE AND THE DIGITAL
R0007   AUTOPILOT ARE BOTH ON:
R0008               A) THE TRIM GIMBAL CONTROL LAW WAS ON DURING THE PREVIOUS Q,R-AXIS TIME5 INTERRUPT (OR THE DAPIDLER
R0010                  INITIALIZATION WAS SET FOR TRIM GIMBAL CONTROL AND THIS IS THE FIRST PASS), OR
R0012               B) THE Q,R-AXES RCS AUTOPILOT DETERMINED THAT THE VEHICLE WAS ENTERING (OR HAD JUST ENTERED) A COAST
R0014                  ZONE WITH A SMALL OFFSET ANGULAR ACCELERATION.

R0015   GTS IS THE ENTRY TO THE GIMBAL TRIM SYSTEM FOR CONTROLLING ATTITUDE ERRORS AND RATES AS WELL AS ACCELERATIONS.

 0018   REF   15  LAST 1466   21,3027  3 7770 0  GTS       CAF     NEGONE          MAKE THE NEXT PASS THROUGH THE DAP BE
 0019   REF    6  LAST 1450   21,3030  55'630 1            TS      COTROLER          THROUGH RCS CONTROL,
 0020   REF   49  LAST 1467   21,3031  3 4742 1            CAF     FOUR              AND ENSURE THAT IT IS NOT A SKIP.
 0021   REF    9  LAST 1453   21,3032  55'534 0            TS      SKIPU
 0022   REF    3  LAST 1453   21,3033  55'535 1            TS      SKIPV

 00225  REF  101  LAST 1468   21,3034  3 4743 0            CAF     TWO
 0023   REF    5  LAST 1448   21,3035  55'632 0            TS      INGTS           SET INDICATOR OF GTS CONTROL POSITIVE.
 0024   REF    7  LAST 1427   21,3036  55'631 0            TS      QGIMTIMR        SET TIMERS TO 200 MSEC TO AVOID BOTH
 0025   REF    5  LAST 1427   21,3037  55'633 1            TS      RGIMTIMR        RUNAWAY AND INTERFERENCE BY NULLING.

R0026   THE DRIVE SETTING ALGORITHM

R0027   DEL = SGN(OMEGA + ALPHA*ABS(ALPHA)/(2*K))

R0028                                             2                1/2                        2        3/2
R0030   NEGUSUM = ERROR*K + ALPHA*(DEL*OMEGA + ALPHA /(3*K)) + DEL*K    (DEL*OMEGA + ALPHA /(2*K))

R0032   DRIVE = -SGN(NEGUSUM)

 0033   REF   27  LAST 1302   21,3040  3 0021 1            CA      SR              SAVE THE SR.  SHIFT IT LEFT TO CORRECT
 0034   REF  511  LAST 1466   21,3041  6 0000 1            AD      A               FOR THE RIGHT SHIFT DUE TO EDITING.
 0035   REF    1              21,3042  55'505 1            TS      SAVESR

 0036   REF  102  LAST 1470   21,3043  3 4743 0  GTSGO+ON  CAF     TWO             SET INDEXER FOR R-AXIS CALCULATIONS.
 0037   REF    1              21,3044  1 3046 1            TCF     GOQTRIMG +1

 0038   REF  309  LAST 1468   21,3045  3 4746 0  GOQTRIMG  CAF     ZERO            SET INDEXER FOR Q-AXIS CALCULATIONS
 0039   REF    1              21,3046  55'747 0            TS      QRCNTR

 0040   REF    2  LAST 1470   21,3047  51'747 1            INDEX   QRCNTR          AOS SCALED AT PI/2
 0041   REF   23  LAST 1439   21,3050  3 1536 0            CA      AOSQ
 0042                         21,3051  0 0006 1            EXTEND
 0043   REF   54  LAST 1442   21,3052  7 4743 1            MP      BIT2            RESCALE AOS TO PI/4
```

```
                              21,3053  0 0006 1            EXTEND
REF   1                       21,3054  1 3060 0            BZF      GTSQAXIS -3      USE FULL SCALE FOR LARGER AOS ESTIMATES.

REF 512  LAST 1470            21,3055  50 000 1            INDEX    A
REF  10  LAST 1455            21,3056  4 4725 1            CS       LIMITS           LIMITS +1 CONTAINS NEGMAX.
REF 309  LAST 1469            21,3057  56 001 0            XCH      L                LIMITS -1 CONTAINS POSMAX.

REF   3  LAST 1470            21,3060  11'747 0            CCS      QRCNTR           PICK UP RATE FOR THIS AXIS.  RATE CELLS
REF 513  LAST 1471            21,3061  50 000 1            INDEX    A                ARE ADJACENT, NOT SEPARATED.  AT PI/4
REF   5  LAST 1440            21,3062  3 1436 1            CA       EDOTQ
REF   1                       21,3063  53'743 1  GTSQAXIS  DXCH     WCENTRAL

REF   4  LAST 1471            21,3064  51'747 1            INDEX    QRCNTR           COLLECT K FOR THIS AXIS
REF   3  LAST  137            21,3065  3 1504 1            CA       KQ
REF   1                       21,3066  55'740 1            TS       KCENTRAL

                              21,3067  0 0006 1            EXTEND                    CONTROL AUTHORITY  ZERO.  AVOID DRIVING
REF   1                       21,3070  1 3526 1            BZF      POSDRIVE +1      ENGINE BELL TO THE STOPS.

REF   5  LAST 1471            21,3071  51'747 1            INDEX    QRCNTR           QDIFF, RDIFF ARE STORED IN D.P.
REF   2  LAST 1470            21,3072  31'450 1            CAE      QDIFF

                              21,3073  0 0006 1  ALGORTHM  EXTEND                    Q(R)DIFF IS THETA (ERROR) SCALED AT PI.
REF   2  LAST 1471            21,3074  7 1740 1            MP       KCENTRAL         FORM K*ERROR AT PI(2)/2(8), IN D.P.
REF   1                       21,3075  23'736 1            LXCH     K2THETA
                              21,3076  0 0006 1            EXTEND
REF  52  LAST 1459            21,3077  7 4740 1            MP       BIT5             RESCALE TO 4*PI(2)
REF   2  LAST 1471            21,3100  53'737 1            DXCH     K2THETA
                              21,3101  0 0006 1            EXTEND
REF  53  LAST 1471            21,3102  7 4740 1            MP       BIT5             FIRST TERM OF NEGUSUM IN K2THETA.
REF   3  LAST 1471            21,3103  27'737 1            ADS      K2THETA  +1      NO CARRY NEEDED    D.P. AT 4*PI(2)

REF   1                       21,3104  4 1743 1            CS       ACENTRAL         FORM ALPHA(2)/(2*K) AT 16*PI, IN D.P.,
                              21,3105  0 0006 1            EXTEND                    LIMITING QUOTIENT TO AVOID OVERFLOW.
REF  85  LAST 1463            21,3106  7 4727 0            MP       BIT14            -ALPHA/2 IN A, SCALED AT PI/4
                              21,3107  0 0006 1            EXTEND
REF   2  LAST 1471            21,3110  7 1743 1            MP       ACENTRAL         -ALPHA(2)/2 IN A,L, SCALED AT PI(2)/16
REF   3  LAST 1471            21,3111  6 1740 0            AD       KCENTRAL
                              21,3112  0 0006 1            EXTEND
REF   1                       21,3113  6 3130 0            BZMF     HUGEQUOT         K-ALPHA(2)/2 SHOULD BE PNZ FOR DIVISION

                              21,3114  0 0006 1            EXTEND
REF 514  LAST 1471            21,3115  4 0001 1            DCS      A                ALPHA(2)/2 - K
REF   4  LAST 1471            21,3116  6 1740 0            AD       KCENTRAL
                              21,3117  0 0006 1            EXTEND
REF   5  LAST 1471            21,3120  11'740 1            DV       KCENTRAL         HIGH ORDER OF QUOTIENT.
REF   1                       21,3121  57'745 0            XCH      A2CNTRAL
REF 310  LAST 1471            21,3122  3 0001 0            CA       L                SHIFT UP THE REMAINDER.
                              21,3123  22 007 0            LXCH     7                ZERO LOW-ORDER DIVIDEND.
                              21,3124  0 0006 1            EXTEND
```

```
 0086   REF   6  LAST 1471   21,3125  11'740 1            DV      KCENTRAL
 0087   REF   2  LAST 1471   21,3126  57'746 0            XCH     A2CNTRAL +1     QUOTIENT STORED AT 16*PI , D.P.
 0088   REF   1              21,3127  1 3133 1            TCF     HAVEQUOT

 0089   REF  41  LAST 1420   21,3130  3 4724 1  HUGEQUOT  CA      POSMAX
 0090   REF 311  LAST 1471   21,3131  54 001 1            TS      L
 0091   REF   3  LAST 1472   21,3132  53'746 1            DXCH    A2CNTRAL        LIMITED QUOTIENT STORED AT 16*PI, D.P.

 0092   REF   2  LAST 1471   21,3133  3 1742 1  HAVEQUOT  CA      WCENTRAL
 0093                        21,3134  0 0006 1            EXTEND
 0094   REF  36  LAST 1444   21,3135  7 4734 1            MP      BIT9            RESCALE OMEGA AT 16*PI IN D.P.
 0095   REF   1              21,3136  53'742 0            DXCH    K2CNTRAL        LOWER WORD OVERLAYS OMEGA IN WCENTRAL

 0096                        21,3137  0 0006 1            EXTEND
 0097   REF   2  LAST 1472   21,3140  3 1742 1            DCA     K2CNTRAL
 0098   REF   1              21,3141  53'751 1            DXCH    FUNCTION

 0099   REF   3  LAST 1471   21,3142  3 1743 0            CA      ACENTRAL        GET ALPHA*ABS(ALPHA)/(2*K)
 0100                        21,3143  0 0006 1            EXTEND
 0101                        21,3144  6 3150 0            BZMF     +4

 0102                        21,3145  0 0006 1            EXTEND
 0103   REF   4  LAST 1472   21,3146  3 1746 0            DCA     A2CNTRAL
 0104                        21,3147  1 3152 0            TCF      +3

 0105                        21,3150  0 0006 1            EXTEND
 0106   REF   5  LAST 1472   21,3151  4 1746 1            DCS     A2CNTRAL

 0107   REF   2  LAST 1472   21,3152  21'751 1            DAS     FUNCTION        OMEGA + ALPHA*ABS(ALPHA)/2*K) AT 16*PI

 0108   REF   3  LAST 1472   21,3153  11'750 0            CCS     FUNCTION        DEL = +1 FOR FUNCTL GREATER THAN ZERO.
 0109   REF   1              21,3154  1 3160 1            TCF     POSFNCTL        OTHERWISE DEL = -1
 0110                        21,3155  1 3157 0            TCF      +2
 0111   REF   1              21,3156  1 3162 0            TCF     NEGFNCTL

 0112   REF   4  LAST 1472   21,3157  11'751 1            CCS     FUNCTION +1     USE LOW ORDER WORD SINCE HIGH IS ZERO
 0113   REF  68  LAST 1459   21,3160  3 4744 1  POSFNCTL  CAF     BIT1
 0114                        21,3161  1 3163 1            TCF      +2
 0115   REF  69  LAST 1472   21,3162  4 4744 0  NEGFNCTL  CS      BIT1
 0116   REF   1              21,3163  55'744 0            TS      DEL

 0117   REF   2  LAST 1472   21,3164  11'744 0            CCS     DEL             REPLACE OMEGA BY DEL*OMEGA
 0118   REF   1              21,3165  1 3177 1            TCF     FUNCT2          POSITIVE DEL VALUE.  PROCEED.
 0119   REF   1              21,3166  1 3170 0            TCF     DEFUNCT
 0120   REF   1              21,3167  1 3174 1            TCF     NEGFNCT2

 0121   REF   3  LAST 1472   21,3170  55'741 0  DEFUNCT   TS      K2CNTRAL
 0122   REF   4  LAST 1472   21,3171  55'742 0            TS      K2CNTRAL +1
 0123   REF   2  LAST 1472   21,3172  1 3177 1            TCF     FUNCT2
```

```
0124                          21,3173   65252 1  NEG1/3    DEC     -.33333

0125                          21,3174   0 0006 1  NEGFNCT2 EXTEND
0126   REF    5  LAST 1472    21,3175   4 1742 0           DCS     K2CNTRAL
0127   REF    6  LAST 1473    21,3176   53'742 0           DXCH    K2CNTRAL

0128                          21,3177   0 0006 1  FUNCT2   EXTEND
0129   REF    6  LAST 1472    21,3200   3 1746 0           DCA     A2CNTRAL
0130   REF    7  LAST 1473    21,3201   21'742 0           DAS     K2CNTRAL          DEL*OMEGA + ALPHA(2)/(2*K) AT 16*PI,D.P.

0131   REF    7  LAST 1473    21,3202   3 1745 0  FUNCT3   CA      A2CNTRAL
0132                          21,3203   0 0006 1           EXTEND
0133   REF    1               21,3204   7 3173 0           MP      NEG1/3
0134   REF    8  LAST 1473    21,3205   53'746 1           DXCH    A2CNTRAL
0135   REF  312  LAST 1472    21,3206   3 0001 0           CA      L
0136                          21,3207   0 0006 1           EXTEND
0137   REF    2  LAST 1473    21,3210   7 3173 0           MP      NEG1/3
0138   REF    9  LAST 1473    21,3211   27'746 1           ADS     A2CNTRAL +1
0139   REF  313  LAST 1473    21,3212   54 001 1           TS      L
0140                          21,3213   1 3215 0           TCF      +2               A2CNTRAL NOW CONTAINS  -ALPHA(2)/(6*K),
0141   REF   10  LAST 1473    21,3214   27'745 1           ADS     A2CNTRAL          SCALED AT 16*PI, IN D.P.

0142                          21,3215   0 0006 1           EXTEND
0143   REF    8  LAST 1473    21,3216   3 1742 1           DCA     K2CNTRAL          DEL*OMEGA + ALPHA(2)/(3*K) IN A2CNTRAL,
0144   REF   11  LAST 1473    21,3217   21'746 1           DAS     A2CNTRAL          SCALED AT 16*PI, D.P.

0145   REF   12  LAST 1473    21,3220   3 1745 0           CA      A2CNTRAL
0146                          21,3221   0 0006 1           EXTEND
0147   REF    4  LAST 1472    21,3222   7 1743 1           MP      ACENTRAL
0148   REF    4  LAST 1471    21,3223   21'737 1           DAS     K2THETA
0149   REF   13  LAST 1473    21,3224   3 1746 0           CA      A2CNTRAL +1
0150                          21,3225   0 0006 1           EXTEND
0151   REF    5  LAST 1473    21,3226   7 1743 1           MP      ACENTRAL          ACENTRAL MAY NOW BE OVERLAID.
0152   REF    5  LAST 1473    21,3227   27'737 1           ADS     K2THETA  +1
0153   REF  314  LAST 1473    21,3230   54 001 1           TS      L
0154                          21,3231   1 3233 1           TCF      +2               TWO TERMS OF NEGUSUM ACCUMULATED, SO FAR
0155   REF    6  LAST 1473    21,3232   27'736 0           ADS     K2THETA           SCALED AT 4*PI(2), IN D.P.

0156   REF    9  LAST 1473    21,3233   3 1741 1  GETROOT  CA      K2CNTRAL          K*(DEL*OMEGA + ALPHA(2)/(2*K)) IS THE
0157                          21,3234   0 0006 1           EXTEND                    TERM FOR WHICH A SQUARE ROOT IS NEEDED.
0158   REF    7  LAST 1472    21,3235   7 1740 1           MP      KCENTRAL          K AT PI/2(8)
0159   REF    5  LAST 1472    21,3236   53'751 1           DXCH    FUNCTION
0160   REF   10  LAST 1473    21,3237   3 1742 1           CA      K2CNTRAL +1
0161                          21,3240   0 0006 1           EXTEND
0162   REF    8  LAST 1473    21,3241   7 1740 1           MP      KCENTRAL
0163   REF    6  LAST 1473    21,3242   27'751 1           ADS     FUNCTION +1
0164   REF  315  LAST 1473    21,3243   54 001 1           TS      L
0165                          21,3244   1 3246 0           TCF      +2
0166   REF    7  LAST 1473    21,3245   27'750 0           ADS     FUNCTION          DESIRED TERM IN FUNCTION, AT PI(2)/16
```

```
 0167    REF   3  LAST 1472   21,3246  11'744 0               CCS      DEL
 0168    REF   1              21,3247  1 3454 0               TCF      RSTOFGTS
 0169    REF   1              21,3250  1 3516 1               TCF      NEGUSUM
 0170    REF   1              21,3251  1 3253 1               TCF      NEGATE
 0171    REF   2  LAST 1474   21,3252  1 3516 1               TCF      NEGUSUM

 0172                         21,3253  0 0006 1   NEGATE      EXTEND
 0173    REF  11  LAST 1473   21,3254  4 1742 0               DCS      K2CNTRAL
 0174    REF  12  LAST 1474   21,3255  53'742 0               DXCH     K2CNTRAL
 0175    REF   2  LAST 1474   21,3256  1 3454 0               TCF      RSTOFGTS

 0176                         16,3736                         BANK     16
 0177    REF   5  LAST 1426   E6,1501                         EBANK=   NEGUQ
 0178    REF   4  LAST 1468   16,2000                         SETLOC   DAPS1
 0179                         16,3736                         BANK

R0180    THE WRCHN12 SUBROUTINE SETS BITS 9,10,11,12 OF CHANNEL 12 ON THE BASIS OF THE CONTENTS OF NEGUQ,NEGUR WHICH ARE
R0182    THE NEGATIVES OF THE DESIRED ACCELERATION CHANGES.  ACDT+C12 SETS Q(R)ACCDOT TO REFLECT THE NEW DRIVES.

R0184    WARNING:  ACDT+C12 AND WRCHN12 MUST BE CALLED WITH INTERRUPT INHIBITED.

 0185                         16,3736   07400 1   BGIM        OCTAL    07400
 0186    REF   6  LAST 1297      0066             CHNL12      EQUALS   ITEMP6
 0187    REF   6  LAST 1474   16,3737  4 1501 0   ACDT+C12    CS       NEGUQ
 0188                         16,3740  0 0006 1               EXTEND                      GIMBAL DRIVE REQUESTS.
 0189    REF   4  LAST  137   16,3741  7 1507 0               MP       ACCDOTQ
 0190    REF   4  LAST 1426   16,3742  23'510 1               LXCH     QACCDOT
 0191    REF   3  LAST 1427   16,3743  4 1503 1               CS       NEGUR
 0192                         16,3744  0 0006 1               EXTEND
 0193    REF   1              16,3745  7 1511 1               MP       ACCDOTR
 0194    REF   4  LAST 1427   16,3746  23'512 0               LXCH     RACCDOT

 0195    REF   7  LAST 1474   16,3747  11'501 0               CCS      NEGUQ
 0196    REF  50  LAST 1468   16,3750  3 4733 1               CAF      BIT10
 0197                         16,3751  1 3753 1               TCF      +2
 0198    REF  37  LAST 1472   16,3752  3 4734 0               CAF      BIT9
 0199    REF   1              16,3753  54 0066 0              TS       CHNL12

 0200    REF   4  LAST 1474   16,3754  11'503 1               CCS      NEGUR
 0201    REF  40  LAST 1466   16,3755  3 4731 0               CAF      BIT12
 0202                         16,3756  1 3760 1               TCF      +2
 0203    REF  33  LAST 1467   16,3757  3 4732 0               CAF      BIT11
 0204    REF   2  LAST 1474   16,3760  26 0066 0              ADS      CHNL12             (STORED RESULT NOT USED AT PRESENT)

 0205    REF   1              16,3761  4 3736 1               CS       BGIM
 0206                         16,3762  0 0006 1               EXTEND
 0207    REF  68  LAST 1427   16,3763  02 0012 0              RAND     CHAN12
 0208    REF   3  LAST 1474   16,3764  6 0066 1               AD       CHNL12
 0209                         16,3765  0 0006 1               EXTEND
 0210    REF  69  LAST 1474   16,3766  01 0012 0              WRITE    CHAN12
```

```
L        TRIM GIMBAL CONTROL SYSTEM                                                              USER'S PAGE NO.   6      E6 S4

R0211
 0212   REF   2  LAST 1426    16,3767  4 4740 1          CS      CALLGMBL         TURN OFF REQUEST FOR ACDT+C12 EXECUTION.
 0213   REF  48  LAST 1446    16,3770  7 1774 0          MASK    RCSFLAGS
 0214   REF  49  LAST 1475    16,3771  55'774 0          TS      RCSFLAGS

 0215   REF 417  LAST 1469    16,3772  0 CC02 0          TC      Q                PETURN TO CALLER.

 0216                         21,3257                    BANK    21
 0217   REF   3  LAST 1471    E6,1450                    EBANK=  QDIFF
 0218   REF   2  LAST 1470    21,2000                    SETLOC  DAPS4
 0219                         21,3257                    BANK
```

```
L        TRIM GIMBAL CONTROL SYSTEM                                                      USER'S PAGE NO.   7       E? S4

P0220    SUBROUTINE TIMEGMBL:  MOD 0,  OCTOBER 1967, CRAIG WORK

R0221    TIMEGMBL COMPUTES THE DRIVE TIME NEEDED FOR THE TRIM GIMBAL TO POSITION THE DESCENT ENGINE NOZZLE SO AS TO NULL
R0223    THE OFFSET ANGULAR ACCELERATION ABOUT THE Q (OR R) AXIS.  INSTEAD OF USING AOSQ(P), TIMEGMBL USES .4*AOSQ(R),
R0225    SCALED AT PI/8.                     FOR EACH AXIS, THE DRIVE TIME IS COMPUTED AS ABS(ALPHA/ACCDOT).  A ZERO
R0227    ALPHA OR ACCDOT OR A ZERO QUOTIENT TURNS OFF THE GIMBAL DRIVE IMMEDIATELY.  OTHERWISE, THE GIMBAL IS TURNED ON
R0229    DRIVING IN THE CORRECT DIRECTION. THE Q(R)GIMTIMR IS SET TO TERMINATE THE DRIVE AND Q(R)ACCDOT
R0231    IS STORED TO REFLECT THE NEW ACCELERATION DERIVATIVE.  NEGUQ(R) WILL CONTAIN +1,+0,-1 FOR A Q(R)ACCDOT VALUE
R0233    WHICH IS NEGATIVE, ZERO, OR POSITIVE.

R0234    INPUTS:  AOSQ,AOSR, SCALED AT PI/2, AND ACCDOTQ, ACCDOTR AT PI/2(7).    PI/2(7).

R0236    OUTPUTS:    NEW GIMBAL DRIVE BITS IN CHANNEL 12,NEGUQ,NEGUR,QACCDOT AND RACCDOT, THE LAST SCALED AT PI/2(7).
R0238                Q(R)GIMTIMR WILL BE SET TO TIME AND TERMINATE GIMBAL DRIVE(S)

R0239    DEBRIS:  A,L,Q, ITEMPS 2,3,6, RUPTREG2 AND ACDT+C12 DEBRIS.

R0240    EXITS:  VIA TC Q.

R0241    ALARMS, ABORTS, :  NONE

R0242    SUBROUTINES:  ACDT+C12, IBNKCALL

R0243    WARNING:  THIS SUBROUTINE WRITES INTO CHANNEL 12 AND USES THE ITEMPS.  THEREFORE IT MAY ONLY BE CALLED WITH
R0245    INTERRUPT INHIBITED.

R0246    ERASABLE STORAGE CONFIGURATION (NEEDED BY THE INDEXING METHODS):

A0247                                                          NEGUQ     ERASE   +2           NEGATIVE OF Q-AXIS GIMBAL DRIVE
A0248                                                          (SPWORD)  EQUALS NEGUQ +1      ANY S.P. ERASABLE NUMBER, NOW THRSTCMD
A0249                                                          NEGUR     EQUALS NEGUQ +2      NEGATIVE OF R-AXIS GIMBAL DRIVE

A0250                                                          ACCDOTQ   ERASE   +2           Q-JERK TERM SCALED AT PI/2(7) RAD/SEC(3)
A0251                                                          (SPWORD)  EQUALS ACCDOTQ +1    ANY S.P. ERASABLE NUMBER  NOW QACCDOT
A0252                                                          ACCDOTR   EQUALS ACCDOTQ +2    R-JERK TERM SCALED AT PI/2(7) RAD/SEC(3)
A0253                                                                                         ACCDOTQ,ACCDOTR ARE MAGNITUDES.
A0254                                                          AOSQ      ERASE  +4            Q-AXIS ACC.,D.P. AT PI/2 R/SEC(2)
A0255                                                          AOSR      EQUALS AOSQ +2       R-AXIS ACCELERATION SCALED AT PI/2 R/S2

 0256    REF   7  LAST 1474        0066                QRNDXER   EQUALS ITEMP6
 0257                          21,3257     23146 0     OCT23146  OCTAL  23146                 DECIMAL .6
 0258    REF  25  LAST 1372        0063                NZACCDOT  EQUALS ITEMP3

 0259    REF 159  LAST 1456    21,3260   3 4744 1      TIMEGMBL  CAF    ONE                   INITIALIZE ALLOWGTS.
 0260    REF   3  LAST 1447    21,3261   55502 0                 TS     ALLOWGTS

 0261    REF 102  LAST 1470    21,3262   3 4743 0                CAF    TWO                   SET UP LOOP FOR R AXIS.
 0262    REF 418  LAST 1475    21,3263   22 002 0                LXCH   Q                     SAVE RETURN ADDRESS.
 0263    REF  23  LAST 1466    21,3264   22 071 1                LXCH   RUPTREG2
```

```
0264                        21,3265  1 3267 0           TCF     +2
0265  REF 310  LAST 1470    21,3266  3 4746 0  TIMQGMBL CAF     ZERO          NOW DO THE Q-AXIS
0266  REF   1               21,3267  54 0066 0          TS      QRNDXER
0267  REF   2  LAST 1477    21,3270  50 0066 1          INDEX   QRNDXER
0268  REF   5  LAST 1474    21,3271  3 1507 1           CA      ACCDOTQ       ACCDOT IS PRESUMED TO BE AT PI/2(7).
0269                        21,3272  0 0006 1           EXTEND
0270  REF   1               21,3273  6 3343 0           BZMF    TGOFFNOW      IS ACCDOT LESS THAN OR EQUAL TO 0?
0271  REF   1               21,3274  54 0063 0          TS      NZACCDOT      NO.  STORE NON-ZERO, POSITIVE ACCDOT.

0272  REF   3  LAST 1477    21,3275  50 0066 1 ALPHATRY INDEX   QRNDXER
0273  REF  24  LAST 1470    21,3276  4 1536 1           CS      AOSQ
0274                        21,3277  0 0006 1           EXTEND
0275  REF   2  LAST 1477    21,3300  1 3343 1           BZF     TGOFFNOW      IS ALPHA ZERO?

0276  REF 419  LAST 1476    21,3301  54 0002 1          TS      Q             SAVE A COPY OF  -AOS.
0277                        21,3302  0 0006 1           EXTEND                NO.  RESCALE FOR TIMEGMBL USE.
0278  REF   1               21,3303  7 3257 0           MP      OCT23146      OCTAL 23146 IS DECIMAL .6
0279  REF 420  LAST 1477    21,3304  6 0002 0           AD      Q             -1.6*AOS AT PI/2 = -.4*AOS AT PI/8.
0280  REF 316  LAST 1473    21,3305  54 0001 1          TS      L             WAS THERE OVERFLOW?
0281  REF   1               21,3306  1 3313 1           TCF     SETNEGU       NO.  COMPUTE DRIVE TIME.

0282  REF 515  LAST 1471    21,3307  4 0000 0           CS      A             RECOVER  -SGN(AOS) IN THE A REGISTER.
0283  REF   4  LAST 1477    21,3310  50 0066 1          INDEX   QRNDXER       YES.  START DRIVE WITHOUT WAITLIST.
0284  REF   8  LAST 1474    21,3311  57'501 1           XCH     NEGUQ
0285  REF   1               21,3312  1 3347 0           TCF     NOTALLOW      KNOCK DOWN THE ALLOWGTS FLAG.

0286                        21,3313  0 0006 1  SETNEGU  EXTEND
0287  REF   1               21,3314  6 3321 1           BZMF    POSALPH

0288                        21,3315  4 0000 0           COM
0289  REF  31  LAST 1373    21,3316  54 0062 1          TS      ITEMP2        STORE  -ABS(.4*AOS) SCALED AT PI/8.
0290  REF  70  LAST 1472    21,3317  4 4744 0           CS      BIT1
0291  REF   2  LAST 1477    21,3320  1 3323 1           TCF     POSALPH +2
0292  REF  32  LAST 1477    21,3321  54 0062 1 POSALPH  TS      ITEMP2        STORE  -ABS(.4*AOS) SCALED AT PI/8.
0293  REF  71  LAST 1477    21,3322  3 4744 1           CA      BIT1
0294  REF   5  LAST 1477    21,3323  50 0066 1   +2     INDEX   QRNDXER       SGN(AOS) INTO NEGU
0295  REF   9  LAST 1477    21,3324  55'501 0           TS      NEGUQ         STORE SGN(APLHA) AS NEGU

0296  REF   2  LAST 1477    21,3325  3 0063 1           CA      NZACCDOT
0297                        21,3326  0 0006 1           EXTEND
0298  REF  41  LAST 1474    21,3327  7 4731 1           MP      BIT12         2*ACCDOT, SCALED AT PI/8.
0299  REF  33  LAST 1477    21,3330  6 0062 0           AD      ITEMP2        -ABS(ALPHA) + 2*ACCDOT, AT PI/8.
0300                        21,3331  0 0006 1           EXTEND
0301  REF   2  LAST 1477    21,3332  6 3347 1           BZMF    NOTALLOW      IS DRIVE TIME MORE THAN TWO SECONDS?
0302  REF  34  LAST 1477    21,3333  4 0062 1           CS      ITEMP2        NO.  COMPUTE DRIVE TIME.
0303                        21,3334  0 0006 1           EXTEND                ABS(ALPHA) AT PI/8.
0304  REF   1               21,3335  7 3370 1           MP      OCT00240      DECIMAL 10/1024
0305                        21,3336  0 0006 1           EXTEND                QUOTIENT IS DRIVE TIME AT WAITLIST.
0306  REF   3  LAST 1477    21,3337  10 0063 0          DV      NZACCDOT      ABS(ALPHA)/ACCDOT AT 2(14)/100
```

```
 0307                          21,3340  0 0006 1            EXTEND
 0308  REF   3  LAST 1477      21,3341  1 3343 1            BZF     TGOFFNOW       DRIVE TIME MUST BE GREATER THAN ZERO.

 0309  REF   1                 21,3342  1 3355 0            TCF     DRIVEON

 0310  REF 311  LAST 1477      21,3343  3 4746 0  TGOFFNOW  CAF     ZERO           TURN OFF GIMBAL NOW.
 0311  REF   6  LAST 1477      21,3344  50 066 1            INDEX   QRNDXER
 0312  REF  10  LAST 1477      21,3345  55'501 0            TS      NEGUQ

 0313  REF   1                 21,3346  1 3357 1            TCF     DONEYET

 0314  REF   4  LAST  831      21,3347  3 6010 0  NOTALLOW  CAF     OCT31
 0315  REF   7  LAST 1478      21,3350  50 066 1            INDEX   QRNDXER
 0316  REF   8  LAST 1478      21,3351  55'631 0            TS      QGIMTIMR
 0317  REF 312  LAST 1478      21,3352  3 4746 0            CAF     ZERO           DRIVE TIME IS MORE THAN 2 SECONDS, SO
 0318  REF   4  LAST 1476      21,3353  55'502 0            TS      ALLOWGTS       DO NOT PERMIT FURTHER GTS ATTITUDE-RATE
A0319                                                                              CONTROL UNTIL AOSTASK APPROVES.
 0320  REF   2  LAST 1478      21,3354  1 3357 1            TCF     DONEYET        NO WAITLIST CALL IS MADE.

 0321  REF   8  LAST 1478      21,3355  50 066 1  DRIVEON   INDEX   QRNDXER
 0322  REF   9  LAST 1478      21,3356  55'631 0            TS      QGIMTIMR       CHOOSE Q OR R AXIS.

 0323  REF   9  LAST 1478      21,3357  10 066 0  DONEYET   CCS     QRNDXER
 0324  REF   1                 21,3360  1 3266 1            TCF     TIMQGMBL

 0325  REF  14  LAST 1360      21,3361  52 073 1            DXCH    RUPTREG3       PROTECT IBNKCALL ERASABLES.  ACDT+C12
 0326  REF  35  LAST 1477      21,3362  52 063 0            DXCH    ITEMP2         LEAVES ITEMPS2,3 ALONE.

 0327  REF  64  LAST 1450      21,3363  0 4665 0            TC      IBNKCALL       TURN OF CHANNEL BITS, SET Q(R)ACCDOTS.
 0328  REF   7  LAST 1426      21,3364   35737 1            CADR    ACDT+C12

 0329  REF  36  LAST 1478      21,3365  52 063 0            DXCH    ITEMP2         RESTORE ERASABLES FOR IBNKCALL.
 0330  REF  15  LAST 1478      21,3366  52 073 1            DXCH    RUPTREG3

 0331  REF  24  LAST 1476      21,3367  0 0071 1            TC      RUPTREG2       RETURN TO CALLER.

 0332                          21,3370   00240 1  OCT00240  OCTAL   00240          DECIMAL 10/1024
```

```
P0333   THE FOLLOWING SECTION IS A CONTINUATION OF THE TRIM GIMBAL CONTROL FROM THE LAST GTS ENTRY. THE QUANTITY NEGUSUM
R0335   IS COMPUTED FOR EACH AXIS (Q,R), .707*DEL*FUNCTION(3/2) + K2THETA = NEGUSUM.  NEW DRIVES ARE ENTERED TO CH 12.

R0337   THE SUBROUTINE GTSQRT ACCEPTS A DOUBLE PRECISION VALUE IN FUNCTION, FUNCTION +1 AND RETURNS A SINGLE-PRECISION
R0339   SQUARE ROOT OF THE FOURTEEN MOST SIGNIFICANT BITS OF THE ARGUMENT.  ALSO, THE CELL SHFTFLAG CONTAINS A BINARY
R0341   EXPONENT S, SUCH THAT THE SQUARE ROOT (RETURNED IN THE A REGISTER) MUST BE SHIFTED RIGHT (MULTIPLIED BY 2 TO THE
R0343   POWER (-S)) IN ORDER TO BE THE TRUE SQUARE ROOT OF THE FOURTEEN MOST SIGNIFICANT BITS OF FUNCTION, FUNCTION +1.
R0345   SQUARE ROOT ERROR IS NOT MORE THAN 2 IN THE 14TH SIGNIFICANT BIT.  CELLS CLOBBERED ARE A,L,SHFTFLAG,ININDEX,
R0347   HALFARG,SCRATCH,SR,FUNCTION, FUNCTION +1.  GTSQRT IS CALLED BY TC GTSQRT AND RETURNS VIA TC Q OR TC FUNCTION +1.
R0349   ZERO OR NEGATIVE ARGUMENTS YIELD ZERO FOR SQUARE ROOTS.

 0350   REF   8  LAST 1473    21,3371  11'750 0  GTSQRT   CCS     FUNCTION
 0351   REF   1               21,3372  1 3410 0           TCF     GOODARG          FUNCTION IS POSITIVE.  TAKE SQUARE ROOT.
 0352                         21,3373  1 3375 1           TCF      +2              HIGH ORDER WORD IS ZERO.  TRY THE LOWER.
 0353   REF   1               21,3374  1 3401 0           TCF     ZEROOT           NEGATIVE.  USE ZERO FOR 1/2 POWER.

 0354   REF   9  LAST 1479    21,3375  3 1751 0           CA      FUNCTION +1
 0355                         21,3376  0 0006 1           EXTEND
 0356   REF   2  LAST 1479    21,3377  6 3401 1           BZMF    ZEROOT

 0357   REF   1               21,3400  1 3404 0           TCF     ZEROHIGH         PROCEED.
 0358   REF 313  LAST 1478    21,3401  3 4746 0  ZEROOT   CA      ZERO
 0359   REF   1               21,3402  55'740 1           TS      SHFTFLAG
 0360   REF 421  LAST 1477    21,3403  0 0002 0           TC      Q

 0361   REF  10  LAST 1479    21,3404  57'750 1  ZEROHIGH XCH     FUNCTION         14 MOST SIGNIFICANT BITS ARE IN THE
 0362   REF  11  LAST 1479    21,3405  57'751 0           XCH     FUNCTION +1      LOWER WORD.  EXCHANGE THEM.
 0363   REF  27  LAST 1371    21,3406  3 4750 1           CA      SEVEN
 0364   REF   2  LAST 1479    21,3407  1 3411 1           TCF     GOODARG  +1

 0365   REF 314  LAST 1479    21,3410  3 4746 0  GOODARG  CA      ZERO
 0366   REF   2  LAST 1479    21,3411  55'740 1           TS      SHFTFLAG
 0367   REF   2  LAST  898    21,3412  3 5745 1           CA      TWELVE           INITIALIZE THE SCALING LOOP.
 0368   REF   1               21,3413  55'743 1           TS      ININDEX
 0369   REF   1               21,3414  1 3423 0           TCF     SCALLOOP

 0370   REF  12  LAST 1479    21,3415  3 1750 1  SCALSTRT CA      FUNCTION
 0371   REF   1               21,3416  1 3437 0           TCF     SCALDONE

 0372   REF  11  LAST 1464    21,3417  3 7767 0  MULBUSH  CA      NEG2             IF ARG IS NOT LESS THAN 1/4, INDEX IS
 0373   REF   2  LAST 1479    21,3420  27'743 1           ADS     ININDEX          ZERO, INDICATING NO SHIFT NEEDED.
 0374                         21,3421  0 0006 1           EXTEND                   BRANCH IF ARG IS NOT LESS THAN 1/4.
 0375   REF   1               21,3422  6 3415 1           BZMF    SCALSTRT         OTHERWISE COMPARE ARG WITH A REFERENCE
A0376                                                                              WHICH IS 4 TIMES LARGER THAN THE LAST.
 0377   REF  13  LAST 1479    21,3423  4 1750 0  SCALLOOP CS      FUNCTION
 0378   REF   3  LAST 1479    21,3424  51'743 0           INDEX   ININDEX
 0379   REF  55  LAST 1454    21,3425  6 4726 0           AD      BIT15            REFERENCE MAGNITUDE LESS OR EQUAL TO 1/4
 0380                         21,3426  0 0006 1           EXTEND
 0381   REF   1               21,3427  6 3417 0           BZMF    MULBUSH          IF ARG IS NOT LESS THAN REFERENCE, GO
A0382                                                                              AROUND THE MULBERRY BUSH ONCE MORE.
```

```
 0383   REF   4  LAST 1479  21,3430  51'743 0           INDEX  ININDEX
 0384   REF  56  LAST 1479  21,3431  3 4726 0           CA     BIT15           THIS IS THE SCALE MAGNITUDE
 0385   REF   1             21,3432  57'746 0           XCH    HALFARG         2**(-ININDEX) IS THE SHIFT DIVISOR.
 0386                       21,3433  0 0006 1           EXTEND                 RESCALE ARGUMENT.
 0387   REF  14  LAST 1479  21,3434  3 1751 0           DCA    FUNCTION
 0388                       21,3435  0 0006 1           EXTEND
 0389   REF   2  LAST 1480  21,3436  11'746 1           DV     HALFARG
A0390                                                                          ININDEX AND SHFTFLAG PRESERVE INFO FOR

A0391                                                                          RESCALING AFTER ROOT PROCESS.
 0392                       21,3437  0 0006 1  SCALDONE EXTEND
 0393   REF  15  LAST 1480  21,3440  23'751 0           QXCH   FUNCTION +1     SAVE Q FOR RETURN
 0394                       21,3441  0 0006 1           EXTEND
 0395   REF  86  LAST 1471  21,3442  7 4727 0           MP     BIT14
 0396   REF   3  LAST 1480  21,3443  55'746 1           TS     HALFARG
 0397   REF  54  LAST 1460  21,3444  7 4730 0           MASK   BIT13
 0398   REF 516  LAST 1477  21,3445  10 000 0           CCS    A
 0399   REF   1             21,3446  3 3564 0           CA     OCT11276
 0400   REF   1             21,3447  6 3562 0           AD     ROOTHALF        INITIAL GUESS IS ROOT 1/2 OR POSMAX

 0401   REF   1             21,3450  0 3566 1           TC     ROOTCYCL
 0402   REF   2  LAST 1480  21,3451  0 3566 1           TC     ROOTCYCL
 0403   REF   3  LAST 1480  21,3452  0 3566 1           TC     ROOTCYCL

 0404   REF  16  LAST 1480  21,3453  0 1751 0           TC     FUNCTION +1

R0405   ******************************************************************************************************************


 0407   REF   1             21,3454  0 3371 1  RSTOFGTS TC     GTSQRT
 0408   REF  13  LAST 1474  21,3455  57'741 1  PRODUCT  XCH    K2CNTRAL
 0409                       21,3456  0 0006 1           EXTEND
 0410   REF  14  LAST 1480  21,3457  7 1741 0           MP     K2CNTRAL
 0411   REF  15  LAST 1480  21,3460  53'742 0           DXCH   K2CNTRAL
 0412                       21,3461  0 0006 1           EXTEND                             THE PRODUCT OF
 0413   REF 317  LAST 1477  21,3462  7 0001 1           MP     L                1/2                   2       1/2
 0414   REF  16  LAST 1480  21,3463  27'742 0           ADS    K2CNTRAL +1     K   *(DEL*OMEGA + ALPHA /(2*K))
 0415   REF 318  LAST 1480  21,3464  54 001 1           TS     L                               AND
 0416                       21,3465  1 3467 0           TCF     +2                                    2
 0417   REF  17  LAST 1480  21,3466  27'741 0           ADS    K2CNTRAL         DEL*(DEL*OMEGA + ALPHA /(2*K)) NOW IN
A0418                                                                          K2CNTRAL

 0419   REF   5  LAST 1480  21,3467  3 1743 0  DOSHIFT  CA     ININDEX
 0420                       21,3470  0 0006 1           EXTEND                 MULTIPLY IN THE FACTOR 2(-S), RETURNED
 0421   REF  87  LAST 1480  21,3471  7 4727 0           MP     BIT14           BY THE GTSQRT SUBROUTINE
 0422   REF   3  LAST 1479  21,3472  27'740 1           ADS    SHFTFLAG
 0423                       21,3473  0 0006 1           EXTEND
 0424   REF   1             21,3474  1 3513 1           BZF    ADDITIN
 0425   REF   4  LAST 1480  21,3475  51'740 0           INDEX  SHFTFLAG
 0426   REF  57  LAST 1480  21,3476  3 4726 0           CA     BIT15
 0427    REF  18   LAST 1480     21,3477   57'741 1            XCH     K2CNTRAL
 0428                            21,3500   0 0006 1            EXTEND
 0429    REF  19   LAST 1481     21,3501   7 1741 0            MP      K2CNTRAL
 0430    REF   7   LAST 1473     21,3502   21'737 1            DAS     K2THETA
 0431    REF  20   LAST 1481     21,3503   57'741 1            XCH     K2CNTRAL
 0432                            21,3504   0 0006 1            EXTEND
 0433    REF  21   LAST 1481     21,3505   7 1742 0            MP      K2CNTRAL +1
 0434    REF   8   LAST 1481     21,3506   27'737 1            ADS     K2THETA  +1
 0435    REF 319   LAST 1480     21,3507   54 001 1            TS      L
 0436                            21,3510   1 3512 0            TCF      +2
 0437    REF   9   LAST 1481     21,3511   27'736 0            ADS     K2THETA

 0438    REF   3   LAST 1474     21,3512   1 3516 1            TCF     NEGUSUM

 0439                            21,3513   0 0006 1   ADDITIN  EXTEND
 0440    REF  22   LAST 1481     21,3514   3 1742 1            DCA     K2CNTRAL
 0441    REF  10   LAST 1481     21,3515   21'737 1            DAS     K2THETA            NOW ADD IN THE K2THETA TERM.
 0442    REF  11   LAST 1481     21,3516   11'736 0   NEGUSUM  CCS     K2THETA            TEST SIGN OF HIGH ORDER PART.
 0443    REF   1                 21,3517   1 3523 1            TCF     NEGDRIVE
 0444                            21,3520   1 3522 0            TCF      +2
 0445    REF   2   LAST 1471     21,3521   1 3525 1            TCF     POSDRIVE

 0446    REF  12   LAST 1481     21,3522   11'737 1            CCS     K2THETA  +1        SIGN TEST FOR LOW ORDER PART.
 0447    REF  72   LAST 1477     21,3523   3 4744 1   NEGDRIVE CA      BIT1
 0448                            21,3524   1 3526 1            TCF      +2                STOP GIMBAL DRIVE FOR A ZERO NEGUSUM.
 0449    REF  73   LAST 1481     21,3525   4 4744 0   POSDRIVE CS      BIT1
 0450    REF 320   LAST 1481     21,3526   54 001 1            TS      L                  SAVE FOR DRIVE REVERSAL TEST.
 0451    REF   6   LAST 1471     21,3527   51'747 1            INDEX   QRCNTR
 0452    REF  11   LAST 1478     21,3530   57'501 1            XCH     NEGUQ

 0453                            21,3531   0 0006 1            EXTEND
 0454    REF 321   LAST 1481     21,3532   7 0001 1            MP      L                  MULTIPLY OLD NEGU AND NEW NEGU.
 0455    REF 322   LAST 1481     21,3533   10 001 1            CCS     L
 0456    REF   1                 21,3534   1 3551 1            TCF     LOUPE              NON-ZERO GIMBAL DRIVE BEING CONTINUED.

 0457    REF   1                 21,3535   1 3546 1            TCF     ZEROLOUP           NO REVERSAL PROBLEM HERE.

 0458    REF   1                 21,3536   1 3540 1            TCF     REVERSAL           NON-ZERO GIMBAL DRIVE BEING REVERSED.
 0459    REF   2   LAST 1481     21,3537   1 3546 1            TCF     ZEROLOUP           NO REVERSAL PROBLEM HERE.

 0460    REF   7   LAST 1481     21,3540   51'747 1   REVERSAL INDEX   QRCNTR             A ZERO-DRIVE PAUSE IS NEEDED HERE.  ZERO
 0461    REF   5   LAST 1474     21,3541   55'510 0            TS      QACCDOT            IS IN A REGISTER FROM CCS ON (-1).
 0462    REF   8   LAST 1481     21,3542   51'747 1            INDEX   QRCNTR
 0463    REF   1                 21,3543   4 3563 0            CS      GMBLBITA
 0464                            21,3544   0 0006 1            EXTEND
 0465    REF  70   LAST 1474     21,3545   03 C12 1            WAND    CHAN12

 0466    REF  50   LAST 1475     21,3546   4 1774 0   ZEROLOUP CS      RCSFLAGS           SET UP REQUEST FOR ACDT+C12 CALL.
 0467    REF   3   LAST 1475     21,3547   7 4740 1            MASK    CALLGMBL
 0468    REF  51   LAST 1481     21,3550   27'774 0            ADS     RCSFLAGS
```

```
L       TRIM GIMBAL CONTROL SYSTEM                                                   USER'S PAGE NO.  13      E6 S4

 0469   REF   5  LAST 1481   21,3551  11'747 0  LOUPE     CCS      QRCNTR           HAVE BOTH AXES BEEN PROCESSED?
 0470   REF   2  LAST 1470   21,3552  1 3045 1            TCF      GOQTRIMG         NO.  DO Q AXIS NEXT.

 0471   REF   2  LAST 1470   21,3553  3 1505 0            CA       SAVESR           RESTORE THE SR
 0472   REF  28  LAST 1470   21,3554  54 021 0            TS       SR

 0473                        21,3555  0 0006 1  GOCLOSE   EXTEND                    TERMINATE THE JASK.
 0474   REF   1              21,3556  3 3561 0            DCA      CLUSFADR
 0475                        21,3557  52 006 0            DTCB

 0476   REF  25  LAST 1477   E6,1536                      EBANK=   AOSQ
 0477   REF   4  LAST 1453   21,3560   03270 1  CLOSEADR  2CADR    CLOSEOUT         TERMINATE THE JASK.
 0477                        21,3561   36106 0
R0478
 0479   REF   6  LAST 1429      5745            TWELVE    EQUALS   OCT14
 0480                        21,3562   26501 1  ROOTHALF  OCTAL    26501            SQUARE ROOT OF 1/2
 0481                        21,3563   01400 1  GMBLBITA  OCTAL    01400            INDEXED WRT GMBLBITB    DO NOT MOVE******
 0482                        21,3564   11276 1  OCT11276  OCTAL    11276            POSMAX - ROOTHALF
 0483                        21,3565   06000 1  GMBLBITB  OCTAL    06000            INDEXED WRT GMBLBITA    DO NOT MOVE******
R0484
R0485   SUBROUTINE ROOTCYCL:  BY CRAIG WORK,3 APRIL 68
R0486   ROOTCYCL IS A SUBROUTINE WHICH EXECUTES ONE NEWTON SQUARE ROOT ALGORITHM ITERATION.  THE INITIAL GUESS AT THE
R0488   SQUARE ROOT IS PRESUMED TO BE IN THE A REGISTER AND ONE-HALF THE SQUARE IS TAKEN FROM HALFARG.  THE NEW APPROXI-
R0490   MATION TO THE SQUARE ROOT IS RETURNED IN THE A REGISTER.  DEBRIS:   A,L,SR,SCRATCH.  ROOTCYCL IS CALLED FROM
R0492   LOCATION (LOC) BY A TC ROOTCYCL, AND RETURNS (TC Q) TO LOC +1.

R0493   WARNING:  IF THE INITIAL GUESS IS NOT GREATER THAN THE SQUARE, DIVIDE OR ADD OVERFLOW IS A REAL POSSIBILITY.

 0495   REF   1              21,3566  55'745 1  ROOTCYCL  TS       SCRATCH          STORE X
 0496   REF  29  LAST 1482   21,3567  54 021 0            TS       SR               X/2 NOW IN SR
 0497   REF   4  LAST 1480   21,3570  3 1746 0            CA       HALFARG          ARG/2 IN THE A REG
 0498                        21,3571  22 007 0            ZL                        PREPARE FOR DIVISION
 0499                        21,3572  0 0006 1            EXTEND
 0500   REF   2  LAST 1482   21,3573  11'745 1            DV       SCRATCH          (ARG/X)/2
 0501   REF  30  LAST 1482   21,3574  6 0021 1            AD       SR               (X + ARG/X)/2 IN THE A REG
 0502   REF 422  LAST 1479   21,3575  0 0002 0            TC       Q

R0503
```

```
L       AOSTASK AND AOSJOB                                                      USER'S PAGE NO.   1       EO S4

R0001   PROGRAM NAME: 1/ACCS
R0002   PROGRAM WRITTEN BY: BOB COVELLI AND MIKE HOUSTON
R0003   LAST MODIFICATION: FEB.14,1969 BY G.KALAN

R0004   PROGRAM DESCRIPTION:

R0005      1/ACCS PROVIDES THE INTERFACE BETWEEN THE GUIDANCE PROGRAMS AND THE DIGITAL AUTOPILOT. WHENEVER THERE IS A
R0007   CHANGE IN THE MASS OF THE VEHICLE, IN THE DEADBAND SELECTED, IN THE VEHICLE CONFIGURATION (ASCENT-DESCENT-
R0009   DOCKED), AND DURING A FRESH START OR A RESTART, 1/ACCS IS CALLED TO COMMUNICATE THE DATA CHANGES TO THE DAP.

R0011      THE INPUTS TO 1/ACCS ARE MASS, ACCELERATION (ABDELV), DEADBAND (DB), OFFSET ACCELERATIONS (AOSQ AND AOSR),
R0013   STAGE VERIFY BIT (CHAN30,BIT2), DOCKED BIT (DAPBOOLS,BIT13), DRIFT BIT (DAPBOOLS,BIT8), USEQRJTS (DAPBOOLS,
R0015   BIT14), AND SURFACE FLAG (FLAGWRD8,BIT8), AND CH5MASK.

R0016      1/ACCS COMPUTES THE JET ACCELERATIONS (1JACC, 1JACCQ, 1JACCR) AS FUNCTIONS OF MASS. 1JACCU AND 1JACCV ARE
R0018   FORMED BY RESOLVING 1JACCQ NAD 1JACCR. IN THE DESCENT CASE, THE DESCENT ENGINE MOMENT ARM (L,PVT-CG) IS ALSO
R0020   COMPUTED AS A FUNCTION OF MASS. THE RATE OF CHANGE OF ACCELERATION DUE TO ROTATION OF THE GIMBAL (ACCDOTQ,
R0022   ACCDOTR) IS ALSO COMPUTED IN THE DESCENT CASE.

R0023      AFTER THE ABOVE COMPUTATIONS, THE PROGRAM 1/ACCONT COMPUTES THE RECIPROCAL  NET ACCELERATIONS ABOUT THE P, U,
R0025   AND V AXES (2 JETS FOR P AXIS, BOTH 1 AND 2 JETS FOR U AND V AXES), AND THE RECIPROCAL COAST ACCELERATIONS ABOUT
R0027   THE P, U, AND V AXES. THE ACCELERATION FUNCTIONS (ACCFCTZ1 AND ACCFCTZ5)ARE ALSO COMPUTED FOR THESE AXES. THE
R0029   FIRE AND COAST DEADBANDS AND AXISDIST ARE COMPUTED FOR EACH AXIS. FLAT AND ZONE3LIM, THE WIDTH AND HEIGHT OF THE
R0031   MINIMUM IMPULSE ZONE, ARE COMPUTED. 1/ACCONT ALSO SETS ACCSWU AND ACCSWV, WHICH INDICATE WHEN 1 JET ACCELERATION
R0033   IS NOT SUFFICIENT TO PRODUCE MINIMUM ACCELERATION. AT THE COMPLETION OF 1/ACCS, THE ACCSOKAY BIT IS SET.

R0035   SUBROUTINES CALLED:

R0036              TIMEGMBL
R0037              MAKECADR
R0038              ROT45DEG

R0039   CALLING SEQUENCE:

A0040                                                              TC      BANKCALL         (1/ACCS MUST BE CALL BY BANKCALL
A0041                                                              CADR    1/ACCS

R0042   NORMAL EXIT: VIA BANKJUMP        ALARM AND ABORT EXIT MODES: NONE.

R0043   INPUT/OUTPUT: SEE PROGRAM DESCRIPTION

R0044   DEBRIS:

R0045   ALL OF THE EXECUTIVE TEMPORARY REGISTERS, EXCEPT FIXLOC AND OVFIND, AND THE CORE SET AREA FROM MPAC TO BANKSET.

R0047   RESTRICTIONS:

R0048   1/ACCS MUST BE CALLED BY BANKCALL
R0049   LBANK IS SET TO 6, BUT NOT RESTORED.
```

```
L         AOSTASK AND AOSJOB                                                                USER'S PAGE NO.   2       EO S4

 0050                                21,3576                         BANK    21
 0051     REF   3  LAST 1475         21,2000                         SETLOC DAPS4
 0052                                21,3576                         BANK

 0053     REF   1                                                    COUNT* $$/DAPAO

 0054     REF  26  LAST 1432         E6,1536                         EBANK= AOSQ

R0055     ENTRY IS THROUGH 1/ACCJOB OR 1/ACCSET WHEN 1/ACCS IS TO BE DONE AS A SEPARATE NOVAC JOB.

R0057     IT IS POSSIBLE FOR MORE THAN ONE OF THESE JOBS TO BE SET UP CONCURRENTLY.  HOWEVER, SINCE THERE IS NO CHECK OF
R0059     NEWJOB, A SECOND MANIFESTATION CANNOT BE STARTED UNTIL THE FIRST IS COMPLETED.

 0061     REF 315  LAST 1479         21,3576  3 4746 0  1/ACCSET CAF     ZERO           ENTRY FROM FRESH START/RESTART CODING.
 0062     REF  27  LAST 1484         21,3577  55'536 1           TS      AOSQ             NULL THE OFFSET ESTIMATES FOR 1/ACCS.
 0063     REF  10  LAST 1425         21,3600  55'540 0           TS      AOSR
 0064     REF   7  LAST 1425         21,3601  55'424 0           TS      ALPHAQ           NULL THE OFFSET ESTIMATES FOR DOWNLIST
 0065     REF   7  LAST 1425         21,3602  55'425 1           TS      ALPHAR

 0066     REF 308  LAST 1399         21,3603  0 4607 1  1/ACCJOB TC      BANKCALL       1/ACCS ASSUMES ENTRY VIA BANKCALL.
 0067     REF   2  LAST  867         21,3604   40465 1           CADR    1/ACCS +2      SKIP EBANK SETTING.

 0068     REF 151  LAST 1389         21,3605  0 5146 1           TC      ENDOFJOB

 00682                               20,2463                         BANK    20
 00683    REF   5  LAST 1412         20,2000                         SETLOC DAPS3
 00684                               20,2463                         BANK
 00685    REF   3 LAST   45 TO  46:     3       4*                   COUNT* $$/DAPAO

 0069     REF  11  LAST 1405         20,2463  3 5006 1  1/ACCS   CA      EBANK6         ***** EBANK SET BUT NOT RESTORED *****
 0070     REF  94  LAST 1406         20,2464  54 003 0           TS      EBANK

 0071     REF  15  LAST 1374         20,2465  0 4636 0           TC      MAKECADR       SAVE RETURN SO THAT BUF2 MAY BE USED
 0072     REF   1                    20,2466  54 117 1           TS      ACCRETRN

R0073     DETERMINE MASS OF THE LEM.
 0074     REF  61  LAST 1451         20,2467  3 0111 0           CA      DAPBOOLS       IS CSM DOCKED
 0075     REF  11  LAST 1450         20,2470  7 4730 0           MASK    CSMDOCKD
 0076     REF   1                    20,2471  54 157 0           TS      DOCKTEMP       STORE RECORD OF STATE IN TEMP (MPAC +3).
 0077     REF 517  LAST 1480         20,2472  10 000 0           CCS     A
 0078     REF  11  LAST  326         20,2473  4 1327 1           CS      CSMMASS          DOCKED:  LEMMASS = MASS - CSMMASS
 0079     REF  14  LAST  864         20,2474  6 1243 0           AD      MASS             LEM ALONE: LEMMASS = MASS
 0080     REF  12  LAST  326         20,2475  55'326 0           TS      LEMMASS

R0081     ON THE BASIS OF APSFLAG:
R0082          SET THE P-AXIS RATE COMMAND LIMIT FOR 2-JET/4-JET CONTROL
R0083          SET MPAC, WHICH INDICATES THE PROPER SET OF COEFFICIENTS FOR THE LEM-ALONE F(MASS) CALCULATIONS
R0085          ENSURE THAT THE LEM MASS VALUE IS WITHIN THE ACCEPTABLE RANGE

 00855                               20,2476  0 0004 0           INHINT
 0086  REF  36  LAST 1451   20,2477  30 106 0            CAF    FLGWRD10      DETERMINE WHETHER STAGED.
 0087  REF  16  LAST 1451   20,2500  7 4730 0            MASK   APSFLBIT
 0088                       20,2501  0 0006 1            EXTEND
 0089  REF   1              20,2502  1 2526 0            BZF    DPSFLITE

 0090  REF  42  LAST 1472   20,2503  4 4724 0            CS     POSMAX        ASCENT (OR ON LUNAR SURFACE)
 0091  REF   3  LAST 1433   20,2504  55'475 1            TS     -2JETLIM      ALWAYS 2 JETS FOR P-AXIS RATE COMMAND
 0092  REF   7  LAST 1482   20,2505  3 5745 1            CAF    OCT14         INITIALIZE INDEX AT 12.
 0093  REF 873  LAST 1399   20,2506  54 154 0            TS     MPAC
 0094  REF  13  LAST 1484   20,2507  4 1326 0            CS     LEMMASS       CHECK IF MASS TOO HIGH.  CATCH STAGING.
 0095  REF   3  LAST  223   20,2510  6 1400 1            AD     HIASCENT
 0096                       20,2511  0 0006 1            EXTEND
 0097  REF   1              20,2512  6 2517 0            BZMF   MASSFIX
 0098  REF  14  LAST 1485   20,2513  4 1326 0            CS     LEMMASS       CHECK IF MASS TOO LOW.  THIS LIMITS THE
 0099  REF   1              20,2514  6 2001 1            AD     LOASCENT        DECREMENTING BY MASSMON.
 0100                       20,2515  0 0006 1            EXTEND
 0101  REF   1              20,2516  6 2544 0            BZMF   F(MASS)

 0102  REF  15  LAST 1485   20,2517  27'326 0  MASSFIX   ADS    LEMMASS       STORE THE VIOLATED LIMIT AS LEMMASS.
 0103                       20,2520  22 0007 0           ZL                     ALSO CORRECT TOTAL MASS, ZEROING THE
 0104  REF   2  LAST 1484   20,2521  10 157 0            CCS    DOCKTEMP        LOW-ORDER WORD.
 0105  REF  12  LAST 1484   20,2522  31'327 0            CAE    CSMMASS           DOCKED:  MASS = LEMMASS + CSMMASS
 0106  REF  16  LAST 1485   20,2523  6 1326 1            AD     LEMMASS           LEM ALONE:  MASS = LEMMASS
 0107  REF  15  LAST 1484   20,2524  53'244 0            DXCH   MASS
 0108  REF   2  LAST 1485   20,2525  1 2544 1            TCF    F(MASS)

 0109  REF  51  LAST 1474   20,2526  4 4733 0  DPSFLITE  CS     BIT10         FOUR JETS FOR P-AXIS RATE COMMAND ERRORS
 0110  REF   4  LAST 1485   20,2527  55'475 1            TS     -2JETLIM        EXCEEDING 1.4 DEG/SEC  (SCALED AT 45)
 0111  REF  34  LAST 1438   20,2530  3 6263 0            CAF    SIX           INITIALIZE INDEX AT 6.
 0112  REF 874  LAST 1485   20,2531  54 154 0            TS     MPAC
 0113  REF  17  LAST 1485   20,2532  4 1326 0            CS     LEMMASS       CHECK IF MASS TOO HIGH.  SHOULD NEVER
 0114  REF   1              20,2533  6 2002 1            AD     HIDESCNT        OCCUR EXCEPT PERHAPS BEFORE THE PAD
 0115                       20,2534  0 0006 1            EXTEND                 LOAD IS DONE.
 0116  REF   2  LAST 1485   20,2535  6 2517 0            BZMF   MASSFIX
 0117  REF  18  LAST 1485   20,2536  4 1326 0            CS     LEMMASS       CHECK IF MASS TOO LOW.  THIS LIMITS THE
 0118  REF   1              20,2537  6 2003 0            AD     LODESCNT        DECREMENTING BY MASSMON.
 0119  REF   4  LAST 1485   20,2540  6 1400 1            AD     HIASCENT
 0120                       20,2541  0 0006 1            EXTEND
 0121  REF   3  LAST 1485   20,2542  6 2544 0            BZMF   F(MASS)
 0122  REF   3  LAST 1485   20,2543  1 2517 1            TCF    MASSFIX
R0123  COMPUTATION OF FUNCTIONS OF MASS

 0124                       20,2544  0 0003 1  F(MASS)   RELINT
 0125  REF   3  LAST 1485   20,2545  10 157 0            CCS    DOCKTEMP
 0126  REF   1              20,2546  1 3063 0            TCF    DOCKED        DOCKED: USE SEPERATE COMPUTATION.
 0127  REF 104  LAST 1476   20,2547  3 4743 0            CA     TWO
 0128  REF 875  LAST 1485   20,2550  54 155 1  STCTR     TS     MPAC +1       J=2,1,0 FOR 1JACCR,1JACCQ,1JACC

 0129  REF 105  LAST 1485   20,2551  4 4743 1            CS     TWO
 0130  REF 876  LAST 1485   20,2552  26 154 0            ADS    MPAC          JX=10,8,6 OR 4,2,0 TO INDEX COEFS.
 0131   REF  19  LAST 1485   20,2553  31'326 1  STCTR1    CAE    LEMMASS
 01311  REF 877  LAST 1485   20,2554  50 154 1            INDEX  MPAC
 0132   REF   1              20,2555  6 3042 1            AD     INERCONC
 0133   REF 878  LAST 1486   20,2556  54 156 1            TS     MPAC +2            MASS + C
 0134                        20,2557  0 0006 1            EXTEND
 0135   REF 879  LAST 1486   20,2560  5 0154 1            INDEX  MPAC
 0136   REF   1              20,2561  3 3024 1            DCA    INERCONA
 0137                        20,2562  0 0006 1            EXTEND
 0138   REF 880  LAST 1486   20,2563  10 156 1            DV     MPAC +2
 0139   REF 881  LAST 1486   20,2564  50 154 1            INDEX  MPAC
 0140   REF   1              20,2565  6 3041 1            AD     INERCONB
 0141   REF 882  LAST 1486   20,2566  50 155 0            INDEX  MPAC +1            1JACC(J)=A(JX)/(MASS+C(JX) + B(JX)
 0142   REF   7  LAST 1421   20,2567  55'530 1            TS     1JACC              1JACC(-1)=L,PVT-CG   SCALED AT 8 FEET

 0143   REF 883  LAST 1486   20,2570  10 155 1            CCS    MPAC +1
 0144   REF   1              20,2571  1 2550 1            TCF    STCTR
 0145   REF   1              20,2572  1 2574 1            TCF    COMMEQS
 0146   REF   1              20,2573  1 2673 0            TCF    LRESC

R0147     COEFFQ AND COEFFR ARE COMPUTED IN THIS SECTION. THEY ARE USED TO RESOLVE Q-R COMPONENTS INTO NON-ORTHOGONAL
R0149   U AND V COMPONENTS (SEE ROT-TCUV SECTION).

 0150                        20,2574  22 007 0  COMMEQS   ZL
 01501  REF   2  LAST 1469   20,2575  4 1532 0            CS     1JACCR
 0151   REF   2  LAST 1469   20,2576  6 1531 1            AD     1JACCQ
 0152                        20,2577  0 0006 1            EXTEND
 0153   REF   1              20,2600  6 2624 0            BZMF   BIGIQ
 0154                        20,2601  0 0006 1            EXTEND                    EPSILON IS A MEASURE OF COUPLING AND IS
 0155   REF   3  LAST 1486   20,2602  11'531 0            DV     1JACCQ             DEFINED=1-IQ/IR FOR IR GREATER THAN IQ.
 0156   REF   1              20,2603  54 155 1            TS     EPSILON            THE COMPUTED EXPRESSION IS EQUIVALENT
 0157   REF   1              20,2604  6 3062 0            AD     -EPSMAX
 0158                        20,2605  0 0006 1            EXTEND
 0159   REF   1              20,2606  6 2611 0            BZMF   GOODEPS1
 0160   REF   2  LAST 1486   20,2607  4 3062 1            CS     -EPSMAX
 0161   REF   2  LAST 1486   20,2610  54 155 1            TS     EPSILON            EPSILON IS LIMITED TO A MAX. OF .42265
 0162   REF   3  LAST 1486   20,2611  3 0155 0  GOODEPS1  CA     EPSILON
 0163                        20,2612  0 0006 1            EXTEND
 0164   REF   1              20,2613  7 3056 0            MP     0.35356
 0165   REF   1              20,2614  6 3060 1            AD     .7071
 0166   REF   2  LAST 1455   20,2615  55'627 1            TS     COEFFR             IN THIS CASE WHERE IR IS GREATER THAN
 0167   REF  43  LAST 1485   20,2616  4 4724 0            CS     POSMAX             IQ, COEFFQ=-.707(1+.5EPSILON)(1-EPSILON)
 0168   REF   4  LAST 1486   20,2617  6 0155 0            AD     EPSILON            AND COEFFR=.707(1+.5EPSILON)
 0169                        20,2620  0 0006 1            EXTEND
 0170   REF   3  LAST 1486   20,2621  7 1627 1            MP     COEFFR
 0171   REF   3  LAST 1455   20,2622  55'626 0            TS     COEFFQ
 0172   REF   1              20,2623  1 2647 1            TCF    JACCUV
 0173                        20,2624  0 0006 1  BIGIQ     EXTEND                    EPSILON IS DEFINED AS 1-IR/IQ FOR IQ
 0174   REF   3  LAST 1486   20,2625  11'532 0            DV     1JACCR             GREATER THAN IR. -EPSILON IS COMPUTED
 0175   REF   1              20,2626  54 155 1            TS     -EPSILON           RATHER THAN EPSILON FOR CONVENIENCE
 0176   REF   2  LAST 1486   20,2627  4 0155 1            CS     -EPSILON
```

```
L       AOSTASK AND AOSJOB                                                                                  USER'S PAGE NO.   5      E6 S4

 0177   REF    3  LAST 1486    20,2630   6 3062 0              AD       -EPSMAX
 0178                          20,2631   0 0006 1              EXTEND
 0179   REF    1               20,2632   6 2635 0              BZMF     GOODEPS2
 0180   REF    4  LAST 1487    20,2633   3 3062 0              CA       -EPSMAX
 0181   REF    3  LAST 1486    20,2634   54 155 1              TS       -EPSILON         EPSILON IS LIMITED TO A MAX. OF .42265
 0182   REF    4  LAST 1487    20,2635   3 0155 0    GOODEPS2  CA       -EPSILON
 0183                          20,2636   0 0006 1              EXTEND
 0184   REF    2  LAST 1486    20,2637   7 3056 0              MP       0.35356
 0185   REF    1               20,2640   6 3061 0              AD       -.7071
 0186   REF    4  LAST 1486    20,2641   55'626 0              TS       COEFFQ           IN THIS CASE WHERE IQ IS GREATER THAN
 0187   REF    5  LAST 1487    20,2642   4 0155 1              CS       -EPSILON         IR, COEFFQ=-.707(1+.5EPSILON) AND
 0188   REF   12  LAST 1467    20,2643   6 4726 0              AD       NEGMAX           COEFFR=.707(1+.5EPSILON)(1-EPSILON)
 0189                          20,2644   0 0006 1              EXTEND
 0190   REF    5  LAST 1487    20,2645   7 1626 0              MP       COEFFQ
 0191   REF    4  LAST 1486    20,2646   55'627 1              TS       COEFFR
 0192   REF    6  LAST 1487    20,2647   4 1626 0    JACCUV    CS       COEFFQ
 0193                          20,2650   0 0006 1              EXTEND
 0194   REF    4  LAST 1486    20,2651   7 1531 0              MP       1JACCQ           1JACCQ IS SCALED AT PI/4
 0195   REF    1               20,2652   55'533 1              TS       1JACCU           1JACCU USED AS TEMPORARY STORAGE
 0196   REF    5  LAST 1487    20,2653   3 1627 0              CA       COEFFR
 0197                          20,2654   0 0006 1              EXTEND
 0198   REF    4  LAST 1486    20,2655   7 1532 0              MP       1JACCR
 0199   REF    2  LAST 1487    20,2656   6 1533 0              AD       1JACCU
 0200                          20,2657   0 0006 1              EXTEND
 0201   REF   68  LAST 1480    20,2660   7 4727 0              MP       BIT14            SCALING CHANGED FROM PI/4 TO PI/2
 0202   REF    3  LAST 1487    20,2661   55'533 1              TS       1JACCU           SCALED AT PI/2 RADIANS/SEC(2)
 0204   REF  884  LAST 1486    20,2662   10 154 0              CCS      MPAC             COMPUTE L,PVT-CG IF IN DESCENT
 0205   REF  316  LAST 1484    20,2663   3 4746 0              CAF      ZERO             ZERO SWITCHES AND GO TO 1/ACCONT IN
 0206   REF    5  LAST 1478    20,2664   55'502 0              TS       ALLOWGTS           ASCENT
 0207   REF    1               20,2665   1 3206 1              TCF      1/ACCONT -1

 0208   REF  106  LAST 1485    20,2666   4 4743 1              CS       TWO
 0209   REF  885  LAST 1487    20,2667   54 154 0              TS       MPAC
 0210   REF  160  LAST 1476    20,2670   4 4744 0              CS       ONE
 0211   REF  886  LAST 1487    20,2671   54 155 1              TS       MPAC +1
 0212   REF    1               20,2672   1 2553 1              TCF      STCTR1
R0213   THIS SECTION COMPUTES THE RATE OF CHANGE OF ACCELERATION DUE TO THE ROTATION OF THE GIMBALS.  THE EQUATION IMPLE
R0215   MENTED IN BOTH THE Y-X PLANE AND THE Z-X PLANE IS -- D(ALPHA)/DT = TL/I*D(DELTA)/DT, WHERE
R0217         T = ENGINE THRUST FORCE
R0218         L = PIVOT TO CG DISTANCE OF ENGINE
R0219         I = MOMENT OF INERTIA

 0220   REF    7  LAST  866    20,2673   31'245 0    LRESC     CAE      ABDELV           SCALED AT 2(13) CM/SEC(2)
 0221                          20,2674   0 0006 1              EXTEND
 0222   REF   16  LAST 1485    20,2675   7 1243 1              MP       MASS             SCALED AT B+16 KGS
 0223   REF    1               20,2676   0 2760 1              TC       DVOVSUB          GET QUOTIENT WITH OVERFLOW PROTECTION
 0224   REF    1               20,2677    03057 0              ADRES    GFACTM

R0225   MASS IS DIVIDED BY ACCELERATION OF GRAVITY IN ORDER TO MATCH THE UNITS OF IXX,IYY,IZZ, WHICH ARE SLUG-FT(2).
R0227   THE RATIO OF ACCELERATION FROM PIPAS TO ACCELERATION OF GRAVITY IS THE SAME IN METRIC OR ENGINEERING UNITS, SO
```

```
R0229   THAT IS UNCONVERTED.  2.20462 CONVERTS KG. TO LB.  NOW T IS IN A SCALED AT 2(14).

 0231                         20,2700  0 0006 1            EXTEND
 0232   REF   1               20,2701  7 1527 1            MP      L,PVT-CG          SCALED AT 8 FEET.
 0233                         20,2702  0 0004 0            INHINT
 0234   REF 887  LAST 1487    20,2703  54 154 0            TS      MPAC
 0235                         20,2704  0 0006 1            EXTEND
 0236   REF   5  LAST 1487    20,2705  7 1532 0            MP      1JACCR
 0237   REF   2  LAST 1487    20,2706  0 2760 1            TC      DVOVSUB           GET QUOTIENT WITH OVERFLOW PROTECTION
 0238   REF   1               20,2707   02000 0            ADRES   TORKJET1

 0239   REF   2  LAST 1474    20,2710  55'511 1            TS      ACCDOTR           SCALED AT PI/2(7)
 0240   REF 888  LAST 1488    20,2711  3 0154 1            CA      MPAC
 0241                         20,2712  0 0006 1            EXTEND
 0242   REF   5  LAST 1487    20,2713  7 1531 0            MP      1JACCQ
 0243   REF   3  LAST 1488    20,2714  0 2760 1            TC      DVOVSUB           GET QUOTIENT WITH OVERFLOW PROTECTION
 0244   REF   2  LAST 1488    20,2715   02000 0            ADRES   TORKJET1

 0245   REF   6  LAST 1477    20,2716  55'507 0  SPSCONT   TS      ACCDOTQ           SCALED AT PI/2(7)
 0246                         20,2717  0 0006 1            EXTEND
 0247   REF   1               20,2720  7 3055 0            MP      DGBF              .3ACCDOTQ SCALED AT PI/2(8)
 0248   REF   4  LAST 1471    20,2721  55'504 0            TS      KQ
 0249   REF   3  LAST 1488    20,2722  31'511 0            CAE     ACCDOTR           .3ACCDOTR AT PI/2(8)
 0250                         20,2723  0 0006 1            EXTEND
 0251   REF   2  LAST 1488    20,2724  7 3055 0            MP      DGBF
 0252   REF   1               20,2725  55'506 1            TS      KRDAP
 0253   REF   6  LAST 1431    20,2726  11'510 0            CCS     QACCDOT           UPDATE THE JERK VALUES USED BY THE STATE
 0254   REF   7  LAST 1488    20,2727  3 1507 1            CA      ACCDOTQ             ESTIMATOR WITH THE MAGNITUDES THAT
 0255                         20,2730  1 2732 1            TCF     +2                  HAVE JUST BEEN COMPUTED.
 0256   REF   8  LAST 1488    20,2731  4 1507 0            CS      ACCDOTQ
 0257   REF   7  LAST 1486    20,2732  55'510 0    +2      TS      QACCDOT
 0258   REF   5  LAST 1474    20,2733  11'512 1            CCS     RACCDOT
 0259   REF   4  LAST 1488    20,2734  3 1511 0            CA      ACCDOTR
 0260                         20,2735  1 2737 1            TCF     +2
 0261   REF   5  LAST 1438    20,2736  4 1511 1            CS      ACCDOTR
 0262   REF   6  LAST 1488    20,2737  55'512 1    +2      TS      RACCDOT
 0281   REF  62  LAST 1484    20,2740  4 0111 1            CS      DAPBOOLS          IS GIMBAL USABLE?
 0282   REF   6  LAST 1450    20,2741  7 4727 0            MASK    USEQRJTS
 0283                         20,2742  0 0006 1            EXTEND
 0284   REF   1               20,2743  1 3664 1            BZF     DOWNGTS           NO. BE SURE THE GIMBAL SWITCHES ARE DOWN
 0285   REF   6  LAST 1411    20,2744  4 1262 1            CS      T5ADR             YES.  IS THE DAP RUNNING?
 0286   REF   1               20,2745  6 3744 0            AD      PAXISADR
 0287                         20,2746  0 0006 1            EXTEND
 0288                         20,2747  1 2751 1            BZF      +2
 0289   REF   2  LAST 1488    20,2750  1 3664 1            TCF     DOWNGTS           NO. BE SURE THE GIMBAL SWITCHES ARE DOWN
 0290   REF   6  LAST 1470    20,2751  11'632 0            CCS     INGTS             YES.  IS GTS IN CONTROL?
 0291   REF   1               20,2752  1 2755 0            TCF     DOCKTEST          YES.  PROCEED WITH 1/ACCS.
 0292   REF  65  LAST 1478    20,2753  0 4665 0            TC      IBNKCALL          NO.  NULL OFFSET AND FIND ALLOWGTS
 0293   REF   2  LAST 1448    20,2754   43260 1            CADR    TIMEGMBL
 0294    REF    4  LAST 1435   20,2755  10 157 0  DOCKTEST CCS     DOCKTEMP        BYPASS 1/ACCONT WHEN DOCKED.
 0295    REF    1              20,2756   1 3647 0           TCF     1/ACCRET
 0296    REF    2  LAST 1487   20,2757   1 3207 0           TCF     1/ACCONT
```

```
P0297    SUBROUTINE:  DVOVSUB

R0298    AUTHOR:  C. WORK, MOD 0 12 JUNE 68

R0299    PURPOSE:  THIS SUBROUTINE PROVIDES A SINGLE-PRECISION MACHINE LANGUAGE DIVISION OPERATION WHICH RETURNS
R0301              (1) THE QUOTIENT, IF THE DIVISION WAS NORMAL.
R0302              (2) NEGMAX, IF THE QUOTIENT WAS IMPROPER AND NEGATIVE.
R0303              (3) POSMAX, IF THE QUOTIENT WAS IMPROPER AND POSITIVE OR IF THERE WAS A ZERO DIVISOR.
R0305              THE CALLING PROGRAM IS PRESUMED TO BE A JOB IN THE F BANK WHICH CONTAINS DVOVSUB. E BANK MUST BE 6.
R0307              THE DIVISOR FOR THIS ROUTINE MAY BE IN EITHER FIXED OR ERASABLE STORAGE.  SIGN AGREEMENT IS
R0309              ASSUMED BETWEEN THE TWO HALVES OF THE DIVIDEND. (THIS IS CERTAIN IF THE A AND L REGISTERS ARE THE RE-
R0311              SULT OF A MULTIPLICATION OPERATION.)
R0312    CALL SEQUENCE:
A0313                                                 L          TC       DVOVSUB
A0314                                                 L +1       ADRES    (DIVISOR)
A0315                                                 L +2       RETURN HERE, WITH RESULT IN A,L

R0316    INPUT:  DIVIDEND IN A,L (SIGN AGREEMENT ASSUMED), DIVISOR IN LOCATION DESIGNATED BY "ADRES".
R0318            DIVISOR MAY BE IN THE DVOVSUB FBANK,FIXED-FIXED FBANK,EBANK 6, OR UNSWITCHED ERASABLE.

R0320    OUTPUT:  QUOTIENT AND REMAINDER, OR POSMAX (NEGMAX), WHICHEVER IS APPROPRIATE.

R0322    DEBRIS:  SCRATCHX,SCRATCHY,SCRATCHZ,A,L  (NOTE:  SCRATCHX,Y,Z ARE EQUATED TO MPAC +4,+5,AND +6.)

R0324    ABORTS OR ALARMS:  NONE

R0325    EXITS:  TO THE CALL POINT + 2.

R0326    SUBROUTINES CALLED:  NONE.

 0327    REF    1                20,2760  54 161 0  DVOVSUB  TS       SCRATCHY         SAVE UPPER HALF OF DIVIDEND
 0328    REF    1                20,2761  54 160 1           TS       SCRATCHX
 0329    REF 423  LAST 1482      20,2762  50 002 0           INDEX    Q                OBTAIN ADDRESS OF DIVISOR.
 0330                            20,2763  3 0000 1           CA       0
 0331    REF 424  LAST 1490      20,2764  24 002 0           INCR     Q                STEP Q FOR PROPER RETURN SEQUENCE.
 0332    REF 518  LAST 1484      20,2765  50 000 1           INDEX    A
 0333                            20,2766  3 0000 1           CA       0                PICK UP THE DIVISOR.
 0334                            20,2767  0 0006 1           EXTEND                    RETURN POSMAX FOR A ZERO DIVISOR.
 0335    REF    1                20,2770  1 3017 0           BZF      MAXPLUS

 0336    REF    1                20,2771  54 162 0           TS       SCRATCHZ         STORE DIVISOR.

 0337    REF 519  LAST 1490      20,2772  10 000 0           CCS      A                GET ABS(DIVISOR) IN THE A REGISTER.
 0338    REF  74  LAST 1431      20,2773  6 4744 1           AD       BIT1
 0339    REF    1                20,2774  1 2776 1           TCF      ZEROPLUS
 0340    REF  75  LAST 1490      20,2775  6 4744 1           AD       BIT1

 0341    REF    2  LAST 1490     20,2776  56 161 1  ZEROPLUS XCH      SCRATCHY         STORE ABS(DIVISOR).  PICK UP TOP HALF OF
 0342                            20,2777  0 0006 1           EXTEND                    DIVIDEND.
 0343    REF    1                20,3000  6 3002 0           BZMF     GOODNEG          GET  -ABS(DIVIDEND)
 0344    REF 520  LAST 1490   20,3001  4 0000 0             CS      A

 0345    REF   3  LAST 1490   20,3002  6 0161 1  GOODNEG    AD      SCRATCHY          ABS(DIVISOR) - ABS(DIVIDEND)
 0346                         20,3003  0 0006 1             EXTEND
 0347    REF   1              20,3004  6 3011 1             BZMF    MAKEMAX           BRANCH IF DIVISION IS NOT PROPER.

 0348    REF   2  LAST 1490   20,3005  3 0160 0             CA      SCRATCHX          RE-ESTABLISH THE DIVIDEND.
 0349                         20,3006  0 0006 1             EXTEND
 0350    REF   2  LAST 1490   20,3007  10 162 0             DV      SCRATCHZ          QUOTIENT IN THE A, REMAINDER IN L.
 0351    REF 425  LAST 1490   20,3010  0 0002 0             TC      Q                 RETURN TO CALLER.

 0352    REF   3  LAST 1491   20,3011  10 160 1  MAKEMAX    CCS     SCRATCHX          DETERMINE THE SIGN OF THE QUOTIENT.
 0353    REF   3  LAST 1491   20,3012  10 162 0             CCS     SCRATCHZ          SCRATCHX AND SCRATCHZ ARE NON-ZERO.
 0354    REF   2  LAST 1490   20,3013  1 3017 0             TCF     MAXPLUS
 0355    REF   4  LAST 1491   20,3014  10 162 0             CCS     SCRATCHZ
 0356    REF  13  LAST 1487   20,3015  3 4726 0             CAF     NEGMAX            +,- OR -,+
 0357    REF 426  LAST 1491   20,3016  0 0002 0             TC      Q
 0358    REF  44  LAST 1486   20,3017  3 4724 1  MAXPLUS    CAF     POSMAX            -,- OR +,+
 0359    REF 427  LAST 1491   20,3020  0 0002 0             TC      Q

R0360    COEFFICIENTS FOR THE JET ACCELERATION CURVE FITS
R0361    THE CURVE FITS ARE OF THE FORM -

R0362              1JACC = A/(MASS + C) + B

R0363    A IS SCALED AT PI/4 RAD/SEC**2 B+16KG, B IS SCALED AT PI/4 RAD/SEC**2, AND C IS SCALED AT B +16 KG.

R0365    THE CURVE FIT FOR L,PVT-CG IS OF THE SAME FORM, EXCEPT THAT A IS SCALED AT 8 FT B+16 KG, B IS SCALED AT 8 FT,
R0367    AND C IS SCALED AT B+16 KG.


 0368   *                     20,3021   00502 0             2DEC    +.0197118964      L          A   DESCENT
 0368   *                     20,3022   36554 0
 0369   *                     20,3023   00165 0  INERCONA   2DEC    +.0071756944      1JACCP     A   DESCENT
 0369   *                     20,3024   22103 0
 0370   *                     20,3025   00027 1             2DEC    +.0014551624      1JACCQ     A   DESCENT
 0370   *                     20,3026   32731 0
 0371   *                     20,3027   00016 0             2DEC    +.0008936540      1JACCR     A   DESCENT
 0371   *                     20,3030   24420 1
 0372                         20,3031   00153 0             2DEC    +.0065443852      1JACCP     A   ASCENT
 0372                         20,3032   07111 1
 0373                         20,3033   00072 1             2DEC    +.0035784354      1JACCQ     A   ASCENT
 0373                         20,3034   24103 0
 0374                         20,3035   00135 0             2DEC    +.0056946631      1JACCR     A   ASCENT
 0374                         20,3036   11511 1

 0375   *                     20,3037   06147 0             DEC     +.193797          L          B   DESCENT
 0376   *                     20,3040   75512 0             DEC     -.073545          L          C   DESCENT
 0377   *                     20,3041   00000 1  INERCONB   DEC     +.000000          1JACCP     B   DESCENT
 0378   *                     20,3042   01363 0  INERCONC   DEC     +.046084          1JACCP     C   DESCENT
 0379  *                           20,3043   00455 0            DEC      +.018374         1JACCQ  B  DESCENT
 0380  *                           20,3044   76036 0            DEC      -.060583         1JACCQ  C  DESCENT
 0381  *                           20,3045   00562 0            DEC      +.022613         1JACCR  B  DESCENT
 0382  *                           20,3046   75643 1            DEC      -.068096         1JACCR  C  DESCENT

 0383                              20,3047   00001 0            DEC      +.000032         1JACCP  B  ASCENT
 0384                              20,3050   77616 0            DEC      -.006923         1JACCP  C  ASCENT
 0385                              20,3051   05154 1            DEC      +.162862         1JACCQ  B  ASCENT
 0386                              20,3052   00052 0            DEC      +.002588         1JACCQ  C  ASCENT
 0387                              20,3053   00231 1            DEC      +.009312         1JACCR  B  ASCENT
 0388                              20,3054   77174 0            DEC      -.023608         1JACCR  C  ASCENT


 0393                              20,3055   23146 0  DGBF      DEC      0.6               .3 SCALED AT 1/2
 0394                              20,3056   13241 1  0.35356   DEC      0.35356          .70711 SCALED AT 2
 0395                              20,3057   00337 0  GFACTM    OCT      337              979.24/2.20462 AT B+15
 0396                              20,3060   26501 1  .7071     DEC      .70711
 0397                              20,3061   51276 0  -.7071    DEC      -.70711
 0398                              20,3062   62362 1  -FPSMAX   DEC      -.42265
R0399   CSM-DOCKED INERTIA COMPUTATIONS

 0400   REF 161  LAST 1487  20,3063  3 4744 1   DOCKED   CA       ONE              COEFTR = 1 FOR INERTIA COEFFICIENTS
 0401   REF   1             20,3064  54 160 1  SPSLOOP1  TS       COEFCTR                 = 7 FOR CG COEFFICIENTS
 0402   REF 162  LAST 1492  20,3065  3 4744 1            CA       ONE              MASSCTR = 1 FOR CSM
 0403   REF   1             20,3066  54 161 0            TS       MASSCTR                 = 0 FOR LEM

 0404   REF   2  LAST 1492  20,3067  50 160 0            INDEX    COEFCTR
 0405   REF   1             20,3070  3 3170 1            CA       COEFF -1         COEFF -1 = C
 0406                       20,3071  0 0006 1            EXTEND
 0407   REF  20  LAST 1486  20,3072  7 1326 0            MP       LEMMASS
 0408                       20,3073  0 0006 1            EXTEND
 0409   REF  13  LAST 1485  20,3074  7 1327 1            MP       CSMMASS          LET X = CSMMASS AND Y = LEMMASS

 0410   REF   3  LAST 1492  20,3075  50 160 0            INDEX    COEFCTR
 0411   REF   2  LAST 1492  20,3076  6 3171 0            AD       COEFF            COEFF = F
 0412   REF 889  LAST 1488  20,3077  54 154 0            TS       MPAC             MPAC = C X Y + F
 0413                       20,3100  1 3104 0            TCF      +4

 0414   REF   2  LAST 1492  20,3101  54 161 0  SPSLOOP2  TS       MASSCTR          LOOP TWICE THROUGH HERE TO OBTAIN
 0415                       20,3102  0 0006 1            EXTEND                    MPAC = MPAC + (A X +D)X + (B Y +E)Y
 0416   REF   4  LAST 1492  20,3103  26 160 1            DIM      COEFCTR                          LOOP #1     LOOP #2
 0417   REF   5  LAST 1492  20,3104  50 160 0            INDEX    COEFCTR
 0418   REF   3  LAST 1492  20,3105  3 3173 1            CA       COEFF +2         COEFF +2 = A OR B
 0419                       20,3106  0 0006 1            EXTEND
 0420   REF   3  LAST 1492  20,3107  5 0161 1            INDEX    MASSCTR
 0421   REF  21  LAST 1492  20,3110  7 1326 0            MP       LEMMASS
 0422   REF   6  LAST 1492  20,3111  50 160 0            INDEX    COEFCTR
 0423   REF   4  LAST 1492  20,3112  6 3175 1            AD       COEFF +4         COEFF +4 = E OR D
 0424                       20,3113  0 0006 1            EXTEND
 0425   REF   4  LAST 1492  20,3114  5 0161 1            INDEX    MASSCTR
 0426    REF  22  LAST 1492    20,3115  7 1326 0                MP      LEMMASS
 0427    REF 890  LAST 1492    20,3116  26 154 0                ADS     MPAC

 0428    REF   5  LAST 1492    20,3117  10 161 0                CCS     MASSCTR
 0429    REF   1               20,3120  1 3101 0                TCF     SPSLOOP2
 0430    REF   7  LAST 1492    20,3121  10 160 1                CCS     COEFCTR          IF COEFCTR IS POS , EXIT FROM LOOP WITH
 0431                          20,3122  1 3131 0                TCF     +7               CG X DELDOT = MPAC X 4 PI RAD-CM/SEC
 0432                          20,3123   00000 1  TORQCONS 2DEC     0.51443 B-14     CORRESPONDS TO 500 LB-FT
 0432                          20,3124   20354 1
 0433    REF 891  LAST 1493    20,3125  3 0154 1                CA      MPAC
 0434    REF 892  LAST 1493    20,3126  54 155 1                TS      MPAC +1          INERTIA = (MPAC +1) X 2(38) KG-CM(2)
 0435    REF  28  LAST 1479    20,3127  3 4750 1                CA      SEVEN
 0436    REF   1               20,3130  1 3064 1                TCF     SPSLOOP1

 0437    REF   1               20,3131  3 3170 1                CA      1JACCCON         1JACC=1JACCCON/MASS
 0438                          20,3132  22 007 0                ZL
 0439    REF   4  LAST 1488    20,3133  0 2760 1                TC      DVOVSUB
 0440    REF  17  LAST 1487    20,3134   01243 0                ADRES   MASS
 0441    REF   8  LAST 1486    20,3135  55'530 1                TS      1JACC            SCALED AT PI/4

 0442    REF  45  LAST 1491    20,3136  3 4724 1                CA      POSMAX           SET INVERSE JET ACCELERATIONS TO POSMAX,
 0443    REF   2  LAST 1433    20,3137  55'550 1                TS      1/ANETP          WHICH CORRESPONDS TO ACCEL. OF 1.4 D/SS.
 0444    REF   3  LAST 1462    20,3140  55'570 0                TS      1/ANET2 +1
 0445    REF   4  LAST 1493    20,3141  55'571 1                TS      1/ANET2 +2
 0446    REF   5  LAST 1493    20,3142  55'610 0                TS      1/ANET2 +17D
 0447    REF   6  LAST 1493    20,3143  55'611 1                TS      1/ANET2 +18D
 0448                          20,3144  0 0006 1                EXTEND
 0449    REF   1               20,3145  3 3124 0                DCA     TORQCONS
 0450                          20,3146  0 0006 1                EXTEND
 0451    REF 893  LAST 1493    20,3147  10 155 1                DV      MPAC +1
 0452                          20,3150  0 0004 0                INHINT
 0453    REF   6  LAST 1488    20,3151  55'531 0                TS      1JACCQ           SCALED AT PI/4
 0454    REF   6  LAST 1488    20,3152  55'532 0                TS      1JACCR

 0455    REF   2  LAST 1487    20,3153  3 3061 0                CA      -.7071
 0456    REF   7  LAST 1487    20,3154  55'626 0                TS      COEFFQ           COEFFQ AND COEFFR ARE CHOSEN TO MAKE U-
 0457    REF   2  LAST 1466    20,3155  3 3060 1                CA      .7071            AND V-AXES ORTHOGONAL FOR DOCKED CASE
 0458    REF   6  LAST 1487    20,3156  55'627 1                TS      COEFFR
 0459    REF  18  LAST 1493    20,3157  3 1243 0                CA      MASS             SCALED AT 2(16) KG
 0460                          20,3160  0 0006 1                EXTEND
 0461    REF 894  LAST 1493    20,3161  7 0154 0                MP      MPAC             SCALED AT 4 PI RAD-CM/SEC
 0462                          20,3162  0 0006 1                EXTEND
 0463    REF   8  LAST 1487    20,3163  7 1245 1                MP      ABDELV           SCALED AT 2(13) CM/SEC(2)
 0464    REF   5  LAST 1493    20,3164  0 2760 1                TC      DVOVSUB          GET QUOTIENT WITH OVERFLOW PROTECTION
 0465    REF 895  LAST 1493    20,3165   00155 0                ADRES   MPAC +1

 0466    REF   6  LAST 1488    20,3166  55'511 1                TS      ACCDOTR
 0467    REF   1               20,3167  1 2716 1                TCF     SPSCONT          CONTINUE K, KSQ CALCULATIONS

 0468                          20,3170   00167 1  1JACCCON OCT      00167            SCALED AT PI/4X2(16) RAD/SEC(2)-KG
```

```
A0469                                                                                           2    2
A0470                                                  COEFFICIENTS FOR CURVE FIT OF THE FORM Z=A X +B Y +C X Y +D X +E Y +F

 0471                           20,3171   06176 1  COEFF     DEC      .19518          C  COEFFICIENT OF INERTIA
 0472                           20,3172   77650 1            DEC     -.00529          F              ''
 0473                           20,3173   72260 0            DEC     -.17670          B              ''
 0474                           20,3174   76637 1            DEC     -.03709          A              ''
 0475                           20,3175   02167 0            DEC      .06974          E              ''
 0476                           20,3176   00645 0            DEC      .02569          D              ''

 0477                           20,3177   06335 1            DEC      .20096          C   COEFFICIENT OF CG
 0478                           20,3200   04256 1            DEC      .13564          F        ''
 0479                           20,3201   30163 0            DEC      .75704          B        ''
 0480                           20,3202   64072 0            DEC     -.37142          A        ''
 0481                           20,3203   53632 0            DEC     -.63117          E        ''
 0482                           20,3204   15133 1            DEC      .41179          D        ''

R0483    ASSIGNMENT OF TEMPORARIES FOR 1/ACCS (EXCLUDING 1/ACCONT)

A0484                                              MPAC, MPAC +1, MPAC +2 USED EXPLICITLY
 0485    REF 896  LAST 1493       0160             COEFCTR  EQUALS MPAC +4
 0486    REF 897  LAST 1494       0161             MASSCTR  EQUALS MPAC +5
 0487    REF 898  LAST 1494       0160             SCRATCHX EQUALS MPAC +4         SCRATCH AREA FOR DVOVSUB ROUTINE.
 0488    REF   4  LAST 1491       0161             SCRATCHY EQUALS SCRATCHX +1
 0489    REF   5  LAST 1494       0162             SCRATCHZ EQUALS SCRATCHX +2

 0490    REF 899  LAST 1494       0157             DOCKTEMP EQUALS MPAC +3         RECORD OF CSMDOCKED BIT OF DAPBOOLS
 0491    REF 900  LAST 1494       0155             EPSILON  EQUALS MPAC +1
 0492    REF   5  LAST 1486       0155             -EPSILON EQUALS EPSILON
 0493                           20,3205   71777 0  -.1875    DEC     -.18750
```

```
P0494
 0495                          20,3206                       BANK    20
 0496    REF    6  LAST 1484   20,2000                       SETLOC  DAPS3
 0497                          20,3206                       BANK

 0498    REF   28  LAST 1484   E6,1536                       EBANK=  AOSQ

 0499    REF    4 LAST 1484 TO 1495:    339    343*          COUNT*  $$/DAPAO

 0500    REF    7  LAST 1488   20,3206  55'632 0  -1         TS      INGTS           ZERO  INGTS IN ASCENT
 0501    REF    7  LAST 1405   20,3207  3 1343 1  1/ACCONT   CA      DB              INITIALIZE DBVAL1,2,3
 0502                          20,3210  0 C006 1             EXTEND
 0503    REF   55  LAST 1480   20,3211  7 4730 0             MP      BIT13
 0504    REF  323  LAST 1481   20,3212  54 001 1             TS      L               0.25 DB
 0505    REF  521  LAST 1491   20,3213  6 CC00 1             AD      A
 0506    REF    1              20,3214  54 115 0             TS      DBVAL3          0.50 DB
 0507    REF    1              20,3215  4 1343 0             CS      DBVAL1
 0508    REF  324  LAST 1495   20,3216  6 0001 0             AD      L
 0509    REF    1              20,3217  54 114 1             TS      DBVAL2          -.75 DB

 0510                          20,3220  C CC04 0  GETAOSUV   INHINT
 0511    REF   11  LAST 1484   20,3221  31'540 1             CAE     AOSR            COMPUTE AOSU AND AOSV BY ROTATING
 0512    REF  325  LAST 1495   20,3222  54 001 1             TS      L                     AOSQ AND AOSR.
 0513    REF   29  LAST 1495   20,3223  31'536 0             CAE     AOSQ
 0514    REF   66  LAST 1488   20,3224  0 4665 0             TC      IBNKCALL
 0515    REF    4  LAST 1450   20,3225   37200 1             CADR    ROT-TOUV
 0516    REF    1              20,3226  53'543 0             DXCH    AOSU

 0517                          20,3227  0 0003 1             RELINT
 0518    REF   63  LAST 1488   20,3230  3 0111 0             CA      DAPBOOLS
 0519    REF    6  LAST 1451   20,3231  7 4735 0             MASK    DRIFTBIT        ZERO DURING ULLAGE AND POWERED FLIGHT.
 0520    REF  522  LAST 1495   20,3232  10 000 0             CCS     A               IF DRIFTING FLIGHT,
 0521    REF  163  LAST 1492   20,3233  3 4744 1             CA      ONE                   SET DRIFTER TO 1
 0522    REF    1              20,3234  54 116 0             TS      DRIFTER         SAVE TO TEST FOR DRIFTING FLIGHT LATER
 0523    REF    6  LAST 1487   20,3235  6 1502 1             AD      ALLOWGTS        NON-ZERO IF DRIFT OR GTS NEAR
 0524    REF  523  LAST 1495   20,3236  10 C00 0             CCS     A
 0525    REF    1              20,3237  3 3741 0             CA      FLATVAL         DRIFTING FLIGHT, STORE .8 IN FLAT
 0526    REF    1              20,3240  54 151 0             TS      FLATEMP         IN POWERED FLIGHT, STORE ZERO IN FLAT
 0527                          20,3241  0 C006 1             EXTEND
 0528    REF    1              20,3242  1 3246 0             BZF     DOPAXIS         IF POWERED AND NO GTS, START P AXIS,
 0529    REF    2  LAST 1495   20,3243  10 116 0             CCS     DRIFTER         OTHERWISE SET ZONE3LIM
 0530    REF    1              20,3244  3 3740 1             CA      ZONE3MAX        17.5 MS , SCALED AT 4 SECONDS.
 0531    REF    1              20,3245  54 152 0             TS      Z3TEM

 0532    REF    9  LAST 1493   20,3246  3 1530 0  DOPAXIS    CA      1JACC           1JACC AT PI/4 = 2JACC AT PI/2 =
A0533                                                                                ANET AT PI/2 = ANET/ACOAST AT 2(6).
 0534    REF   38  LAST 1474   20,3247  6 4734 0             AD      BIT9            1 + ANET/ACOAST AT 2(6)
 0535    REF    1              20,3250  54 157 0             TS      FUNTEM

 0536    REF   10  LAST 1495   20,3251  3 1530 0             CA      1JACC
 0537  REF   1              20,3252  0 3656 1            TC      INVERT
 0538                       20,3253  0 0004 0            INHINT                  P AXIS DATA MUST BE CONSISTENT
 0539  REF   3  LAST 1495   20,3254  55'550 1            TS      1/ANETP         SCALED AT 2(7)/PI.
 0540  REF   4  LAST 1496   20,3255  55'551 0            TS      1/ANETP +1

 0541  REF  39  LAST 1495   20,3256  4 4734 1            CS      BIT9            -1 AT 2(6)
 0542                       20,3257  0 0006 1            EXTEND
 0543  REF   5  LAST 1496   20,3260  7 1550 1            MP      1/ANETP         -1/ANET AT 2(13)/PI
 0544                       20,3261  0 0006 1            EXTEND
 0545  REF   2  LAST 1495   20,3262  10 157 0            DV      FUNTEM          -1/(ANET + ANET**2/ACOAST) AT 2(7)/PI
 0546  REF   1              20,3263  55'556 1            TS      PACCFUN
 0547  REF   2  LAST 1496   20,3264  55'557 0            TS      PACCFUN +1

 0548  REF   1              20,3265  3 4724 1            CA      1/.03           NO AOS FOR P AXIS, ACOAST = AMIN
 0549  REF   1              20,3266  55'552 0            TS      1/ACOSTP
 0550  REF   2  LAST 1496   20,3267  55'553 1            TS      1/ACOSTP +1
 0551                       20,3270  0 0003 1            RELINT


 0552                       20,3271  22 007 0            ZL
 0553  REF   3  LAST 1495   20,3272  10 116 0            CCS     DRIFTER
 0554  REF   2  LAST 1495   20,3273  53'543 0            DXCH    AOSU            ZERO AOSU,V IF IN DRIFT, JUST TO BE SURE

 0555  REF 317  LAST 1487   20,3274  3 4746 0  UAXIS     CA      ZERO            DO U AXIS COMPUTATIONS
 0556  REF   1              20,3275  54 154 0            TS      UV              ZERO FOR U AXIS, ONE FOR V AXIS.

 0557  REF   1              20,3276  54 163 1  BOTHAXES  TS      SIGNAOS         CODING COMMON TO U,V AXES
 0558  REF   2  LAST 1496   20,3277  50 154 1            INDEX   UV
 0559  REF   3  LAST 1496   20,3300  11'542 1            CCS     AOSU            PICK UP ABS(AOSU OR AOSV)
 0560  REF 164  LAST 1495   20,3301  6 4744 1            AD      ONE             RESTORE TO PROPER VALUE
 0561                       20,3302  1 3305 0            TCF     +3              AND LEAVE SIGNAOS AT ZERO
 0562  REF 165  LAST 1496   20,3303  6 4744 1            AD      ONE             NEGATIVE, RESTORE TO PROPER VALUE
 0563  REF   2  LAST 1496   20,3304  24 163 0            INCR    SIGNAOS         AND SET SIGNAOS TO ONE TO SHOW AOS NEG
 0564  REF   1              20,3305  54 162 0            TS      ABSAOS          SAVE ABS(AOS)
 0565  REF   3  LAST 1496   20,3306  4 0163 1            CS      SIGNAOS
 0566  REF   1              20,3307  54 164 0            TS      -SIGNAOS        USED AS AN INDEX

 0567  REF   2  LAST 1495   20,3310  3 1343 1            CA      DBVAL1          SET DB1, DB2 TO DBVAL1 (= DB)
 0568  REF   1              20,3311  54 143 0            TS      DB81
 0569  REF   1              20,3312  54 144 1            TS      DB82

 0570  REF   2  LAST 1496   20,3313  3 0162 1            CA      ABSAOS          TEST MAGNITUDE OF ABS(AOS)
 0571  REF   1              20,3314  6 3742 0            AD      -.03R/S2
 0572                       20,3315  0 0006 1            EXTEND
 0573  REF   1              20,3316  6 3410 1            BZMF    NOTMUCH         ABS(AOS) LESS THAN AMIN
 0574  REF   2  LAST 1495   20,3317  10 151 0  BIGAOS    CCS     FLATEMP         ABS(AOS) GREATER THAN AMIN
 0575  REF   1              20,3320  1 3350 0            TCF     SKIPDB1         I DRIFT OR GTS, DO NOT COMPUTE DB

 0576  REF   3  LAST 1496   20,3321  3 1343 1            CA      DBVAL1
 0577  REF   2  LAST 1496   20,3322  50 164 1            INDEX   -SIGNAOS
 0578  REF   2  LAST 1496   20,3323  26 144 1             ADS     DBB2              DB2(1) = 2 DB
 0579  REF   4  LAST 1496   20,3324  50 163 0             INDEX   SIGNAOS
 0580  REF   1              20,3325  54 145 0             TS      DBB4              DB4(3) = I DB
 0581  REF   1              20,3326   3 3205 0            CA      -.1875            -.1875 PI/2 RAD/SEC(2) SCALED AT PI/2
 0582  REF   3  LAST 1496   20,3327   6 0162 1            AD      ABSAOS            ABSAOS IS SCALED AT PI/2
 0583                       20,3330   0 0006 1            EXTEND
 0584                       20,3331   6 3334 0            BZMF    +3
 0585  REF   2  LAST 1495   20,3332   4 0115 0            CS      DBVAL3            -.5 DB
 0586  REF   1              20,3333   1 3343 1            TCF     DBONE
 0587  REF   4  LAST 1497   20,3334   4 0162 0            CS      ABSAOS
 0588                       20,3335   6 0000 1            DOUBLE
 0589                       20,3336   6 0000 1            DOUBLE
 0590  REF  89  LAST 1487   20,3337   6 4727 1            AD      BIT14
 0591                       20,3340   6 0000 1            DOUBLE                    1-8 ABSAOS. (8 IS 16/PI SCALED AT 2/PI)
 0592                       20,3341   0 0006 1            EXTEND
 0593  REF   8  LAST 1495   20,3342   7 1343 0            MP      DB
 0594  REF   5  LAST 1497   20,3343  50 163 0  DBONE      INDEX   SIGNAOS           DB1(2)=(1-8 ABSAOS) DB.  IF ABSAOS IS
 0595  REF   2  LAST 1496   20,3344  54 143 0             TS      DBB1              GREATER THAN .1875 THEN DB1(2)=-.5 DB
 0596  REF   2  LAST 1495   20,3345   3 0114 0            CA      DBVAL2
 0597  REF   3  LAST 1496   20,3346  50 164 1             INDEX   -SIGNAOS
 0598  REF   1              20,3347  54 146 0             TS      DBB3              DB3(4) = -.75 DB

 0599  REF   5  LAST 1497   20,3350   3 0162 1  SKIPDB1   CA      ABSAOS            ABS(AOS) GREATER THAN AMIN, SO IT IS
 0600                       20,3351   0 0006 1            EXTEND
 0601  REF  42  LAST 1477   20,3352   7 4731 1            MP      BIT12
 0602  REF   6  LAST 1497   20,3353   6 0162 1            AD      ABSAOS            (9/8) ABSAOS.
 0603  REF   2  LAST 1496   20,3354   0 3656 1            TC      INVERT            ALL RIGHT TO DIVIDE
 0604  REF   4  LAST 1497   20,3355  50 164 1             INDEX   -SIGNAOS
 0605  REF   1              20,3356  54 130 1             TS      1/ACOSTT +1       1/ACOASTPOS(NEG) = 1/ABS(AOS)
 0606  REF   2  LAST 1496   20,3357   3 4724 1            CA      1/.03
 0607  REF   6  LAST 1497   20,3360  50 163 0             INDEX   SIGNAOS
 0608  REF   2  LAST 1497   20,3361  54 127 1             TS      1/ACOSTT          1/ACOASTNEG(POS) = 1/AMIN

 0609  REF   7  LAST 1497   20,3362   3 0162 1            CA      ABSAOS
 0610  REF   4  LAST 1487   20,3363   6 1533 0            AD      1JACCU
 0611  REF   5  LAST 1497   20,3364   6 1533 0            AD      1JACCU            2 JACC + ABS(AOS)
 0612  REF  40  LAST 1496   20,3365   6 4734 0            AD      BIT9              MAXIMUM VALUE IN COMPUTATIONS
 0613  REF 524  LAST 1495   20,3366  54 000 0             TS      A                 TEST FOR OVERFLOW
 0614  REF   1              20,3367   1 3434 0            TCF     SKIPDB2           NO OVERFLOW,  DO NORMAL COMPUTATION

 0615  REF   8  LAST 1497   20,3370   3 0162 1            CA      ABSAOS            RESCALE TO PI TO PREVENT OVERFLOW
 0616                       20,3371   0 0006 1            EXTEND
 0617  REF  50  LAST 1497   20,3372   7 4727 0            MP      BIT14
 0618  REF   6  LAST 1497   20,3373   6 1533 0            AD      1JACCU            1 JACC AT PI/2 = 2JACC AT PI
 0619  REF   1              20,3374  54 157 0             TS      ANET              ANETPOS(NEG) MAX SCALED AT PI   =
A0620                                                                               ANETPOS(NEG) MAX/ACOASTNEG(POS) AT 2(7)
 0621  REF  47  LAST 1441   20,3375   6 4735 1            AD      BIT8              1 + ANETPOS/ACOASTNEG AT 2(7)
 0622  REF   2  LAST 1497   20,3376  56 157 1             XCH     ANET              SAVE IN ANET, WHILE PICKING UP ANET
 0623  REF   3  LAST 1497   20,3377   0 3656 1            TC      INVERT
 0624                       20,3400   0 0006 1            EXTEND
 0625   REF  51  LAST 1497   20,3401   7 4727 0              MP      BIT14           SCALE 1/ANET AT 2(7)/PI
 0626   REF   1              20,3402  54 160 1               TS      1/ANET

 0627   REF   1              20,3403   3 3407 1              CA      ACCHERE         SET UP RETURN FROM COMPUTATION ROUTINE
 0628   REF   1              20,3404  54 161 0               TS      ARET
 0629   REF  48  LAST 1497   20,3405   4 4735 0              CS      BIT8            -1 AT 2(7)
 0630   REF   1              20,3406   1 3711 1              TCF     DOACCFUN        FINISH ACCFUN COMPUTATION

 0631   REF   1              20,3407   1 3441 1   ACCHERE    TCF     ACCTHERE


 0632   REF 326  LAST 1495   20,3410  54 001 1    NOTMUCH    TS      L               ABS(AOS) LESS THAN AMIN, SAVE IN L
 0633   REF   3  LAST 1497   20,3411   3 4724 1              CA      1/.03           ACOASTPOS,NEG = AMIN
 0634   REF   3  LAST 1497   20,3412  54 127 1               TS      1/ACOSTT
 0635   REF   4  LAST 1498   20,3413  54 130 1               TS      1/ACOSTT +1

 0636   REF   3  LAST 1496   20,3414  10 151 0               CCS     FLATEMP
 0637   REF   2  LAST 1497   20,3415   1 3434 0              TCF     SKIPDB2         DO NOT COMPUTE DB IF DRIFT OR GTS

 0638   REF   1              20,3416   3 3743 1              CA      .0228/S2        .0228 RAD/SEC(2)
 0639   REF 327  LAST 1498   20,3417   6 0001 0              AD      L               L=ABS(AOS)-AMIN=ABS(AOS)-.0245RAD/SEC(2)
 0640                        20,3420   0 0006 1              EXTEND                  RESULT IS ABS(AOS)-.0017 RAD/SEC(2)
 0641   REF   1              20,3421   6 3431 1              BZMF    NOAOS           ABS(AOS) LESS THAN .0017 RAD/SEC(2)
 0642   REF   3  LAST 1497   20,3422   3 0115 1   SOMEAOS    CA      DBVAL3          .0017 RAD/SEC(2) LT ABS(AOS) LT AMIN
 0643   REF   5  LAST 1497   20,3423  50 164 1               INDEX   -SIGNAOS
 0644   REF   2  LAST 1497   20,3424  54 146 0               TS      DBB3            DB3(4) = DB/2
 0645   REF 525  LAST 1497   20,3425   6 0000 1              AD      A
 0646   REF   7  LAST 1497   20,3426  50 163 0               INDEX   SIGNAOS
 0647   REF   2  LAST 1497   20,3427  54 145 0               TS      DBB4            DB4(3) = DB
 0648   REF   3  LAST 1498   20,3430   1 3434 0              TCF     SKIPDB2

 0649   REF   4  LAST 1496   20,3431   3 1343 1   NOAOS      CA      DBVAL1
 0650   REF   3  LAST 1498   20,3432  54 146 0               TS      DBB3            DB3,4 = DB
 0651   REF   3  LAST 1498   20,3433  54 145 0               TS      DBB4

 0652   REF   9  LAST 1497   20,3434   3 0162 1   SKIPDB2    CA      ABSAOS          ANETPOS(NEG) MAX = 2 JACC + ABS(AOS)
 0653   REF   7  LAST 1497   20,3435   6 1533 0              AD      1JACCU
 0654   REF   8  LAST 1498   20,3436   6 1533 0              AD      1JACCU
 0655   REF   3  LAST 1497   20,3437  54 157 0               TS      ANET            CANNOT OVERFLOW HERE
 0656   REF   1              20,3440   0 3702 1   CL1/NET+   TC      DO1/NET+        COMPUTE 1/ANET, ACCFUN

 0657   REF   6  LAST 1498   20,3441  50 164 1    ACCTHERE   INDEX   -SIGNAOS
 0658   REF   1              20,3442  54 134 0               TS      Z5TEM  +2       STORE ACCFUN IN TEMPORARY BUFFER
 0659   REF   2  LAST 1498   20,3443   3 0160 0              CA      1/ANET
 0660   REF   7  LAST 1498   20,3444  50 164 1               INDEX   -SIGNAOS
 0661   REF   1              20,3445  54 126 0               TS      1/ATEM2 +2      STORE 1/ANET IN TEMPORARY BUFFER

 0662   REF  10  LAST 1498   20,3446   3 0162 1              CA      ABSAOS          SEE IF OVERFLOW IN MIN CASE
 0663   REF   9  LAST 1498   20,3447   6 1533 0              AD      1JACCU
 0664   REF  41  LAST 1497   20,3450   6 4734 0              AD      BIT9            MAXIMUM POSSIBLE VALUE
```

```
0665   REF 526  LAST 1498   20,3451  54 000 0            TS      A                 OVERFLOW POSSIBLE BUT REMOTE
0666                        20,3452   1 3454 0           TCF      +2
0667   REF  46  LAST 1493   20,3453   3 4724 1           CA      POSMAX            IF OVERFLOW, TRUNCATE TO PI/2
0668   REF   2  LAST 1496   20,3454   6 3742 0           AD      -.03R/S2          RESTORE TO CORRECT VALUE
0669   REF   4  LAST 1498   20,3455  54 157 0            TS      ANET
0670   REF   2  LAST 1498   20,3456   0 3702 1           TC      DO1/NET+          COMPUTE 1/ANET, ACCFUN

0671   REF   8  LAST 1498   20,3457  50 164 1            INDEX   -SIGNAOS          STORE MIN VALUES JUST AS MAX VALUES
0672   REF   2  LAST 1498   20,3460  54 132 0            TS      Z5TEM
0673   REF   3  LAST 1498   20,3461   3 0160 0           CA      1/ANET
0674   REF   9  LAST 1499   20,3462  50 164 1            INDEX   -SIGNAOS
0675   REF   2  LAST 1498   20,3463  54 124 1            TS      1/ATEM2


0676   REF  11  LAST 1498   20,3464   4 0162 0           CS      ABSAOS            NOW DO NEG(POS) CASES
0677   REF  10  LAST 1498   20,3465   6 1533 0           AD      1JACCU
0678   REF  11  LAST 1499   20,3466   6 1533 0           AD      1JACCU            ANETNEG(POS) MAX
0679   REF   1              20,3467   0 3670 0           TC      1/ANET-           COMPUTE 1/ANET, ACCFUN, AND ACCSW
0680   REF   8  LAST 1498   20,3470  50 163 0            INDEX   SIGNAOS           STORE NEG(POS) VALUES JUST AS POS(NEG)
0681   REF   1              20,3471  54 133 1            TS      Z1TEM +2
0682   REF 328  LAST 1498   20,3472  54 001 1            TS      L                 SAVE IN L FOR POSSIBLE FUTURE USE
0683   REF   4  LAST 1499   20,3473   3 0160 0           CA      1/ANET
0684   REF   9  LAST 1499   20,3474  50 163 0            INDEX   SIGNAOS
0685   REF   1              20,3475  54 125 0            TS      1/ATEM1 +2
0686   REF  12  LAST 1499   20,3476   4 0162 0           CS      ABSAOS
0687   REF  12  LAST 1499   20,3477   6 1533 0           AD      1JACCU            1/ANETNEG(POS) MIN
0688   REF   5  LAST 1499   20,3500  54 157 0            TS      ANET
0689   REF   3  LAST 1499   20,3501   6 3742 0           AD      -.03R/S2          TEST FOR AMIN
0690                        20,3502   0 0006 1           EXTEND                    IF ANET LESS THAN AMIN, STORE MAX JET
0691   REF   1              20,3503   6 3721 0           BZMF    FIXMIN            VALUES FOR MIN JETS AND SET ACCSW

0692   REF   1              20,3504   0 3676 0           TC      1/NETMIN          OTHERWISE DO MIN JET COMPUTATIONS
0693   REF  10  LAST 1499   20,3505  50 163 0  STMIN-    INDEX   SIGNAOS           STORE VALUES
0694   REF   2  LAST 1499   20,3506  54 131 0            TS      Z1TEM
0695   REF   5  LAST 1499   20,3507   3 0160 0           CA      1/ANET
0696   REF  11  LAST 1499   20,3510  50 163 0            INDEX   SIGNAOS
0697   REF   2  LAST 1499   20,3511  54 123 0            TS      1/ATEM1


0698   REF   3  LAST 1496   20,3512  50 154 1            INDEX   UV
0699   REF   1              20,3513   3 3747 0           CA      +UMASK
0700   REF  11  LAST 1456   20,3514   7 1257 1           MASK    CH5MASK           TEST FOR +U (+V) JET FAILURES
0701                        20,3515   0 0006 1           EXTEND
0702   REF   1              20,3516   1 3523 1           BZF     FAIL-
0703   REF   3  LAST 1499   20,3517   3 0124 0           CA      1/ATEM2           REPLACE FUNCTION VALUES DEPENDING ON THE
0704   REF   4  LAST 1499   20,3520  54 126 0            TS      1/ATEM2 +2        FAILED JET PAIR WITH CORRESPONDING ONE-
0705   REF   3  LAST 1499   20,3521   3 0132 1           CA      Z5TEM             JET (OR AMIN) FUNCTION VALUES
0706   REF   4  LAST 1499   20,3522  54 134 0            TS      Z5TEM +2
0707   REF   4  LAST 1499   20,3523  50 154 1  FAIL-     INDEX   UV
0708   REF   1              20,3524   3 3745 1           CA      -UMASK
```

```
0709  REF  12  LAST 1499   20,3525   7 1257 1            MASK    CH5MASK        TEST FOR -U (-V) JET FAILURES
0710                       20,3526   0 0006 1            EXTEND
0711  REF   1              20,3527   1 3534 1            BZF     DBFUN
0712  REF   3  LAST 1499   20,3530   3 0123 1            CA      1/ATEM1        REPLACE FUNCTION VALUES DEPENDING ON THE
0713  REF   4  LAST 1500   20,3531  54 125 0             TS      1/ATEM1 +2     FAILED JET PAIR WITH CORRESPONDING ONE-
0714  REF   3  LAST 1499   20,3532   3 0131 1            CA      Z1TEM          JET (OR AMIN) FUNCTION VALUES
0715  REF   4  LAST 1500   20,3533  54 133 1             TS      Z1TEM +2


0716  REF   4  LAST 1498   20,3534   4 0146 0   DBFUN    CS      DBB3           COMPUTE AXISDIST
0717  REF   3  LAST 1497   20,3535   6 0143 1            AD      DBB1
0718  REF   4  LAST 1498   20,3536   6 0151 1            AD      FLATEMP
0719  REF   1              20,3537  54 147 1             TS      AXDSTEM
0720  REF   4  LAST 1498   20,3540   4 0145 0            CS      DBB4
0721  REF   3  LAST 1497   20,3541   6 0144 0            AD      DBB2
0722  REF   5  LAST 1500   20,3542   6 0151 1            AD      FLATEMP
0723  REF   2  LAST 1500   20,3543  54 150 1             TS      AXDSTEM  +1

0724                       20,3544   0 0004 0            INHINT
0725  REF   5  LAST 1499   20,3545  10 154 0             CCS     UV             TEST FOR U OR V AXIS
0726  REF   1              20,3546   1 3570 1            TCF     STDRV          V AXIS   STORE V VALUES

0727  REF   1              20,3547   3 0122 0            CA      ACCSW          U AXIS   STORE U VALUES
0728  REF   3  LAST 1462   20,3550  55'546 0             TS      ACCSWU

0729  REF   1              20,3551   3 4311 0            CA      NINE           TRANSFER 10 WORDS VIA GENTRAN
0730  REF   3  LAST 1376   20,3552   0 5547 1            TC      GENTRAN +1
0731  REF   5  LAST 1500   20,3553    00123 1            ADRES   1/ATEM1        TEMPORARY BUFFER
0732  REF  12  LAST 1467   20,3554    01566 0            ADRES   1/ANET1        THE REAL PLACE

0733                       20,3555   0 0003 1            RELINT
0734  REF   4  LAST 1500   20,3556  52 144 1             DXCH    DBB1           SAVE U DBS FOR LATER STORING
0735  REF   1              20,3557  52 136 1             DXCH    UDB1
0736  REF   5  LAST 1500   20,3560  52 146 0             DXCH    DBB4
0737  REF   1              20,3561  52 140 0             DXCH    UDB4

0738  REF   3  LAST 1500   20,3562  52 150 1             DXCH    AXDSTEM
0739  REF   1              20,3563  52 142 1             DXCH    UAXDIST

0740  REF 166  LAST 1496   20,3564   3 4744 1            CA      ONE            NOW DO V AXIS
0741  REF   6  LAST 1500   20,3565  54 154 0             TS      UV
0742  REF 318  LAST 1496   20,3566   3 4746 0            CA      ZERO
0743  REF   1              20,3567   1 3276 0            TCF     BOTHAXES       AND DO IT AGAIN


0744  REF   2  LAST 1500   20,3570   3 0122 0   STORV    CA      ACCSW          STORE V AXIS VALUES
0745  REF   1              20,3571  55'547 1             TS      ACCSWV
0746  REF   2  LAST 1500   20,3572   3 4311 0            CA      NINE
0747  REF   4  LAST 1500   20,3573   0 5547 1            TC      GENTRAN  +1
0748  REF   6  LAST 1500   20,3574    00123 1            ADRES   1/ATEM1        TEMPORARY BUFFER
```

```
 0749   REF  13  LAST 1500   20,3575   C1606 0             ADRES   1/ANETI +16D       THE REAL PLACE

A0750                                                                                 NOW STORE DEADBANDS FOR ALL AXES
 0751   REF   6  LAST 1500   20,3576   52 152 0            DXCH    FLATEMP            FLAT AND ZONE3LIM
 0752   REF   3  LAST 1464   20,3577   53'555 1            DXCH    FLAT

 0753   REF   5  LAST 1498   20,3600   3 1343 1            CA      DBVAL1             COMPUTE P AXIS DEADBANDS
 0754   REF   1              20,3601   55'560 1            TS      PDB1
 0755   REF   1              20,3602   55'561 0            TS      PDB2
 0756   REF   4  LAST 1501   20,3603   6 1554 1            AD      FLAT
 0757   REF   1              20,3604   55'563 1            TS      PDB3
 0758   REF   1              20,3605   55'562 0            TS      PDB4
 0759   REF 319  LAST 1500   20,3606   3 4746 0            CA      ZERO
 0760   REF   1              20,3607   55'564 0            TS      PAXDIST
 0761   REF   2  LAST 1501   20,3610   55'565 1            TS      PAXDIST   +1

 0762   REF   5  LAST 1501   20,3611   11'554 0            CCS     FLAT
 0763   REF   1              20,3612   1 3630 0            TCF     DRFDB              DRIFT OR GTS - COMPUTE DBS

 0764   REF   2  LAST 1500   20,3613   52 136 1            DXCH    UDB1               STORE U DEADBANDS
 0765   REF   5  LAST 1467   20,3614   53'601 0            DXCH    FIREDB             CANNOT USE GENTRAN BECAUSE OF RELINT
 0766   REF   2  LAST 1500   20,3615   52 140 0            DXCH    UDB4
 0767   REF   2  LAST 1461   20,3616   53'603 1            DXCH    COASTDB
 0768   REF   2  LAST 1500   20,3617   52 142 1            DXCH    UAXDIST
 0769   REF   3  LAST 1464   20,3620   53'605 1            DXCH    AXISDIST
 0770   REF   5  LAST 1500   20,3621   52 144 1            DXCH    DBB1               STORE V AXIS DEADBANDS
 0771   REF   6  LAST 1501   20,3622   53'621 1            DXCH    FIREDB +16D        COULD USE GENTRAN IF DESIRED
 0772   REF   6  LAST 1500   20,3623   52 146 0            DXCH    DBB4
 0773   REF   3  LAST 1501   20,3624   53'623 0            DXCH    COASTDB +16D
 0774   REF   4  LAST 1500   20,3625   52 150 1            DXCH    AXDSTEM
 0775   REF   4  LAST 1501   20,3626   53'625 0            DXCH    AXISDIST +16D

 0776   REF   2  LAST 1489   20,3627   1 3650 0            TCF     1/ACCRET +1        ALL DONE
 0777   REF   6  LAST 1501   20,3630   3 1343 1  DRFDB     CA      DBVAL1             DRIFT DEADBANDS
 0778   REF   7  LAST 1501   20,3631   55'600 1            TS      FIREDB
 0779   REF   8  LAST 1501   20,3632   55'601 0            TS      FIREDB +1
 0780   REF   9  LAST 1501   20,3633   55'620 0            TS      FIREDB +16D
 0781   REF  10  LAST 1501   20,3634   55'621 1            TS      FIREDB +17D
 0782   REF   6  LAST 1501   20,3635   6 1554 1            AD      FLAT
 0783   REF   4  LAST 1501   20,3636   55'602 0            TS      COASTDB
 0784   REF   5  LAST 1501   20,3637   55'603 1            TS      COASTDB +1
 0785   REF   6  LAST 1501   20,3640   55'622 1            TS      COASTDB +16D
 0786   REF   7  LAST 1501   20,3641   55'623 0            TS      COASTDB +17D
 0787   REF 320  LAST 1501   20,3642   3 4746 0            CA      ZERO
 0788   REF   5  LAST 1501   20,3643   55'604 0            TS      AXISDIST
 0789   REF   6  LAST 1501   20,3644   55'605 1            TS      AXISDIST +1
 0790   REF   7  LAST 1501   20,3645   55'624 1            TS      AXISDIST +16D
 0791   REF   8  LAST 1501   20,3646   55'625 0            TS      AXISDIST +17D

 0792                        20,3647   0 0004 0  1/ACCRET  INHINT
 0793   REF  64  LAST 1495   20,3650  4 0111 1            CS      DAPBOOLS          SET BIT TO INDICATE DATA GOOD.
 0794   REF   3  LAST 1409   20,3651  7 4742 0            MASK    ACCSOKAY
 0795   REF  65  LAST 1502   20,3652  26 111 1            ADS     DAPBOOLS
 0796                        20,3653  0 0003 1            RELINT
 0797   REF   2  LAST 1484   20,3654  3 0117 0            CA      ACCRETRN
 0798   REF  19  LAST 1367   20,3655  0 4631 1            TC      BANKJUMP          RETURN TO CALLER

 0799   REF   1              20,3656  54 165 1  INVERT    TS      HOLD              ROUTINE TO INVERT   -INPUT AT PI/2
 0800   REF  42  LAST 1498   20,3657  3 4734 0            CA      BIT9              1 AT 2(6)
 0801                        20,3660  22 007 0            ZL                        ZERO L FOR ACCURACY AND TO PREVENT OVFLO
 0802                        20,3661  0 0006 1            EXTEND
 0803   REF   2  LAST 1502   20,3662  10 165 1            DV      HOLD
 0804   REF 428  LAST 1491   20,3663  0 0002 0            TC      Q                 RESULT AT 2(7)/PI


 0805   REF 321  LAST 1501   20,3664  3 4746 0  DOWNGTS   CAF     ZERO              ZERO SWITCHES WHEN USEQRJTS BIT IS UP
 0806   REF   7  LAST 1495   20,3665  55'502 0            TS      ALLOWGTS            OR DAP IS OFF.
 0807   REF   8  LAST 1495   20,3666  55'632 0            TS      INGTS
 0808   REF   2  LAST 1488   20,3667  1 2755 0            TCF     DOCKTEST

 0809                        20,3670  22 007 0  1/ANET-   ZL
 0810   REF   3  LAST 1500   20,3671  22 122 0            LXCH    ACCSW             ZERO ACCSW
 0811   REF   6  LAST 1499   20,3672  54 157 0            TS      ANET              SAVE ANET
 0812   REF   4  LAST 1499   20,3673  6 3742 0            AD      -.03R/S2          TEST FOR MIN VALUE
 0813                        20,3674  0 0006 1            EXTEND
 0814   REF   1              20,3675  6 3716 1            BZMF    NETNEG            ANET LESS THAN AMIN, SO FAKE IT
 0815   REF   7  LAST 1502   20,3676  3 0157 1  1/NETMIN  CA      ANET
 0816                        20,3677  0 0006 1            EXTEND
 0817   REF  10  LAST 1499   20,3700  5 0164 1            INDEX   -SIGNAOS
 0818   REF   5  LAST 1498   20,3701  7 0130 1            MP      1/ACOSTT +1       ANETNEG(POS)/ACOASTPOS(NEG) AT 2(6)

A0819                                                                         THE FOLLOWING CODING IS VALID FOR BOTH POS OR NEG
A0820                                                                                   VALUES OF AOS

 0821   REF  43  LAST 1502   20,3702  6 4734 0  DO1/NET+  AD      BIT9              1 + ANET/ACOAST AT 2(6)
 0822   REF   8  LAST 1502   20,3703  56 157 1            XCH     ANET              SAVE AND PICK UP ANET
 0823                        20,3704  0 0006 1            EXTEND
 0824   REF   2  LAST 1498   20,3705  22 161 1            QXCH    ARET              SAVE RETURN
 0825   REF   4  LAST 1497   20,3706  0 3656 1            TC      INVERT
 0826   REF   6  LAST 1499   20,3707  54 160 1            TS      1/ANET            1/ANET AT 2(7)/PI
 0827   REF  44  LAST 1502   20,3710  4 4734 1            CS      BIT9              -1 AT 2(6)
 0828                        20,3711  0 0006 1  DOACCFUN  EXTEND
 0829   REF   7  LAST 1502   20,3712  7 0160 1            MP      1/ANET            -1/ANET AT 2(13)/PI
 0830                        20,3713  0 0006 1            EXTEND
 0831   REF   9  LAST 1502   20,3714  10 157 0            DV      ANET              ACCFUN AT 2(7)/PI
 0832   REF   3  LAST 1502   20,3715  0 0161 1            TC      ARET              RETURN

 0833   REF   5  LAST 1502   20,3716  4 3742 1  NETNEG    CS      -.03R/S2          ANET LESS THAN AMIN - SET EQUAL TO AMIN
 0834   REF  10  LAST 1502   20,3717  54 157 0            TS      ANET
 0835   REF   2  LAST 1499   20,3720  1 3677 0            TCF     1/NETMIN +1       CONTINUE AS IF NOTHING HAPPENED
 0836   REF  12  LAST 1499   20,3721  10 163 1  FIXMIN    CCS      SIGNAOS
 0837   REF 107  LAST 1487   20,3722  3 4743 0            CA       TWO               IF AOS NEG, ACCSW = +1
 0838   REF  16  LAST 1470   20,3723  6 7770 0            AD       NEGONE            IF AOS POS, ACCSW = -1
 0839   REF   4  LAST 1502   20,3724  54 122 1            TS       ACCSW
 0840   REF   7  LAST 1500   20,3725  6 0154 1            AD       UV                IF ACCSW = +1, TEST FOR +U (+V) JET FAIL
 0841   REF 527  LAST 1499   20,3726  50 000 1            INDEX    A                 IF ACCSW = -1, TEST FOR -U (-V) JET FAIL
 0842   REF   2  LAST 1499   20,3727  3 3746 1            CA       -UMASK +1
 0843   REF  13  LAST 1500   20,3730  7 1257 1            MASK     CH5MASK
 0844                        20,3731  0 0006 1            EXTEND
 0845                        20,3732  1 3736 1            BZF      +4
 0846   REF   6  LAST 1502   20,3733  4 3742 1            CS       -.03R/S2          JET FAILURE - CANNOT USE 2-JET VALUES
 0847   REF  11  LAST 1502   20,3734  54 157 0            TS       ANET              ANET = AMIN
 0848   REF   1              20,3735  1 3504 1            TCF      STMIN- -1         CALCULATE FUNCTIONS USING AMIN
 0849   REF 329  LAST 1499   20,3736  3 0001 0            CA       L                 L HAS ACCFUN
 0850   REF   2  LAST 1503   20,3737  1 3505 0            TCF      STMIN-            STORE MAX VALUES FOR MIN JETS

A0851                                                     ERASABLE ASSIGNMENTS FOR 1/ACCONT

 0852   REF   5  LAST  139   E6,1550                      1/ANETP  EQUALS BLOCKTOP +2
 0853   REF   6  LAST 1503   E6,1552                      1/ACOSTP EQUALS BLOCKTOP +4
 0854   REF   7  LAST 1503   E6,1556                      PACCFUN  EQUALS BLOCKTOP +8D
 0855   REF   8  LAST 1503   E6,1560                      PDB1     EQUALS BLOCKTOP +10D
 0856   REF   9  LAST 1503   E6,1561                      PDB2     EQUALS BLOCKTOP +11D
 0857   REF  10  LAST 1503   E6,1562                      PDB4     EQUALS BLOCKTOP +12D
 0858   REF  11  LAST 1503   E6,1563                      PDB3     EQUALS BLOCKTOP +13D
 0859   REF  12  LAST 1503   E6,1564                      PAXDIST  EQUALS BLOCKTOP +14D

 0860   REF  62  LAST 1261      0122                      ACCSW    EQUALS VBUF            EXECUTIVE TEMPORARIES
A0861                                                                                     CANNOT DO  CCS    NEWJOB DURING 1/ACCS
 0862   REF   5  LAST 1503      0123                      1/ATEM1  EQUALS ACCSW +1        TEMP BUFFER FOR U AND V AXES
 0863   REF   7  LAST 1500      0124                      1/ATEM2  EQUALS 1/ATEM1 +1
 0864   REF   8  LAST 1503      0127                      1/ACOSTT EQUALS 1/ATEM1 +4
 0865   REF   9  LAST 1503      0131                      Z1TEM    EQUALS 1/ATEM1 +6
 0866   REF  10  LAST 1503      0132                      Z5TEM    EQUALS 1/ATEM1 +7

 0867   REF  11  LAST 1503      0135                      UDB1     EQUALS 1/ATEM1 +10D    U AXIS DEADBAND BUFFER
 0868   REF  12  LAST 1503      0136                      UDB2     EQUALS 1/ATEM1 +11D
 0869   REF  13  LAST 1503      0137                      UDB4     EQUALS 1/ATEM1 +12D
 0870   REF  14  LAST 1503      0140                      UDB3     EQUALS 1/ATEM1 +13D
 0871   REF  15  LAST 1503      0141                      UAXDIST  EQUALS 1/ATEM1 +14D

 0872   REF  16  LAST 1503      0143                      DBB1     EQUALS 1/ATEM1 +16D    TEMP DEADBAND BUFFER, ALSO V AXIS
 0873   REF  17  LAST 1503      0144                      DBB2     EQUALS 1/ATEM1 +17D
 0874   REF  18  LAST 1503      0145                      DBB4     EQUALS 1/ATEM1 +18D
 0875   REF  19  LAST 1503      0146                      DBB3     EQUALS 1/ATEM1 +19D
 0876   REF  20  LAST 1503      0147                      AXDSTEM  EQUALS 1/ATEM1 +20D

 0877   REF  21  LAST 1503      0151                      FLATEMP  EQUALS 1/ATEM1 +22D
 0878   REF  22  LAST 1503      0152                      Z3TEM    EQUALS 1/ATEM1 +23D    MUST FOLLOW FLATEMP
 0880   REF    3  LAST   98        0114              DBVAL2   EQUALS INTB15+
 0881   REF    4  LAST 1504        0115              DBVAL3   EQUALS INTB15+ +1

 0882   REF    5  LAST 1504        0116              DRIFTER  EQUALS INTB15+ +2

 0883   REF  901  LAST 1494        0154              UV       EQUALS MPAC
 0884   REF  902  LAST 1504        0157              ANFT     EQUALS MPAC +3
 0885   REF  903  LAST 1504        0157              FUNTEM   EQUALS MPAC +3
 0886   REF  904  LAST 1504        0160              1/ANFT   EQUALS MPAC +4
 0887   REF  905  LAST 1504        0161              ARET     EQUALS MPAC +5
 0888   REF  906  LAST 1504        0162              ABSAOS   EQUALS MPAC +6
 0889   REF  907  LAST 1504        0163              SIGNAOS  EQUALS MPAC +7
 0890   REF  908  LAST 1504        0164              -SIGNAOS EQUALS MPAC +8D
 0891   REF  909  LAST 1504        0165              HOLD     EQUALS MPAC +9D
 0892   REF   68  LAST 1398        0117              ACCRETRN EQUALS FIXLOC -1


 0893                           20,3740   00110 1  ZONE3MAX DEC    .004375         17.5 MS (35 MS FOR 1 JET) AT 4 SECONDS
 0894                           20,3741   00443 1  FLATVAL  DEC    .01778          .8 AT PI/4 RAD
 0895                           20,3742   77377 1  -.03R/S2 OCT    77377            -PI/2(7) AT PI/2

 0896                           20,3743   00356 1  .023R/S2 OCT    00356           .0228 RAD/SEC(2) AT PI/2
 0897   REF   47  LAST 1499        4724            1/.03    EQUALS POSMAX           2(7)/PI AT 2(7)/PI

 0898   REF    2  LAST 1411     20,3744   02217 1  PAXISADR GENADR PAXIS


A0899                                                                              THE FOLLOWING 4 CONSTANTS ARE JET
A0900                                                                              FAILURE MASKS AND ARE INDEXED
 0901                           20,3745   00110 1  -UMASK   OCT    00110           -U
 0902                           20,3746   00022 1           OCT    00022           -V
 0903                           20,3747   00204 1  +UMASK   OCT    00204           +U
 0904                           20,3750   00041 1           OCT    00041           +V
```

```
L        SPS BACK-UP RCS CONTROL                                                  USER'S PAGE NO.   1       FO S4

P0001    PROGRAM NAME:  SPSRCS

R0002    AUTHOR:  EDGAR M. OSHIKA (AC ELECTRONICS)

R00021   MODIFIED:  TO RETURN TO ALL AXES VIA Q BY P.S.WEISSMAN, OCT 7, 1968

R00022   MODIFIED TO IMPROVE BENDING STABILITY BY G.KALAN,FEB.14,1969
R0003    FUNCTIONAL DESCRIPTION:

R0004    THIS PROGRAM CONTROLS THE FIRING OF ALL RCS JETS IN THE DOCKED CONFIGURATION ACCORDING TO THE FOLLOWING PHASE
R0006    PLANE LOGIC.

R0007    1. JET SENSE TEST (SPSRCS)

R0008    IF JETS ARE FIRING NEGATIVELY,SET OLDSENSE NEGATIVE AND CONTINUE
R0009    IF JETS ARE FIRING POSITIVELY,SET OLDSENSE POSITIVE AND CONTINUE
R0010    IF JETS ARE NOT FIRING,SET OLDSENSE TO ZERO AND GO TO OUTER RATE LIMIT  TEST

R0012    2. RATE DEAD BAND TEST

R0013    IF JETS ARE FIRING NEGATIVELY AND RATE IS GREATER THAN TARGET RATE,LEAVE
R0014    JETS ON AND GO TO INHIBITION LOGIC. OTHERWISE,CONTINUE.
R0015    IF JETS ARE FIRING POSITIVELY AND RATE IS    LESS  THAN TARGET RATE,LEAVE
R0016    JETS ON AND GO TO INHIBITION LOGIC. OTHERWISE,CONTINUE.

R0017    3. OUTER RATE LIMIT TEST (SPSSTART)

R0018    IF MAGNITUDE OF EDOT IS GREATER THAN 1.73 DEG/SEC SET JET FIRING TIME
R0019     TO REDUCE RATE AND GO TO INHIBITION LOGIC. OTHERWISE,CONTINUE.

R0020    4. COAST ZONE TEST

R0021    IF STATE (E,EDOT) IS BELOW LINE  E + 4 X EDOT > -1.4 DEG  AND EDOT IS LESS THAN 1.30 DEG/SEC SET JET TIME POSI-
R0023    TIVE AND CONTINUE. OTHERWISE,SET JET FIRING TIME TO ZERO AND CONTINUE.
R0024    IF STATE IS ABOVE LINE  E + 4X EDOT > +1.4 DEG AND EDOT IS GREATER THAN -1.30 DEG/SEC, SET JET TIME NEGATIVE
R0026    AND CONTINUE. OTHERWISE,SET JET FIRING TIME TO ZERO AND CONTINUE.

R0027    5. INHIBITION LOGIC

R0028    IF OLDSENSE IS NON-ZERO:
R0029          A) RETURN IF JET TIME HAS SAME SIGN AS OLDSENSE
R0030          B) SET INHIBITION COUNTER*AND RETURN IF JET TIME IS ZERO
R0031          C) SET INHIBITION COUNTER,*SET JET TIME TO ZERO AND RETURN IF SIGN
R0032             OF JET TIME IS OPPOSITE TO THAT OF OLDSENSE

R0033    IF OLDSENSE IS ZERO:
R0034          A) RETURN IF INHIBITION COUNTER IS NOT POSITIVE
R0035          B) SET JET TIME TO ZERO AND RETURN IF INHIBITION COUNTER IS POSITIVE
R0037    *NOTE: INHIBITION COUNTERS CAN BE SET TO 4 OR 10 FOR THE P,AND UV AXES,
R0038    RESPECTIVELY,IN SPSRCS. THEY ARE DECREMENTED BY ONE AT THE BEGINNING OF
```

```
R0039    EACH DAP PASS.

R0040    THE MINIMUM PULSE WIDTH OF THIS CONTROLLER IS DETERMINED BY THE REPETITION  RATE AT WHICH THIS ROUTINE IS CALLED
R0042    AND IS NOMINALLY 100 MS FOR ALL AXES IN DRIFTING FLIGHT.   DURING POWERED FLIGHT THE MINIMUM IS 100 MS FOR THE
R0044    P AXIS AND 200 MS FOR THE CONTROL OF THE U AND V AXES.

R0045    CALLING SEQUENCE:

R0046                 INHINT
R0047                               TC       IBNKCALL
R0048                               CADR     SPSRCS


R0049    EXIT:

R0050                 TC       Q
R0051    ALARM/ABORT MODE:     NONE

R0052    SUBROUTINES CALLED:     NONE

R0053    INPUT:        E,EDOT
R0054                  TJP, TJV, TJU                    TJ MUST NOT BE NEGATIVE ZERO

R0055    OUTPUT:       TJP, TJV, TJU
R0056


 0057                          21,3606                               BANK    21
 0058    REF   4  LAST 1484    21,2000                               SETLOC  DAPS4
 0059                          21,3606                               BANK

 0060    REF   1                                                     COUNT*  $$/DAPBU

 0061    REF  14  LAST 1456    E6,1525                               EBANK=  TJU
 0062                          21,3606   00632 0  RATELIM2 OCT     00632           1.125 DEG/SEC
 0063    REF  32  LAST 1394    21,3607  3 4727 1  POSTHRST CA      HALF

 0064    REF  33  LAST 1462    21,3610  51'505 0           NDX     AXISCTR
 0065    REF  15  LAST 1506    21,3611  55'525 0           TS      TJU
 0066    REF   1               21,3612  11'744 0           CCS     OLDSENSE
 0067    REF   1               21,3613  1 3633 0           TCF     POSCHECK        JETS FIRING POSITIVELY
 0068    REF   1               21,3614  1 3636 0           TCF     CTRCHECK        JETS OFF. CHECK INHIBITION CTR
 0069    REF  34  LAST 1506    21,3615  51'505 0  NEGCHECK INDEX   AXISCTR         JETS FIRING NEGATIVELY
 0070    REF  16  LAST 1506    21,3616  4 1525 0           CS      TJU
 0071    REF 528  LAST 1503    21,3617  10 000 0           CCS     A
 0072    REF 429  LAST 1502    21,3620  0 0002 0           TC      Q               RETURN
 0073                          21,3621  1 3623 1           TCF     +2
 0074                          21,3622  1 3623 1           TCF     +1              JETS COMMANDED OFF.SET CTR AND RETURN
 0075    REF  35  LAST 1506    21,3623  51'505 0  SETCTR   INDEX   AXISCTR         JET FIRING REVERSAL COMMANDED. SET CTR,
 0076    REF   1               21,3624  3 3645 0           CA      UTIME           SET JET TIME TO ZERO,AND RETURN
 0077   REF  36  LAST 1506   21,3625  51'505 0           INDEX  AXISCTR
 0078   REF   3  LAST 1426   21,3626  55'767 1           TS     UJETCTR
 0079   REF 322  LAST 1502   21,3627  3 4746 0  ZAPTJ    CA     ZERO
 0080   REF  37  LAST 1507   21,3630  51'505 0           INDEX  AXISCTR
 0081   REF  17  LAST 1506   21,3631  55'525 0           TS     TJU
 0082   REF 430  LAST 1506   21,3632  0 0002 0           TC     Q
 0083   REF  38  LAST 1507   21,3633  51'505 0  POSCHECK INDEX  AXISCTR
 0084   REF  18  LAST 1507   21,3634  3 1525 1           CA     TJU
 0085   REF   1              21,3635  1 3617 0           TCF    NEGCHECK +2
 0086   REF  39  LAST 1507   21,3636  51'505 0  CTRCHECK INDEX  AXISCTR        CHECK JET INHIBITION COUNTER
 0087   REF   4  LAST 1507   21,3637  11'767 1           CCS    UJETCTR
 0088                        21,3640  1 3642 0           TCF    +2
 0089   REF 431  LAST 1507   21,3641  0 0002 0           TC     Q              CTR IS NOT POSITIVE. RETURN
 0090   REF   1              21,3642  1 3627 0           TCF    ZAPTJ          CTR IS POSITIVE.INHIBIT FIRINGS
 0091   REF 432  LAST 1507   21,3643  0 0002 0           TC     Q              CTR IS NOT POSITIVE.RETURN
 0092                        21,3644   00004 0           OCT    00004
 0093                        21,3645   00012 1  UTIME    OCT    00012
 0094                        21,3646   00012 1           OCT    00012
 0096   REF 167  LAST 1500   21,3647  4 4744 0  NEGFIRE  CS     ONE            JETS FIRING NEGATIVELY
 0097   REF   2  LAST 1506   21,3650  55'744 0           TS     OLDSENSE
 0098   REF  18  LAST 1467   21,3651  3 1427 1           CA     EDOT
 0099                        21,3652  1 3656 0           TCF    +4
 0100   REF 168  LAST 1507   21,3653  3 4744 1  PLUSFIRE CA     ONE
 0101   REF   3  LAST 1507   21,3654  55'744 0           TS     OLDSENSE
 0102   REF  19  LAST 1507   21,3655  4 1427 0           CS     EDOT           RATE DEAD BAND TEST
 0103   REF 529  LAST 1506   21,3656  22 000 1           LXCH   A
 0104   REF  66  LAST 1502   21,3657  4 0111 1           CS     DAPBOOLS       IF DRIFTBIT = 1, USE ZERO TARGET RATE
 0105   REF   7  LAST 1495   21,3660  7 4735 0           MASK   DRIFTBIT       IF DRIFTBIT = 0, USE 0.10 RATE TARGET
 0106   REF 530  LAST 1507   21,3661  10 000 0           CCS    A
 0107   REF   1              21,3662  3 4760 1           CA     RATEDB1
 0108   REF 330  LAST 1503   21,3663  6 0001 0           AD     L
 0109                        21,3664  0 0006 1           EXTEND
 0110   REF   1              21,3665  6 3675 0           BZMF   SPSSTART
 0111   REF   1              21,3666  1 3612 0           TCF    POSTHRST +3

 0112   REF  40  LAST 1507   21,3667  51'505 0  SPSRCS   INDEX  AXISCTR        JET SENSE TEST
 0113   REF  19  LAST 1507   21,3670  11'525 0           CCS    TJU
 0114   REF   1              21,3671  1 3653 0           TCF    PLUSFIRE       JETS FIRING POSITIVELY
 0115                        21,3672  1 3674 0           TCF    +2
 0116   REF   1              21,3673  1 3647 0           TCF    NEGFIRE        JETS FIRING NEGATIVELY
 0117   REF   4  LAST 1507   21,3674  55'744 0           TS     OLDSENSE       JETS OFF
 0118   REF  20  LAST 1507   21,3675  3 1427 1  SPSSTART CA     EDOT           OUTER RATE LIMIT TEST
 0119                        21,3676  0 0006 1           EXTEND
 0120   REF   1              21,3677  7 4757 1           MP     RATELIM1
 0121   REF 531  LAST 1507   21,3700  10 000 0           CCS    A
 0122   REF   1              21,3701  1 3720 0           TCF    NEGTHRST       OUTER RATE LIMIT EXCEEDED
 0123                        21,3702  1 3704 0           TCF    +2
 0124   REF   2  LAST 1507   21,3703  1 3607 1           TCF    POSTHRST       OUTER RATE LIMIT EXCEEDED
 0125   REF  21  LAST 1507   21,3704  3 1427 1           CA     EDOT           COAST ZONE TEST
 0126   REF  17  LAST 1467   21,3705  6 1751 0           AD     E
```

```
L        SPS BACK-UP RCS CONTROL                                                          USER'S PAGE NO.   4      E6 S4

 0127                              21,3706  0 0006 1                EXTEND
 0128    REF   2  LAST  224        21,3707  7 1411 0                MP      DKDB                PAD LOADED DEADBAND. FRESHSTART: 1.4 DEG
 0129                              21,3710  0 0006 1                EXTEND
 0130    REF   1                   21,3711  1 3726 0                BZF     TJZERO

 0131                              21,3712  0 0006 1                EXTEND
 0132                              21,3713  6 3722 0                BZMF    +7
 0133    REF  22  LAST 1507        21,3714  3 1427 1                CA      EDOT
 0134    REF   1                   21,3715  6 3606 1                AD      RATELIM2
 0135                              21,3716  0 0006 1                EXTEND
 0136    REF   2  LAST 1508        21,3717  6 3726 1                BZMF    TJZERO
 0137    REF  33  LAST 1506        21,3720  4 4727 0   NEGTHRST     CS      HALF
 0138    REF   3  LAST 1507        21,3721  1 3610 1                TCF     POSTHRST +1
 0139    REF   2  LAST 1508        21,3722  4 3606 0    +7          CS      RATELIM2
 0140    REF  23  LAST 1508        21,3723  6 1427 1                AD      EDOT
 0141                              21,3724  0 0006 1                EXTEND
 0142    REF   4  LAST 1508        21,3725  6 3607 0                BZMF    POSTHRST
 0143    REF 323  LAST 1507        21,3726  3 4746 0   TJZERO       CA      ZERO
 0144    REF   5  LAST 1508        21,3727  1 3610 1                TCF     POSTHRST +1


 0145    REF   5  LAST 1425           4757             RATELIM1 =        CALLCODE          = 00032, CORRESPONDING TO 1.73 DEG/SEC
 0146    REF   1                      4760             RATEDBL  =        TBUILDFX           = 00045, CORRESPONDS TO 0.101 DEG/SEC

*** END OF LMDAP    .032 ***
```

```
SYMBOL TABLE LISTING, INCLUDING DEFINITION, HEALTH, PAGE OF DEF, # OF REFS, PAGE OF FIRST REF, PAGE OF LAST REF.
SYMBOL     DEF    H       REFERENCES     SYMBOL     DEF    H       REFERENCES     SYMBOL     DEF    H       REFERENCES

.00375A8 17,3771     1467   1 1463       -AYO     E3,1711      116   1 1145       -UP      00,2620     1061   1 1060
.023R/S2 20,3743     1504   1 1498       -AZ      11,2357      823                -XTRANS  17,2201     1441   1 1441
.0375AT4 17,3764     1467   1 1465       -AZBIT      4737 =    823   1  823       -0.3D/S  01,2347      308   1  306
.1AT2    17,3763     1467   1 1465       -BIT10   06,3004      191   1  187       -0.6D/S  01,2346      308   1  306
.1AT4    17,3762     1467   1 1463       -BIT12      7762 =    544   1  544       -1/12    13,3763     1245   1 1235
.166...  23,3520     1254   1 1250       -BIT14      7757     1096   2 1421       -1/2+2   00,2444     1057   1 1077
.3D      12,3761     1244   1 1215       -CCSPR   01,3136     1111   1 1113       -1/8        7762     1096   3  544 1466
.5SEC       4765     1094   2  531 1332  -COMMAX  07,3764     1328   2 1310 1311  -1CHK    43,3276     1284   5 1285 1290
.7071    20,3060     1492   2 1486 1493  -COMMAX- 07,3765     1328   2 1310 1311  -100MS   16,3616     1439   2 1468
=======================================  -DEC103  31,3760      829   1  827       -100MST6 16,3732     1469   3 1468
(AT)A    27,2016       40   1  841       -DELGM8  E6,1673 =    141  19  141  915  -136MST6 16,3573     1438   2 1435 1438
(TBUP)A  27,2020       40   1  841       -DTSCALR 17,2054      578   1  578       -15DEGS  06,2513      180   1  179
(TGO)A   32,3647      838   1  839       -EL      11,2371      823                -150MS   17,3137     1454   1 1451
(1/DV)A  27,2012       40   1  841       -ELBIT      4744 =    823   1  823       -160MST6 16,3530     1437   1 1436
=======================================  -ELR     05,3376      234   1  229       -2JETLIM F6,1475      135   4  135 1485
+AZ      11,2364      823                -ENDERAS    7764     1096   1 1003       -2SEC    10,3600     1379   1 1366
+AZBIT      4740 =    823   1  823       -ENDVAC     6272     1007   2 1003 1021  -3DEG    17,3760     1467   1 1460
+DECSGN  40,2272      413   1  413       -EPSILON    0155 =   1494   5 1486 1487  -45DEGSP    7761 =    548   1  547
+DEC99   31,3762      829   1  827       -EPSMAX  20,3062     1492   4 1486 1487  -50DEGSP 25,2222      548   1  548
+DOWN    00,2610     1061   1 1060       -FOURDEG 16,3531     1437   1 1436       -50SC    04,3053     1183   1 1172
+EL      11,2376      823                -FOURDT  27,2532      767   1  766       -70DEGS  06,2512      180   1  179
+ELBIT      4743 =    823   1  823       -GYROMIN 07,3505     1320   2 1320 1323  -80DEGSR 25,2223      548   1  548
+LIMIT   42,3350      436   1  436       -LOKONFG 23,2040      284                =======================================
+MGA     F4,1643 =    121   5  326  695  -MAXADRS    4341 =   1283   1 1288       /AF/CNST 31,2363      793   1  789
+DN      40,2402      414   3  414  456  -MUDT    33,2077       46   1  882       /AFC/    F7,1463 =    146   6  146  820
+QMIN    17,2304     1443   1 1442       -MUDTMUN 33,2103       46   1  885       /BUF+    00,2721     1065   2 1064
+RMIN    17,2314     1443   1 1443       -MUDT1   33,2101       46                /BUF-    00,2715     1064   2 1064
+TJMINT6 17,3136     1453   4 1444 1452  -OCT10      6243     1006   1 1006       /LAND/   E4,1723 =    124  10  124  885
+UMASK   20,3747     1504   1 1499       -OCT630  16,2321     1421   1 1420       /MPAC+   00,2767     1066   2 1066
+XORULGE 17,2200     1441   2 1440 1441  -ON      40,2422      415   2  414  456  /MPAC-   00,2763     1066   2 1066
+150MST6 16,3613     1439   1 1435       -PHASE1     0751      103   6  225 1298  /NORM    00,2732     1065   1 1065
=======================================  -PHASE2     0753      103   8  224  871  /NORM2   00,2725     1065   1 1065
*ENTER   36,3043      741   1  740       -PHASE3     0755      103   4  225  869  /R/MAG   E4,1671 =    124   6  124  855
*NBSM*   23,3665     1260   7  264  966  -PHASE4     0757      103   9  225 1380  =======================================
*PROCEED 36,3040      741   1  740       -PHASE5     0761      103   2  225  862  ?           6001 =    744
*SMNB*   23,3663     1260   6  263  964  -PHASE6     0763      103   5  225 1392  ?GUIDSUB 31,2417      796   1  782
=======================================  -QMIN    17,2310     1443   1 1442       *======================================
-.0112A8 17,3761     1467   1 1462       -RATED8  E6,1476 =    135   7  135 1445  A           0000 =     94 531  168 1507
-.025AT2 17,3765     1467   1 1465       -RMIN    17,2316     1443   1 1443       A-PCHK   13,3215     1213   4 1210 1222
-.025AT4 17,3766     1467   1 1463       -RRLIMIT 25,2306      551   2  552       AAPFG*   E5,1440 =    125   1  125
-.03R/S2 20,3742     1504   6 1496 1503  -SIGNAOS    0164 =   1504  10 1496 1502  AAPFGX   E5,1424 =    125   1  125
-.05AT2  17,3767     1467   1 1462       -TJMAX   17,3773     1467   2 1463 1464  AAPFGZ   E5,1430 =    125   1  125
-.15AT2  17,3770     1467   1 1462       -TJMIN   17,3775     1467   1 1465       A8CLOAD  41,2647      439   1  422
-.1875   20,3205     1494   1 1497       -TPER    E4,1533 =    120   6  318  724  ABDELV      1245 =    108   8  108 1493
-.7071   20,3061     1492   2 1487 1493  -UMASK   20,3745     1504   2 1499 1503  ABDVCDNV F7,1513 =    154   5  154  864

HEALTH KEY: NORMALLY DEFINED UNLESS FLAGGED AS FOLLOWS:

UN UNDEFINED          = DEFINED BY EQUALS                J DEFINED BY JOKER OR ERASE ANYWHERE       MD MULTIPLY DEFINED
BD BADLY DEFINED      CD DEFINITION ASSOCIATED WITH CONFLICT                  XX MISCELLANEOUS TROUBLE
```

```
SYMBOL TABLE LISTING, INCLUDING DEFINITION, HEALTH, PAGE OF DEF, # OF REFS, PAGE OF FIRST REF, PAGE OF LAST REF.

SYMBOL       DEF    H      REFERENCES     SYMBOL       DEF    H      RFEERENCES     SYMBOL       DEF    H      REFERENCES

ABLJAC    41,2753    440   1  422      ACCRETRN     0117 = 1504   2 1484 1502 ADSRAZ    E3,1470    115   1  341
ABORT        5636 = 1381               ACCSOKAY     4742 =   90   3  230 1502 ADSUM     43,3566   1288   2 1288
ABORTALM  21,2164    837   2  837      ACCSW        0122 = 1503   5 1500 1503 ADTIME    35,3154    673   1  673
ABORTS    32,2000 =   35   2  834  837 ACCSWU    E6,1546 =  139   3  139 1500 ADUPBFM1  04,3664   1391   2 1387 1388
ABORTS1   05,2000 =   30   1  832      ACCSWV    E6,1547 =  139   1 1500      ADUPBUFF  04,3517   1388   1 1386
ABORTYZ   16,2775   1428   1 1439      ACCTHERE  20,3441   1498   1 1498      ADUPTEMP  04,3516   1388   1 1387
ABORT2       5646   1380   1 1380      ACCWD     E5,1512 =  132   2  398  399 ADVAN     01,3216   1114   2 1108 1284
ABOUTONE  15,2156    263   2  261  956 ACC4-2EL     0307 =   89   2  834  839 ADVANCE   34,3016    648   2  628  633
ABRFG*    E5,1436 =  125   2  125  829 ACC4OR2X     4732 =   89   2  306 1441 AFCCALC1  31,3146    807
ABRFGX    E5,1422 =  125   2  125  829 ACDT+C12  16,3737   1474   2 1426 1478 AFCCALC2  31,3156    807
ABRFGZ    E5,1426 =  125   1  125      ACENTRAL  E6,1743 =  137   5 1471 1473 AFCCALC3  31,3172    807   1  807
ABRTABLF  36,2114    728   1  838      ACMODBIT     4730 =   71               AFCCLEND  31,3200    807   1  807
ABRTICN   36,2533    735   1  728      ACMODFLG     0040 =   71   3  511  514 AFCSPOT   32,3415    820   2  820
ABRTJADR  05,3422    833   1  833      ACOS=0    00,3637   1082   4 1082 1084 AFDUMP    31,2151    789
ABRTJASK  05,3423    833   1  833      ACOSABRT  00,3723   1084               AFTERTJ   17,2756   1451   3 1444 1450
ABS       00,3226   1074   4  825 1073 ACOSOVF   00,3721   1084   1 1082      AFTRFLTR  30,3174    910   1  909
ABSAOS       0162 = 1504  12 1496 1499 ACOSSHR   00,3714   1084   1 1082      AFTRGUID  31,2401    794   1  807
ABSC0     E5,1522 =  126   2  126  8E7 ACOSST    00,3625   1082   1 1082      AGAINMM   04,2113    239   1  239
ABSC1     F5,1523 =  126   1  126      ACOSST2   00,3642   1082   2 1082      AGSBUFF   F4,1571 =  122  12  122  220
ABSC2     F5,1524 =  126   1  126      ACOSZERO  00,3731   1084   1 1082      AGSBUFFF  F4,1606 =  122
ABSC3     E5,1525 =  126   1  126      ACOS3     00,3652   1083   1 1084      AGSCODE      1073    105   6  211  589
ABSC4     E5,1526 =  126   1  126      ACTCENT   E3,1753    117   2  327  676 AGSDISPK  32,2022    219
ABSEDOTP  E6,1736 =  136   2 1433      ACTIVE    23,2423    700   4  633  700 AGSEND    32,2120    220   2  220
ABSTJ     F6,1736 =  136   9 1434 1453 ADDGRAV   15,2764    964   1  964      AGSI/UPD  05,2414 =  216   3  204  217
ABTCONIC  12,3752   1199   3 1184 1197 ADDITIN   21,3513   1481   1 1480      AGSINDIC  16,2033   1408   1 1407
ABTFLCS   21,2000 =   32   1 1381      ADDPOS    30,2002    616   1  616      AGSINIT   32,2005    218   1  286
ABTKLEAN  05,2657    225   1  634      ADDRESS      6124   1002               AGSK      F6,1771    142   8  208  286
ABTRDCT   F5,1563 =  127   2  127  835 ADDRWD       0116     98  83  918 1264 AGSLIST   05,2414 =  204
ABTTGBIT     4736 =   83               ADG       F5,1422 =  829   1  806      AGSRND1   32,2177    221   2  220  221
ABTTGFLG     0217 =   83   2  240  836 ADG2TTF   E5,1436 =  829   1  804      AGSRND2   32,2205    221   2  220  221
ABVAL     00,3201   1073               ADIAX     E3,1463    115   1  341      AGSUPDAT     0001 =  247
ABVALABS  00,3176   1073   1 1011      ADIAY     F3,1464    115   1  341      AGSVCALC  32,2036    219   1  219
ABVEL     E7,1471 =  154   8  154  891 ADIAZ     F3,1465    115   1  342      AGSWORD      1321    110   4  220  241
ABVEL*       0130 =  126   3  890  891 ADRPCHN2     5370   1296   1 1296      AHEAD5       6454   1014   1 1014
ACADN83   36,3755    759   1  754      ADRRUPT   17,3272   1456   1 1456      AHZLIM    F5,1476 =  126   3  126  815
ACADN85   36,2057 =  758   1  749      ADRS+1    43,3630   1289               AIG       F7,1457    146  10  162  605
ACCDOTQ   F6,1507    137   8  137 1488 ADRSCAN   27,2214    746   1  746      AIGBANK   26,3331    605   2  599  604
ACCDOTR   E6,1511 =  137   6 1474 1493 ADRSCHK   43,3577   1288   2 1288      AIMER     30,2666    850   1  850
ACCEPTUP  04,3272   1335   2 1336      ADRSDIF1  E6,1745 =  138  12 1459 1467 AINGOTN   37,2217    388   1  388
ACCEPTWD  41,2047    419   3  419  420 ADRSDIF2  E6,1743 =  138  11 1459 1466 AINLA     F5,1434 =  132  33  132  133
ACCFCTZ1  E6,1574 =  139   1 1464      ADRS1     43,3247   1283   1  302      AK        E6,1760    142  24  142 1417
ACCFCTZ5  F6,1575 =  139   1 1462      ADR40400     5736   1381   1 1380      AK1       F6,1761 =  142   1 1416
ACCHERE   20,3407   1496   1 1498      ADR77770     5735   1381   1 1381      AK2       F6,1762 =  142   1 1416
ACCOKFLG     0317 =   90               ADSRAX    F3,1466    115   1  341      ALARM        5571   1378  50  174 1456
ACCOMP    11,2523   1228   1 1230      ADSRAY    F3,1467    115   1  341      ALARM/TB  35,2430    637   1  627

HEALTH KEY: NORMALLY DEFINED UNLESS FLAGGED AS FOLLOWS:

UN UNDEFINED          = DEFINED BY EQUALS           J DEFINED BY JOKER OR ERASE ANYWHERE       MD MULTIPLY DEFINED
BD BADLY DEFINED    CD DEFINITION ASSOCIATED WITH CONFLICT               XX MISCELLANEOUS TROUBLE
```

```
SYMBOL TABLE LISTING, INCLUDING DEFINITION, HEALTH, PAGE OF DEF, # OF REFS, PAGE OF FIRST REF, PAGE OF LAST REF.

SYMBOL     DEF    H       REFERENCES      SYMBOL     DEF    H       REFERENCES      SYMBOL     DEF    H       REFERENCES

ALARMIT   24,3634     767   1  766        ALPHAV    E4,1431 =  118  35  118 1243 AORBSFLG     0125 =   76
ALARMMGA  30,3742     921   1  911        ALRMLT    24,2147    512   1  511      AORBSYST     4740 =   76   2 1434 1435
ALARM1       5726    1381   1 1084        ALRM503   24,3063    526   1  525      AORBTFLG     0310 =   89   1  737
ALARM2       5573    1378   2 1283 1380   ALRM514   24,2365    515   1  513      AORBTRAN     4733 =   89   2 1441 1443
ALCGKK    37,2627     397                 ALRM525   24,2745    523   1  521      AOSQ      E6,1536     138  29  138 1495
ALDK      E5,1532 =   133   3  397  398   ALRM526   24,2363    515               AOSQTERM  E6,1544     138   7  138 1425
ALFDK     E4,1422 =   122   1  397        ALRM527   24,3064    526               AOSR      E6,1540 =   138  11  735 1495
ALFLT     37,2577     397   1  396        ALRM530   24,3202    527   1  527      AOSRTERM  E6,1545 =   138   6 1406 1425
ALFLT3    37,2644     397   1  397        ALSIGNAG     7565   1041   5  888 1067 AOSU      E6,1542 =   138   3 1495 1496
ALGORTHM  21,3073    1471                 ALSK      37,3103    401   1  398      AOSV      E6,1543 =   138
ALIGNCOA  37,2311     390   3  390        ALT          1123 =  107   6  107 1134 AOTAZ     E7,1404     144   5  164  955
ALIGNLPT  15,3313     973   1  973        ALTCALC   22,2131    365   1  364      AOTCODE      1235 =   108  17  108  959
ALILP     37,2667     398   1  398        ALTCONV   21,2005     44   2  898  899 AOTEL     E7,1412     144   1  257
ALINEX    26,2071     351                 ALTDSPLY  20,2227   1412   1 1411      AOTMARK   07,2000     255   3  939  958
ALINEZ    26,2115     352   1  351        ALTERYZ   16,3006   1428   1 1428      AOTMARK1  07,2000 =    30   3  255  959
ALINTIME  43,2415     287   1  275        ALTEXIT   25,3440    575   1  575      AOTMARK2  04,2000 =    30   2  260  981
ALK       E5,1446 =   132   6  133  398   ALTIM     E5,1530 =  133   2  396      AOTMARK3  06,2000 =    30   1  263
ALKCG     37,2632     397                 ALTIMS    E5,1531 =  133   2  396  397 AOTSTALL  07,3731    1326   3  947 1327
ALKCG2    37,2635     397   1  397        ALTITUDE  E7,1730 =  158   5  158  899 APOPERI   23,2000 =    33   1  698
ALKLP     37,2676     398   1  398        ALTM         0060 =   95   2  898  899 APSESBIT     4740 =    81
ALLCOAST  20,2205    1406   4  241  756   ALTRATE   E7,1726 =  158   8  158  898 APSESW       0202 =    81   2 1196 1197
ALLDC/OC  41,3061     442   2  439  441   ALTRCONV  21,2004     44   1  898      APSFLAG      0230 =    84   3  768  787
ALLJETS   17,3257    1456   2 1456        ALTROUT   21,2377    898               APSFLBIT     4730 =    84  16  224 1485
ALLDOP    37,2536     396   2  395  396   ALTRROUT  21,2346    898               APSIDES   12,3704    1198   1  698
ALLOWGTS  E6,1502 =   139   7 1409 1502   ALTRTEMP     0063 =  158   3  897      APSLAD    21,2615     902   1  901
ALLREAD   25,3063     569   2  570  575   ALTSCALE     0272 =   88               APSTGO    27,2671     770   1  769
ALLSET    35,3425     680   1  680        ALTSCBIT     4734 =   88               APSVEX    33,2000      40   3  753  864
ALL1S     26,3703     613   1  612        ALTSTUFF  21,2267    897               ARATE     22,2771     376   3  376
ALL3DEC   42,3604     450   1  449        ALTSYST   16,3432   1435   2 1435      ARCCOS    00,3612    1082   1 1011
ALL4BITS  11,2401     824   2  822        ALTTEMP      0063 =  158   3  899      ARCSIN    00,3610    1082   1 1011
ALM/END   43,2116     277  24  275  309   ALXXXZ    37,3076    401   1  395      ARCTAN    13,2545    1135   5  493 1132
ALMCADR      1363 =   112  18  112 1381   ALX1S     F5,1444 =  132   4  395  401 ARCTANXX  13,2573    1135   2 1135
ALMCYCLE     6020     461  14  420  461   AM        E6,1734    140   3  364  376 ARCTRGSP  30,3606     919   3  917
ALMNCADR     5730    1381                 AMG       E7,1460    146   5  211  599 ARCTRIG   23,3303    1248   9  312 1251
ALMXIT    35,2045     627   2  647        AMOVED    11,3634   1241   1 1240      ARET         0161 =  1504   3 1498 1502
ALMXITA   35,2043     627   1  644        ANET         0157 = 1504  11 1497 1503 ARG+         7306    1034   1 1034
ALM112    07,2453     270   1  270        ANGLTIME  22,3001    376   1  376      ARGHI     00,3417    1078   2 1079
ALOAD     41,3002     441   1  422        ANGTERM   E4,1621 =  123   2  803  808 ARGLO     00,3470    1079   1 1079
ALOADED   13,3206    1213   2 1212 1213   ANGX      E5,1500 =  132   2  399  400 ARGZERO      7326    1034   1 1034
ALPHA        0010 =  1199   4 1172 1174   ANGY      E5,1476 =  132   1  400      ARGZERO2     7323    1034   1 1034
ALPHAM    E4,1467 =   118  14  118 1234   ANGZ      E5,1472 =  132   1  400      ARG90        5060    1100   1 1100
ALPHAQ    E6,1424 =   134   7  161 1484   ANG1CHEK  27,3275    852   1  851      AROUT1SF  40,2733     433   1  430
ALPHAR    E6,1425 =   134   7  207 1484   ANTENBIT     4731 =   87  11  335  560 ARTHINSF  40,3125     447   1  445
ALPHASB   E4,1571 =   122   4  122  327   ANTENFLG     0267 =   87               ARTIN1SF  40,3140     447   1  445
ALPHATRY  21,3275    1477                 AOG       E7,1461    146   9  162  599 ARTOUTSF  40,2726     433   2  430  431

HEALTH KEY: NORMALLY DEFINED UNLESS FLAGGED AS FOLLOWS:

UN UNDEFINED          = DEFINED BY EQUALS               J DEFINED BY JOKER OR ERASE ANYWHERE      MD MULTIPLY DEFINED
BD BADLY DEFINED     CD DEFINITION ASSOCIATED WITH CONFLICT             XX MISCELLANEOUS TROUBLE
```

```
SYMBOL TABLE LISTING, INCLUDING DEFINITION, HEALTH, PAGE OF DEF, # OF REFS, PAGE OF FIRST REF, PAGE OF LAST REF.

SYMBOL      DEF    H     REFERENCES        SYMBOL      DEF    H     REFERENCES        SYMBOL      DEF    H     REFERENCES

ARUPT        0010 =   94  13  163 1456  ATOPOTH   13,2717 =   38   1  713       AVGEND    22,3663     867   1  862
ASCALE    13,3757   1245   1 1230       ATOPTHIS  13,2772 =   38   1  713       AVGEXIT      1251 =  108   7  734  869
ASCENT    30,2307    846   3  841  845  ATP       E4,1751 =  124   4  124  853  AVOUTCAD  37,3534     862   1  862
ASCFILT   34,2000 =   35   1  844       ATR       E4,1747 =  124   3  124  850  AX*SR*T   23,3667    1260   1 1259
ASCSAVE   E5,1637 =  127   2  855  856  ATTACHED  43,3141    309   1  275       AXC       01,2355    1085   1 1010
ASCSPOT   32,3710    871                ATTACHIT  43,3152    309   1  309       AXDSTEM      0147 = 1503   4 1500 1501
ASCTERM   30,2721    851   2  851  853  ATTCADR      1304    110   6  110 1328  AXISCTR   E6,1505 =  137  40  137 1507
ASCTERM1  30,2731    851   1  852       ATTCHK    15,3535    978   1  963       AXISDIFF  17,3755    1467   2 1447 1459
ASCTERM2  30,2746    851   1  847       ATTCK2    42,2035    294   2  293  294  AXISDIST  E6,1604 =  139   8 1461 1501
ASCTERM3  30,2747    851   3  851       ATTFLAG      0150 =   79   1  977       AXISGEN   23,3424    1252   4  939  969
ASCTERM4  30,2750    851   1  844       ATTFLBIT     4744 =   79   3  974  978  AXISGEN1  23,3432    1252   1 1252
ASECXI    E5,1573 =  133                ATTPRIO      1306 =  110   2  381 1328  AXISGEN2  23,3461    1252   1 1253
ASENT     30,2000 =   35   3   40  856  ATTSCALE  42,2053    294   1  294       AXISGEN3  23,3504    1253   1 1253
ASENT1    27,2000 =   34   4   39  856  ATTSTEER  17,2710 = 1450   1 1442       AXO       E3,1713     116   1 1145
ASENT2    07,2000 =   30                ATY       E4,1745 =  124   5  124  853  AXT       01,2350    1085   1 1010
ASENT3    05,2000 =   30                AUG2      07,3601   1322   1 1322       AZ           1344     111   4  111  953
ASENT4    14,2000 =   32                AUG3      07,3557   1321   1 1322       AZBIAS    E6,1773     142   1  810
ASENT5    30,2000 =   35                AURLKONI  23,2034    284   1  284       AZEACH    11,2402     824   3  823  824
ASENT6    33,2000 =   35   1  858       AURLOKON  23,2000    283   1  282       AZEL      14,3665     953   1  953
ASENT7    23,2000 =   33   1  852       AUTOCHEK  16,3105   1430   1 1430       AZIMUTH   E5,1400 =  132   5  132  399
ASENT8    34,2000 =   35   2  842  853  AUTOMANV  26,2200    489                AZINCR    E7,1556 =  156   4  156  802
ASINEX    00,3707   1083   1 1082       AUTOMBIT     4743 =   88   5  193  553  AZINCR1   E7,1644 =  156   7  156  823
ASKASTR   07,2334    267   1  267       AUTOMODE     0301 =   88                AZO       26,2022      55   1 1144
ASKIFNRM  10,2530   1356   1 1356       AUTRATE1     4744 =   90                AZCNTRAL  E6,1745 =  137  13 1471 1473
ASTAR     15,3106    968   1  968       AUTRATE2     4743 =   90                ==========================================
ASTNBIT      4731 =   79   1  733       AUTR1FLG     0321 =   90                B*RNB*B*  36,2137     728   1  751
ASTNCLOK  32,3016    784                AUTR2FLG     0320 =   90                BACKHAND  17,2561    1447   1 1447
ASTNDEX      4353 =  785   1  784       AUXFLAG      0147 =   78                BACKP     16,2322    1421   1 1469
ASTNFLAG     0154 =   79   4  732  755  AUXFLBIT     4743 =   78   3  865  866  BADDES    25,2614     562   1  562
ASTNRET   32,3022    784   1  741       AVECTR       0024 = 1146   7 1141 1143  BADEND    07,3701    1325   2  581 1324
ASTNRETN  36,3027    741   1  740       AVEGEXIT     1251 =  108   6  108  754  BADRAD    25,3256     572   1  572
ASTOK     26,3430    606   1  522       AVEGFBIT     4740 =   80   8  197  861  BADROOT   31,3650     826
ASTREND   27,3172    775   1  774       AVEGFLAG     0163 =   80   2  239  716  BADRUPT   25,3177     571   1  571
ASTROMSK  10,3525   1369   1 1365       AVEGOUT   37,3516    862   1  861       BADR2     12,3674    1197   2 1196
ASTROPRO  32,3154    816   1  816       AVEIT     07,2275    267   1  262       BADX      12,2302    1175   3 1173
AT        E4,1653 =  123   7  123  850  AVEMDBIT     4744 =   83                BAILOUT      5626    1379   3  470 1419
AT/RCS    30,2000     40   1  847       AVEMIDSW     0225 =   83   3  332 1219  BAILOUT1     5712    1380   7  255 1374
ATAN=90   13,2600   1135   1 1135       AVERAGEG  33,2211    865                BALLANGS  26,2300     492   4  352  536
ATDECAY   36,2012     39   1  841       AVERTRN   22,3710    868   1  868       BALLEXIT     1337     111   2  492  493
ATIGINC   E7,1400    144   3  399  669  AVESTAR   07,2237    266   2  266  267  BANKCALL     4607     996 308  219 1484
ATMAG     34,3375    844   2  744  838  AVETOMID  13,3522   1218   1  868       BANKJUMP     4631     996  19  284 1502
ATMAGAD   32,3654    838   1  836       AVFLAG       0050 =   71   6  635  772  BANKMASK     4341 = 1097   3 1009 1021
ATMAGADR  36,3137    744   1  735       AVFLAGA   35,2354    635   4  627  669  BANKRUPT     0016 =   94  13  165 1419
ATOPCSM   13,2717   1207   5   38 1241  AVFLAGP   35,2361    635   4  627  669  BANKSET      0165     101  14  998 1369
ATOPLEM   13,2772   1209   4   38 1241  AVFLBIT      4740 =   71                BASEOTP   E4,1530 =  119   2  707  708

HEALTH KEY: NORMALLY DEFINED UNLESS FLAGGED AS FOLLOWS:

UN UNDEFINED          = DEFINED BY EQUALS            J DEFINED BY JOKER OR ERASE ANYWHERE      MD MULTIPLY DEFINED
BD BADLY DEFINED    CD DEFINITION ASSOCIATED WITH CONFLICT             XX MISCELLANEOUS TROUBLE
```

```
SYMBOL TABLE LISTING, INCLUDING DEFINITION, HEALTH, PAGE OF DEF, # OF REFS, PAGE OF FIRST REF, PAGE OF LAST REF.

SYMBOL        DEF  H      REFERENCES     SYMBOL        DEF  H      REFERENCES     SYMBOL        DEF  H      REFERENCES

BASEOTV   E4,1571 =  119   2  707  708 BITSOFF2  41,2751    440   2  440      BIT9         4734   1093  44   68 1502
BASETEMP     1060 =  244   2  244      BITS15+7  10,3530   1369   1 1357      BLANKCHK  10,3152   1363
BASETHP   E4,1560 =  119   2  707      BITS2-10     5002   1095   1   38      BLANKCON  40,2603    418   2  417  431
BASETHV   E4,1503 =  119   2  707      BITS3&4      5745 = 1328   2 1307 1308 BLANKDEX     4743 =  740   1  730
BASETIME  E4,1512 =  119   3  707  708 BITS4+10  10,3533   1370   1 1368      BLANKDSP  41,3565    468   2  468
BAWLANGS  26,2000 =   34   2  351  492 BITS4&5      4754   1094   4  175  440 BLANKET      5466   1351  12  268 1370
BB           0006 = 1297   5 1296 1303 BITS4&6      4762 = 1328   5  222 1307 BLANKSUB     4246    471   2  454 1363
BBANK        0006 =   94  47  163 1378 BITS4-5   07,3763   1328   1 1313      BLNKBBNK     4273    471   1  471
BBSERVDL     5737   1381   1 1380      BITS4-7   33,3060    885   1  878      BLNKSUB1  40,3543    471   2  471
BCDU      E6,1675    140  13  140 1328 BITS5+11  10,3532   1369   3 1361 1368 BLNKWAIT  36,3352    752   1  752
BDDV         7624   1042   2 1009 1042 BITS6+7      4767 =  885   1  877      BLOAD     41,3013    441   1  422
BDOT      26,2010     55   1 1141      BITS6&15  06,3003    191   1  190      BLOCKTOP  F6,1546    139  12  139 1503
BDSU         7103   1027   1 1009      BITS7+4   10,3531   1369   2 1355      BNKCHK    43,3721   1290
BDTOK     27,2461    766               BITS7&8   06,2777    191   2  174  186 BNKOPTN   43,3320   1284
BEE17     04,3030   1183   1 1194      BITS8,9   16,3620   1439   1 1432      BODY      E7,1574 =  151   2  259  263
BEE19     04,3042 = 1183   1 1191      BITS9+7      6017    299   4  299 1382 BOOLSMSK  20,2114    306   3  304  305
BEE22     04,3046 = 1183   1 1174      BITS9,11     5005 = 1431   1 1430      BOOLSTRT  05,3064    229   1  223
BEGDES    25,2564    561   3  526  557 BIT1         4744   1093  75   69 1490 BOOP      37,2755    399   1  399
BELOW1    10,2236   1298   1 1299      BIT1H     32,3437    821   1  819      BORTENT      5576   1378   2 1379 1380
BELOW2    10,2253   1298   2 1298      BIT10        4733   1093  51   68 1485 BOTHABRT     5715   1380   1 1381
BELOW3    10,2267   1298   1 1298      BIT10+15     6037    531   1  531      BOTHAXES  20,3276   1496   1 1500
BELOW4    10,2272   1298   2 1298      BIT11        4732   1093  33   45 1474 BOTHJOBS  10,2677   1359   1 1358
BESTI     E5,1755 =  128  13  128  960 BIT11+1   25,2363    553   1  553      BOTHLITS  25,3663    618   1  618
BESTJ     E5,1756 =  128   6  128  937 BIT12        4731   1093  42   67 1497 BOTHPAD   22,3401    718   1  718
BETAM     E4,1471 =  118   6  118 1243 BIT12,14     7733 =  568   1  567      BOTHSGN   40,2366    414   1  414
BETASB    E4,1573 =  122   3  122  327 BIT13        4730   1093  55   41 1495 BOTHSHIP  22,3340    717   1  718
BETAV     E4,1437 =  118  11  118 1230 BIT13-14     4346 = 1097   6  293 1407 BOV(B)    01,2463   1088   1 1010
BGIM      16,3736   1474   1 1474      BIT14        4727   1093  91   67 1498 BPL       01,2507   1089   1 1089
BGIM23    16,2207   1411   1 1411      BIT14+7   26,2264    490               BPL/BMN   01,2500   1089   1 1010
BHIZ      01,2456   1038               BIT14&11     7731 =  283   2  282  283 BRANCH       6744   1023  10  888 1089
BIASCALE  22,3167    379   1  379      BIT14CCM  10,2265   1298   1 1298      BRATE     E6,1724 =  140   3  376  379
BIASFACT  33,2640    881   1  871      BIT15        4726   1093  57   67 1480 BRNCHCON  40,2567    417   1  417
BIASHI    00,2566   1059   1 1078      BIT15+6      7755   1096   1 1358      BRNCHCTR  12,2267   1175   1 1176
BIASLO    00,2270   1052   1 1079      BIT15/14  41,3311    452   2  452  454 BRSPOT1   31,2546    799
BIASRDOT  40,2662    432   1  432      BIT2         4743   1093  54   68 1470 BRSPOT2   31,2641    801
BIBIBIAS  37,3407    860   1  254      BIT3         4742   1093  41   68 1417 BRSPOT3   31,3013    804
BIGAOS    20,3317   1496               BIT3H     34,3450    845   1  844      BRSPOT4   31,3205    807
BIGIQ     20,2624   1486   1 1486      BIT4         4741   1093  62   68 1460 BRUPT        0017 =   94   4  833 1456
BIGTIME   12,3447   1194   1 1193      BIT4H     30,3007    858               BSUBO     26,2016     55   1 1141
BINCON       4354    476   4  456 1097 BIT5         4740   1093  53   68 1471 BUF          0130     98 168   98 1396
BINROUND  40,3135    447   3  445  447 BIT6         4737   1093  63   68 1464 BUF+      00,2422   1056   3 1055 1058
BIN3         6266 =  531               BIT7         4736   1093  37   68 1440 BUF-      00,2416   1055   3 1055 1058
BITSET       5011 =  904   1  900      BIT7+9PV  23,2314    536   1  536      BUFNEG    00,2531   1058   1 1055
BITSOFF   41,2740    440   1  440      BIT8         4735   1093  48   68 1498 BUFNORM   00,2500   1058   1 1058
BITSOFF1  41,2744    440   1  440      BIT8,9    17,3140   1454               BUFPOS    00,2516   1058   2 1055 1058

HEALTH KEY: NORMALLY DEFINED UNLESS FLAGGED AS FOLLOWS:

UN UNDEFINED         = DEFINED BY EQUALS                J DEFINED BY JOKER OR ERASE ANYWHERE      MD MULTIPLY DEFINED
BD BADLY DEFINED    CD DEFINITION ASSOCIATED WITH CONFLICT            XX MISCELLANEOUS TROUBLE
```

```
SYMBOL TABLE LISTING, INCLUDING DEFINITION, HEALTH, PAGE OF DEF, # OF REFS, PAGE OF FIRST REF, PAGE OF LAST REF.

SYMBOL      DEF     H      REFERENCES     SYMBOL      DEF     H      REFERENCES     SYMBOL      DEF     H      REFERENCES

BUFZERO   00,2363   1055    1 1058      CALCPERR  16,3447   1435    2 1410 1436 CDUIND    E3,1474 =  115   21  176 1371
BUF2         0133     98   29  255 1379 CALCPHI   22,2701    374    1  374      CDULOGIC  10,3606   1394   15  260 1257
BURNBABY  36,2130    728    3  749  841 CALCRGVG  31,2742    803    2  794  796 CDUS         0036 =   94    5  161  543
BUSYMASK  10,3535   1370                CALCRVG   33,2710    882    1  865      CDUSCMD      0054 =   94    1  900
BUTTONS   05,2705    226                CALCSMSC  10,2030   1262    7  934  979 CDUSPOT      0765    103   25  103 1258
BVECTOR   E7,1524 =  151   25  151 1148 CALCTFF   27,3473   1274    1  724      CDUSPOTX     0771 =  104    4  876 1258
BVECTR       0032 = 1146    5 1142      CALCTHET  27,2255    761                CDUSPOTY     0765 =  103    4  876 1258
BVSU         7057   1026    1 1009      CALCTPER  27,3470   1274    1  724      CDUSPOTZ     0767 =  103    4  876 1258
BYLMATT   15,3527    978    2  975      CALCXY    26,3622    612    1  610      CDUT         0035 =   94   13  198  611
BZE/GOTO  01,2473   1089    1 1010      CALC2BIT     4743 =   72                CDUTCMD      0053 =   94    2  552  900
B12-1        4347 =  476                CALC3BIT     4742 =   72                CDUTEMPX     1154    107    3  576  876
B12T14       7743 = 1097    1 1012      CALGOPOD     6011    235    1  228      CDUTEMPY     1155    107    3  576  876
B14+B2    25,2625    562    1  562      CALL         6661   1021    1 1089      CDUTEMPZ     1156    107    2  874  876
B2/A2     13,2541   1134    1 1136      CALL/ITA  01,2513   1089    1 1010      CDUTODCM  22,2410    369    3  363  496
B2F8      15,3216    970    1  970      CALLACCS  20,2134   1404    1 1405      CDUTRIG   23,3522   1256   11  502  979
B2XSC     13,2537   1134    1 1134      CALLCODE     4757   1094    5  291 1508 CDUTRIGS  23,3532   1256    3 1256 1259
B3TOB4    01,2602   1092    2 1091 1092 CALLDGCH  26,3642    612    4  531  613 CDUWHZ    32,3146    816    1  816
B5OFF        5565   1377   11  311  720 CALLGMBL     4740 = 1409    3 1426 1481 CDUWXFR   30,3425    915    1  915
B5TOB8    01,2471   1088                CALLQERR  17,2124   1440    1 1439      CDUX         0032 =   94   29  161 1435
======================================= CALLRECT  11,3366   1236    4 1236      CDUXCMD      0050 =   94    5  184 1417
C*MM*N1   23,3645   1259    2 1259 1260 CALLRPRT  13,2511   1133    1 1133      CDUXD     F6,1634    139   29  139 1448
C*MM*N2   23,3647   1259    1 1259      CALLRTRP  13,2421   1131    1 1131      CDUY         0033 =   94   17  161 1449
C*MM*N3   23,3660   1259    2 1259 1260 CALLT-35  36,2213    729    1  729      CDUYCMD      0051 =   94    2  184 1416
CA+ECE    07,3125   1311    1  180      CALOOP    14,3327    944    1  944      CDUYD     E6,1635 =  139   12  162 1449
CADRFLSH     0371    102    6  162 1367 CALOOP1   14,3355    944    2  944      CDUZ         0034 =   94   20  161 1449
CADRMARK     0372    102                CALSAM    07,2654    960                CDUZCMD      0052 =   94    2  185 1416
CADRMASK  10,3536   1370    1 1360      CALSAM1   07,2653    960    1  959      CDUZD     E6,1636 =  139   10  207 1449
CADRSTOR     1041    104   13  233 1366 CAL53A    14,3316    944    1  927      CDUZDLIM  30,3757    922    1  911
CADRTAB   01,2001 =  250    1 1303      CAM       F6,1732 =  140    4  140  365 CEARTH       0016 =  933    3  932  936
CAGESUB   06,2735    190    1  174      CANTROO   04,2105    238    2  238      CENTANG   E7,1620    147    6  210  665
CAGESUB1  06,2743    190    1  184      CANV37    04,2160    239    1  239      CG        E5,1571 =  127   16  127  810
CAGESUB2  06,2746    190    1  176      CATLOG    14,2346     53   11  935  960 CGCALC    31,3222    808    2  794  807
CAGETEST  07,3660   1324    5 1308 1313 CCALL        6647   1021    1 1009      CGOTO        6724   1022    1 1009
CAGETSTG  07,3646   1324    1 1313      CCSHOLE      5701   1380   23  388 1464 CHAN      F5,1443 =  132
CAGETSTJ  07,3672   1324    5 1307 1316 CCSL         7704   1044    1 1097      CHANBITS  41,2725    440    1  440
CAGETSTQ  07,3665   1324    3 1314 1315 CD*TR*G   23,3526   1256    2  261  493 CHANBKUP     0374    102    6  161  832
CALCGA    23,3336   1250    4  386  972 CD*TR*GS  23,3540   1257    3 1256 1259 CHANDSP   41,2533    429    1  428
CALCGA1   23,3376   1250    1 1251      CDELF/2      0016 = 1265                CHANGEVB  07,2523    272    1  272
CALCGRAV  33,2642    882    2  871  883 CDESBIT      4726 =   87    3  531  610 CHANG1       5113   1101    6  276 1289
CALCGRV1  33,2677    882    1  882      CDESFLAG     0264 =   87    2  284  526 CHANG2       5117   1101    1 1001
CALCGTA   23,3232   1246    4  941  969 CDHMVR    34,3133    653    2  633  643 CHANJOB   01,2712   1106    4 1101 1113
CALCMAN2     0053 =   72    2  376  377 CDRVE     06,2012    166                CHANLOAD  41,3231    444    1  444
CALCMAN3     0052 =   72    1  376      CDU*NBSM  23,3653   1259    4  708  980 CHAN12       0012 =   95   70  175 1481
CALCN83   36,3463    754    1  759      CDU*SMNB  23,3640   1259    4  534  955 CHAN13       0013 =   95   22  223 1455
CALCN85   32,2570    752    1  727      CDUINC    10,3670   1395                CHAN14       0014 =   95   26  184 1417

HEALTH KEY: NORMALLY DEFINED UNLESS FLAGGED AS FOLLOWS:

UN UNDEFINED           = DEFINED BY EQUALS           J DEFINED BY JOKER OR ERASE ANYWHERE     MD MULTIPLY DEFINED
BD BADLY DEFINED     CD DEFINITION ASSOCIATED WITH CONFLICT          XX MISCELLANEOUS TROUBLE
```

```
SYMBOL TABLE LISTING, INCLUDING DEFINITION, HEALTH, PAGE OF DEF, # OF REFS, PAGE OF FIRST REF, PAGE OF LAST REF.

SYMBOL      DEF     H        REFERENCES       SYMBOL      DEF     H        REFERENCES       SYMBOL      DEF     H        REFERENCES

CHAN30       0030   =    95    9  171 1407 CHKRTIMR 16,2676     1426    4 1426 1427 CMNTOVFL 12,2315     1176    1 1176
CHAN31       0031   =    95   20  293 1442 CHKSDATA 14,3265      943    2  942  948 CMOON        0022   =   933    2  932  933
CHAN32       0032   =    95    3  163  866 CHKSRCH  26,3443      608    1  612      CMOON8IT     4731   =    81
CHAN33       0033   =    95   21  177  877 CHKSUPR  43,3651     1289    1 1289      CMOONFLG     0173   =    81    9   38 1208
CHAN5        0005   =    95    6  223 1448 CHKTEMX  37,3640      875    1  875      CMPONENT 30,2607      850    1  848
CHAN6        0006   =    95    3  223 1411 CHKVISFZ 16,2744     1427    1 1426      CMPX1    E5,1445   =   132    2  398
CHAN76       0076   =    95                CHKWHAT  07,2404      269    1  270      CNGL     22,2400      369
CHAN77       0077   =    95    2  222 1223 CHK12    07,2456      270    1  270      CNTABTAD 21,2144      832    1  832
CHAR         0117   =    98    5  410  412 CHNL12       0066   = 1474    3 1474      CNTDNDEX     4753   =   740    5  728  742
CHARALRM 40,3463      461   18  410  464 CHRPRIO      4346      476    7  168 1389 CNTRCHK  43,3471     1286
CHARIN   40,2057      410    1 1335      CH31TEMP E6,1443      135    2 1430 1444 CNTRCON      4762   = 1283    1 1286
CHARIN2  40,2072      410    2  410      CH5MASK      1257      109   13  162 1503 CNTRLOOP 43,3472     1286    1 1287
CHECKALT 30,2755      852    1  851      CH6MASK      1260      109    7  202 1438 CNTTHROT E7,1623   =   156    3  797  814
CHECKB       7771     1299    1 1296      CIRCL    34,2372      642    3  641      COAALIGN 37,2301      390    1  388
CHECKCTR 12,2644     1181    2 1175 1193 CIRCULAR 12,3670     1197    1 1196      COARFINE 14,3347      944
CHECKG   37,2332      390    2  387  388 CKIMUSE      5246     1119                COARS    07,2775     1309    1 1309
CHECKG1  37,2335      390    1  391      CKMID2   13,3662     1221    1 1240      COARSE   14,3542      949    5  944  972
CHECKIN  17,2300     1443    1 1442      CKMODCAD 43,2411      286    3  278  285 COARSERR 07,3075     1311    2 1310
CHECKMAX 22,2117      364    1  364      CKSTALL  32,2103      220    1  220      COARSRET 15,2316      927    1  944
CHECKMM      5323     1291    5  729  834 CK4V32   04,3510     1388    3 1387      COARSTOL 07,3103     1311    1 1311
CHECKNJ  43,3335     1284    3 1284 1289 CLEANDSP 10,2451     1354    3  512  741 COARSTST 07,3641     1324    2 1321
CHECKRR  43,2667      292    1  292      CLEANEND 10,3253     1365    1 1363      COARSTYP 15,2326      928    1  927
CHECKTAB 04,2112      239    1  238      CLEAR    40,2456      416    1  411      COARS1   07,3002     1309    1 1309
CHECKLUP 16,2042     1409                CLEARMRK     5476     1351    2  236 1351 COARS2   07,3025     1310    2 1310 1311
CHECKYAW 23,2453      853    2  852      CLEAR1   40,2511      416    1  416      COASCODF 07,2132      258    1  257
CHEKAXIS 27,2137      497    1  497      CLOAD    41,3030      441    1  422      COASTDB  E6,1602   =   139    7 1461 1501
CHEKBITS 16,2000     1407    2 1409 1419 CLOCKCON 10,3551     1370    1 1355      COASTSET 36,3607      756    1  755
CHEKMORE 16,2016     1407    1 1418      CLOCPLAY 10,2466     1355    2  740      COASTTJ  17,3455     1461    4 1461 1467
CHEKSTIK 17,2354     1444    1 1442      CLOG2/32 30,3061      859    1  859      COATRIM  14,3715      972    1  969
CHEXERR  32,2554      590    1  589      CLOKJOB  36,2736      739    1  739      CO8          0040   = 1146    4 1141 1142
CHKBIT10 17,2237     1442                CLOKTASK 36,2716      739    4  254  739 CODE         0124   =    98   15  411  468
CHKBMAG  30,2536      849    1  849      CLOSEADR 21,3560     1482    1 1482      CODE1TO6 07,2116      257    1  257
CHKCORS  07,3060     1310    1 1311      CLOSEOUT 17,3270     1456    4 1452 1482 CODE500  32,3064      785    1  785
CHKDATA1 20,2014      305    1  305      CLPASHI  40,2474      416    1  416      CODE7    07,2102      257    2  257
CHKFAIL1     5605     1378    1 1381      CLPASS       1014      104   13  233  469 COEFCTR      0160   = 1494    7 1492 1493
CHKFAIL2     5612     1378    1 1378      CLRADMD1     6032      531    3  511  613 COEFF    20,3171     1494    4 1492
CHKINGTS 17,2641     1448    1 1448      CLRADMOD     6027      531    9  240  559 COEFFQ   E6,1626      139    7  139 1493
CHKLINS1 26,2221      490    1  489      CLRMOON  13,2747     1208    2 1209 1237 COEFFR   E6,1627   =   139    6 1455 1493
CHKLINUS 26,2214      489    2  489      CLROVFLW 13,2547     1135    1 1135      COF      E6,1667   =   140   45  364  498
CHKLIST  05,3541      990                CLRRND   43,3034      299    1  299      COFMAXGO 22,2176      365
CHKMINTJ 17,3656     1465    2 1463 1466 CLRXFLAG 30,2717      851    1  852      COFSKEW  E6,1724   =   140    8  140  367
CHKNOVAC 01,3641     1302    1 1305      CLR5     40,2514      416    1  416      COGA     E5,1765   =   130   17  130 1196
CHKOUT   14,3313      943    1  943      CLUPDATE 35,3574      684    1  683      COGAFBIT     4741   =    82
CHKPOOH  43,2121      277    6  293  482 CLUPLOCK 04,3353     1336    1 1336      COGAFLAG     0203   =    82    3 1184
CHKPRIO  10,2422     1353    1 1352      CLI/NET+ 20,3440     1498                COGAMAX      0016   = 1200    4 1191 1195

HEALTH KEY: NORMALLY DEFINED UNLESS FLAGGED AS FOLLOWS:

UN UNDEFINED          = DEFINED BY EQUALS            J DEFINED BY JOKER OR ERASE ANYWHERE      MD MULTIPLY DEFINED
BD BADLY DEFINED     CD DEFINITION ASSOCIATED WITH CONFLICT            XX MISCELLANEOUS TROUBLE
```

```
SYMBOL TABLE LISTING, INCLUDING DEFINITION, HEALTH, PAGE OF OEF, # OF REFS, RAGE OF FIRST REF, PAGE OF LAST REFF.

SYMBCL      DEF    H      PEFERENCES     SYMBOL     DEF    H      REFERENCES     SYMBOL     DEF    H      REFFRENCES

CUGAMIN     0C10 = 12)C    3 1192 1194 CONTINU  43,3621     1289    5 1288 1289 COS15DEG 23,2315      536    1  534
CUGAUVFL 12,2764    1134   2 1134 1196 CONTMANU 22,3170      379    1  378      COS60DEG 23,2502 =    613    2  610
COGLOLIM )4,3C63    1183   1 1195      CONTRLBT    4743 =     85    6  191 1429 COTROLER F6,1630      139    6 1409 1470
COGUPLIM 04,3061    1183   2 1192      CONTRLFL    0243 =     85                ~~COUNT~~        0143 =     99   12  411  460
COLINEAR 04,3161    1136   1 1186      CUNTSERV 33,2501      878    6  876  892 COUNT'FM 11,2347      823    I  822
COLRFG      1116 =   1)7   7  1)7 1241 CONUMNOR 41,3141      443    1  +43      COVCNV   42,3706      503    1  503
COMADRS  43,3536    1287   2 1289      CONV3    42,3634      502                COZY4    E7,1666      148    4  689  692
CUMFAIL  36,257C     737   2  253  867 CONV4    42,3645      502    1  502      CPHI        0321 =    101   11  352 1414
COMFAIL1 36,2607     737   1  74)      CONV5    42,3647      502    1  502      CPSI        0323 =    101    5  363 1413
CUMFAIL2 36,2622     737   1  74)      CCN1        5407     1296    1 1297      CREWMANU 43,3011      298    1  275
CUMFAIL3 36,2611     737   3  726  728 CON2     10,2301     1299    1 1296      CRITCON  40,2304      413    1  412
COMFAIL4 36,2613     737   2  726  727 CON2AOR     5424     1296    1 1296      CROSCOMP 21,2513      900    3  899  903
CUMFLAG     5513    1372   2  733 1372 COOLIT   15,2135      262    3  261  262 CROSSOUT 21,2611      902    1  902
COMMAND  E3,1471 =   115   6 1306 1311 CCOLOUT  07,2320      267    1  262      CSI/A    34,2113      638    1  629
COMMECS  20,2574    1486   1 1486      COPIES   10,2747     1360    1 1352      CSI/B    34,2125      639    1  647
COMMFX   43,3530    1287   2 1289      COPIES2  10,2750     1360    1 1357      CSI/81   34,2165      639    3  644  647
COMMINIT 30,2267     842   2  835  842 C)PINDEX    0164 = 1370   24 1353 1367 CSI/B2   34,2176      639    1  646
COMMNOUT 12,2747    1184   1 1197      CORMPAC     0157 = 1370    3 1365 1369 CSI/B22  34,2216      640    1  640
COMMON   36,2404     733   1  727      COPYCYC  33,2352      871    3  365  872 CSI/B23  34,2224      640    1  640
COMMCNLM 12,3436    1194   1 1194      CCPYCYCL 33,2217      865    1  881      CSI/B23D 34,2237      640    1  640
CUMNFC   07,3104    1311   1 1310      COPYCYC1 33,2505      879    1  877      CSI/83   34,2330      641    1  641
COMP        7711    1044   4 1011 1074 COPYNORM 10,2746     1360    1 1356      CSI/COH  35,2000 =     36    3  627  664
CUMPCFK  06,3623     345   1  344      COPYRACS 10,2412     1353    1 1362      CSI/COH1 34,2000 =     35    1  638
COMPDISP 37,3232     708   1  710      COPYTOGO 10,2410     1353    1 1363      CSI/SOL  34,2737      647    1  646
CUMPICK  41,2542     429   1  429      COREINC  01,3037     1109    2 1105 1109 CSIALRM  E7,1613      147    5  147  647
COMPMAT  13,2250     712               CORFOUNO 01,2642     1105                CSISTFP  34,2732      646    1  646
COMPMATX 27,2C72     496   1  498      CORSCHK2 07,3072     1311    2 1310 1311 CSMCONIC 13,3124     1211    3  351  609
COMPMFSN 27,2151     497   1  4)7      CORSIT   14,3744      972    1  972      CSMDKFLG    0305 =     89
COMRNUMB    1167 =   107  11  107 1391 COS.01   15,2154      263    1  262      CSMDOCKD    4730 =     89   11  305 1484
COMPOS   07,3037    1310   1 1310      COSCOU      0743 =    103    5  103 1258 CSMINT   24,3356      583    1  583
COMPTFST 41,2453     427   6  427  441 COSCOUX     0747 =    103    6  493 1263 CSMMASS     1327      110   13  207 1492
COMPTGO  35,2437     656   1  633      COSCOUY     0743 =    103    5  493 1263 CSMPREC  13,3101     1211    5   38  729
COMPTST1 41,2455     427   1  423      COSCOUZ     0745 =    103    7  493 1262 CSMSTORE 23,2427      700    1  700
COMP12   22,2211     366   1  366      COSF        0030 = 1201    4 1196 1197 CSMVFC   43,3047      301    1  276
COMTERM  11,3057    1232   1 1235      COSI     26,2000       54    2 1142      CSS         0016 =    936    1  936
CCMZERO  07,3114    1311   2 1310 1311 COSINE   00,3517     1080    2 1011 1257 CSSUN    14,2614      933    1  933
CONC+S1  43,3244    1283   1 1287      COSMG       0061 = 1411    3  199  200 CSS33    14,2772      936    2  935
CONC+S2  43,3245    1283   1 1287      COSPHI/2    0022 = 1245    6 1232 1235 CSS40    14,2770      936    1  935
CONICS   12,2000 =    31   3 1171 1187 COSRHIE  11,3271     1235    1 1232      CSS5     14,2612      933    2  932  933
CONICS1  04,2000 =    29   4   47 1184 COSTALIL    0000 =    247    3  246  247 CSTH     E5,1731 =    130    9  130 1197
CONST    30,2567     849   1  843      COSTALIN 05,2153 =    208    2  204  217 CSTH-RHO E5,1735 =    130    4  130 1192
CONTABRT 05,3417     833   1  832      COSTH       0020 =    129   18  312 1250 CSTODAY  15,2000       54    1  983
CONTRL2  01,3667    1303   2 13)5      COSTHET1 E5,1565 =    127    2  127  852 CSUN        0020 =    933    1  933
CONTDESG 26,3566     610   1  612      COSTHFT2 E5,1567 =    127    2  127  852 CS359+   35,2422      637
CONTDES2 26,3575     610               COS1/2DG 25,3056      568    1  566      CTHETA      0322 =    I01    3  381 1413

HEALTH KEY: NORMALLY DEFINED UNLESS FLAGGED AS FOLLOWS:

UN UNDEFINED          = DEFINED BY EQUALS              J DEFINED BY JOKER OR ERASE ANYWHERE     MO MULTIRLY DEFINED
BD BADLY DEFINED     CD DEFINITION ASSOCIATED WITH CONFLICT          XX MISCELLANEOUS TROUPLE
```

```
SYMBOL TABLE LISTING, INCLUDING DEFINITION, HEALTH, PAGE OF DEF, # OF REFS, PAGE OF FIRST REF, PAGE OF LAST REF.

SYMBOL      DEF    H      REFERENCES    SYMBOL  .   DEF    H      REFERENCES    SYMBOL      DEF    H      REFERENCES

CTLIST       0334 =  102   7  102  990 DAPLRUPT E6,1753 =  141                DCOMPTST 41,2466    428   2  427
CTRCHECK  21,3636   1507   1 1506      DAPS1    16,2000 =   32   4 1407 1474 DCTSTCYC 41,2501    428   2  444
CULTBIT      4736 =   73               DAPS2    17,2000 =   32   4 1401 1458 DDUMCALC 32,2712    783   1  809
CULTED    14,2765    936   4  936      DAPS3    20,2000 =   32   6   44 1495 DDUMCRIT 32,3071    785   1  783
CULTFLAG     0065 =   73   4  935  936 DAPS4    21,2000 =   32   4 1470 1506 DDUMGOOD 32,2773    784   1  783
CULTRIX   E5,1706 =  128   1  936      DAPTEMP1 E6,1736    141  29  135 1468 DDV         7620   1042   1 1009
CURSOR       1240 =  108   7  108  957 DAPTEMP2 E6,1737 =  141  12  136 1469 DDV/BDDV 00,2353   1055   2  826 1042
CURTAINS     5705   1380   8  939  967 DAPTEMP3 E6,1740 =  141   8  136 1469 DDVCALL  00,3004   1066   1 1066
CUTOFF    34,3526    854   4  742  854 DAPTEMP4 E6,1741 =  141   4  136 1445 DEAD     27,2230    746   2  746
CUTOFF1   34,3540    854   1  854      DAPTEMP5 E6,1742 =  141   5  136 1423 DEBIT       5524   1372   3  738 1372
CUTOFF2   34,3550    854   2  854  855 DAPTEMP6 E6,1743 =  141  11  136 1468 DEC-12   12,2016   1099
CVECTR       0010 = 1146   1 1142      DAPTREG1 E6,1744 =  141   3  137  141 DEC-6    12,2015   1099
CYCLSHFT  43,3500   1287               DAPTREG2 E6,1745 =  141   1  138      DECBRNCH    0777    104  18  411  462
CYL          0022 =   94  23  412 1287 DAPTREG3 E6,1746 =  141   1  138      DECCEND  40,2245    412   2  412
CYR          0020 =   94  42  243 1302 DAPTREG4 E6,1747 =  141   9 1419 1424 DECCNTR  33,2310    867   1  866
C1/2         7740   1095   1 1100      DAPTREG5 E6,1750 =  141   5  136 1424 DECDSP   41,2552    429   1  421
C13BANK   17,2000 =   32   1  577      DAPTREG6 E6,1751 =  141   7  138 1424 DECDSP3  41,2624    430   2  430
C13FSAV      1266    109   2  577  578 DAPT4S   06,3167 =  199   3  169  198 DECEND   40,2250    412   2  412  419
C13QSAV      1265    109   8  991 1455 DAPZRUPT E6,1756 =  142   4 1410 1457 DECON    40,2311    413   1  413
C13SLOOP  17,2030    577   1  578      DASAMPL  25,3340    574   1  574      DECOUNT     0117 =   98  27  423  447
C13STALL     6040    578  10  482 1454 DATAGOOD E7,1733 =  150   5  150  612 DECQTIMR 16,2714   1426   1 1426
C13STALL1 17,2022    577   1  578      DATAPL   E5,1472 =  132  13  387  391 DECRET      0115 =   98   2  443  444
C3/2         7760   1096   1 1100      DATGDCHK 26,3653    612   1  612      DECROUND 40,3310    457   1  456
C33JMP    06,2763    191   1  178      DAXMAX   30,3753    922   2  913  922 DECRTIMR 16,2716   1426   1 1426
C33TEST   06,2374    177   6  174  176 DAY/2MAX 30,3755    922   2  913  922 DECTEM      0122 =   98   3  429
C5/2         4776   1094   1 1100      DAZMAX   30,3753 =  922   1  913      DECTEST  41,2472    428   2  427  428
====================================== DB          1343    111   8  111 1497 DECTOBIN 40,2212    412   1  412
DACLIMIT  20,2446   1417   3 1417      DBB1        0143 = 1503   5 1496 1501 DEC17       4352 =  393   3  385  862
DACLOOP   20,2410   1417   1 1417      DBB2        0144 = 1503   3 1496 1500 DEC227   07,2675    960   1  959
DAD          7016   1024   1 1009      DBB3        0146 = 1503   4 1497 1500 DEC23    42,2033    287   1  287
DALTRATE  E7,1713 =  157   3  157  897 DBB4        0145 = 1503   6 1497 1501 DEC27       4755 = 1094
DAMPING   17,2374   1444   1 1444      DBFUN    20,3534   1500   1 1500      DEC29       4756 = 1094
DANZIG       6102   1001  65  827 1399 DBONE    20,3343   1497   1 1497      DEC45       4763   1094   2 1014 1087
DAPARUPT  E6,1752 =  141   5  141 1456 DBSELECT    4741 =   90   1 1404      DEC51    04,3256   1329
DAPATTER  43,2164    279   1  275      DBSELFLG    0316 =   90               DEC58    37,2474    393   1  387
DAPBITS   05,3505    834   1  833      DBSLECT2    4740 =   90   1 1404      DEC585   37,3055    400   1  388
DAPBOOLS     0111 =   89  66  162 1507 DBSL2FLG    0315 =   90               DEC66    31,2454    797   2  791  797
DAPBQRPT  E6,1754 =  142   2 1426 1456 DBVAL1      1343 =  111   6 1495 1501 DEC70    04,2435    244   1  238
DAPDATA1  20,2004    304   1  304      DBVAL2      0114 = 1504   2 1495 1497 DEFUNCT  21,3170   1472   1 1472
DAPDATA2  01,2241    307   3  307      DBVAL3      0115 = 1504   3 1495 1498 DEG.5    15,2612    958   1  956
DAPDATA3  01,2306    307               DCDU     E6,1634 =  140               DEGCOM   40,2712    432   1  431
DAPDATR1     1340    111  10  305  326 DCMCL    30,3211    910   1  916      DEGCON1  40,3123    447   1  446
DAPDAT2   01,2256    307   1  307      DCMTOCDU 22,2654    374   2  377  498 DEGINSF  40,3037    446   2  445
DAPDISP   43,3134    304   1  275      DCOGA       0014 = 1200   4 1193 1195 DEGINSF2 40,3050    446
DAPIDLER  16,2037   1409   3  234 1410 DCOMP       7726   1044   2 1044      DEGOUTSF 40,2604    431   2  430  431

HEALTH KEY: NORMALLY DEFINED UNLESS FLAGGED AS FOLLOWS:

UN UNDEFINED          = DEFINED BY EQUALS             J DEFINED BY JOKER OR ERASE ANYWHERE     MD MULTIPLY DEFINED
BD BADLY DEFINED     CD DEFINITION ASSOCIATED WITH CONFLICT              XX MISCELLANEOUS TROUBLE
```

```
SYMBOL TABLE LISTING, INCLUDING DEFINITION, HEALTH, PAGE OF DEF, # OF REFS, PAGE OF FIRST REF, PAGE OF LAST REF.

SYMBOL      DEF     H      REFERENCES      SYMBOL      DEF     H      REFERENCES      SYMBOL      DEF     H      REFERENCES

DEGREE1  14,3366       944   1  944      DELTAX   E5,1664 =  131  12  131 1154 DESCOUNT    1113      106   4  525  562
DEGTAB   40,2722       433   2  432  433 DELTEEO  E7,1605 =  147   4  673      DESGLOS  26,3635      612   1  610
DEG24    15,2152       263   1  261      DELTHET  E7,1571 =  151   7  151  262 DESIGBIT    4733 =     87   5  531  562
DEG30    15,2610       958   1  956      DELTIME  12,2421     1178   3 1174 1193 DESIGFLG    0271 =     87   1  562
DEG342   15,2150       263   1  261      DELTTFAP E7,1425      144   1  799      DESLOOP  25,2571      562   5  562  613
DEG359   14,3367       945   1  944      DELV        0324      101  12  101  964 DESRET      1112      106  10  106  559
DEG60    15,2614       958               DELVCSI  E7,1573      147  16  147  646 DESRETRN 25,2437      557   1  556
DEIMUBCB 32,3425       820   2  798  817 DELVCTL  E7,1501 =  154   3  754  755 DESRTRN  25,2443      557   2  557
DEL      E6,1744 =     137   3 1472 1474 DELVEET1 E4,1657      121   5  205  640 DETENTCK 16,3067     1430   2 1428 1429
DELAYEX     5237      1118   1 1117      DELVEET2 E4,1665      121   6  205  655 DEXDEX      0142 =     99   7 1256 1261
DELAYJOB [illegible],3736 1374  16  220  949 DELVEET3 E4,1756      123  15  205  776 DEXI        0143 =    100   1 1260
DELAYLOC    1323       110   6  233 1375 DELVIMU  E7,1622      148   7  329  758 DEX1        0143 =     99   5  100 1261
DELAYNUM    4743 =      38   1 1374      DELVLVC  E7,1433      145  22  145  712 DEX2        0144 =    100
DELCDUX  E6,1637       139   6  139 1419 DELVOV      1250 =  109   6  329  712 DFRNT    40,3413      459
DELCDUY  E6,1640 =     139   3  140 1419 DELVREF  E7,1526 =  154   5  154  882 DGBF     20,3055     1492   2 1488
DELCDUZ  E6,1641 =     139   3  140 1419 DELVROD  E7,1766 =  158   7  159  819 DGBITS   25,3136      570   4  569  574
DELCOMP  22,2527       371   3  376  497 DELVSAB  E7,1663 =  148   4  148  761 DGCHECK  25,3232      572
DELDCDU  E6,1637 =     140   2  377  381 DELVSIN  E7,1655 =  148  14  148  761 DGCHECK2 25,3233      572   3  574
DELDCDU1 E6,1640 =     140   1  381      DELVSLV  E7,1433 =  145   4    1  623 DGOODCHK 25,2770      567   1  567
DELDCDU2 E6,1641 =     140   1  381      DELVTEST 27,2252      760               DIDFLAG     0020 =     69
DELDEP   E5,1757 =     130   5  130 1181 DELVTPF  E4,1740      123   3  210  666 DIDFLBIT    4727 =     69   4  228  903
DELDV    E7,1611       147  13  147  646 DELVTPI  E7,1575      147   5  147  666 DIFEQ+0  11,3473     1239   1 1235
DELEL    E7,1575 =     147   4  670  673 DELVX       0324 =  101  12  338  875 DIFEQ+1  11,3477     1239   1 1235
DELELO      0032 =     665   3  670  673 DELVY       0326 =  101  10  341  875 DIFEQ+2  11,3510     1239   1 1235
DELERLIM 30,3755 =     922   1  915      DELVZ       0330 =  101   9  341  875 DIFEQCNT E3,1500      115  25  115 1241
DELGMBLP 30,3261       911   1  911      DELX     E5,1642 =  130   6  130 1176 DIFEQCOM 11,3653     1241   2 1239
DELINDEP    0014 =    1201   2 1180 1181 DEP         0036 = 1201   1 1180      DIFEQTAB 11,3304     1235   1 1235
DELLOOP  00,3741      1374   1 1374      DEPRCRIT 22,3661      830   2  802      DIFEQ0   11,3377     1236   1 1240
DELLT4   E7,1451       145   8  145  762 DEPREV   E5,1761 =  130   3  130 1180 DIFFALT  E7,1577      147   5  205  654
DELM     E5,1550 =     133   5  348      DERCLOOP 31,3577      825   1  826      DIMOBIT     4744 =     73
DELMAX1  34,2105       638   2  646      DERCOF+1    0153 =  100               DIMOFLAG    0073 =     73  23  247 1241
DELMLP   37,2646       397   1  398      DERCOF-1    0151 =  100               DINDX       0063 =    142   6 1417
DELOK    12,2632      1181   1 1180      DERCOF-2    0150 =  100               DIRADRES    6127     1002   2 1016
DELPEROR    1274       109   5  379 1436 DERCOF-3    0147 =  100               DISDVLVC 35,2375      636   2  629  651
DELQEROR    1275       109   3  331 1449 DERCOF-4    0146 =  100               DISGRVER 15,3015      964   1  963
DELQFIX  F5,1503 =     126   2  126  388 DERCOF-5    0145 =  100               DISPCHNG 36,2402      733   4  726  732
DELREROR    1276       109   3  381 1449 DERCOF-6    0144 =  100               DISPCOMN 31,3442      812   1  812
DELRSPL  22,3543 =      38               DERCOF-7    0143 =  100               DISPDEX     1162      107  24  155  833
DELT     E5,1644 =     130   3  130 1174 DERCOF-8    0142 =  100               DISPEXIT 31,3415      811   5  796  811
DELTACSM E3,1572       116   1  605      DERCOFN     0152 =  100   1  827      DISPEX66 31,3420 =    811   3  813  814
DELTAH   E7,1664 =     157   7  157  388 DERPTR      0141 =  100   3  325  826 DISPGYRO 15,3273      972   1  969
DELTALEM E3,1644       116   1  605      DERTABLL 31,3670      827   1  825      DISPINIT 21,2626      902   1  898
DELTAQ   E7,1546 =     151   8  151 1149 DESASCNT    0004 =  247   3  246  247 DISPLACE 41,3136      443   2  443
DELTATM  E7,1426 =     145   2  527      DESC/ASC 05,2277 =  212   1  217      DISPLAYE 35,3604      685   2  664  665
DELTATOK 04,3624      1390   1 1390      DESCBITS 07,2441      270   1  269      DISPLAYS 10,2000 =     30   3 1351 1379

HEALTH KEY: NORMALLY DEFINED UNLESS FLAGGED AS FOLLOWS:

UN UNDEFINED           = DEFINED BY EQUALS            J DEFINED BY JOKER OR ERASE ANYWHERE       MD MULTIPLY DEFINED
BD BADLY DEFINED     CD DEFINITION ASSOCIATED WITH CONFLICT             XX MISCELLANEOUS TROUBLE
```

```
SYMBOL TABLE LISTING, INCLUDING DEFINITION, HEALTH, PAGE OF DEF, # OF REFS, PAGE OF FIRST REF, PAGE OF LAST REF.

SYMBOL      DEF     H       REFERENCES      SYMBOL      DEF     H      REFERENCES     SYMBOL      DEF     H      REFERENCES

DISPNUT   36,3011     741    1  740      DL126     E6,1423  =  207                  DL404     E6,1520  =  213
DISPN5X   40,3761     706    2  706      DL127     E6,1635  =  207                  DL405        0113  =  213
DISPRATE  20,2257    1413    1 1413      DL128     E6,1636  =  207                  DL406        1327  =  213
DISPRSFT  21,2653     903    2  895  898 DL129        0033  =  207                  DL407        1300  =  213
DISTFM       0122 =    98    3  427      DL130        0034  =  207                  DL408     E7,1460  =  213
DIVIDER   16,2310    1420    2 1420      DL131        0035  =  207                  DL409     E7,1462  =  213
DKALT     16,3442    1435    1 1436      DL132     E6,1425  =  207                  DL410     E7,1733  =  213
DKDB      E6,1411     134    2  224 1508 DL133     E6,1514  =  207                  DL411        1356  =  213
DKKAOSN   E6,1405     134    1  224      DL201     E6,1516  =  209                  DL501     E4,1635  =  215
DKOMECAN  E6,1404     134    2  224 1423 DL202     E6,1517  =  209                  DL502        0113  =  215
DKTRAP    E6,1403     134    2  223 1423 DL203     E6,1520  =  209                  DL503        0025  =  215
DLAND     E5,1631 =   127   12  127  801 DL204        1331  =  209                  DL504        0113  =  215
DLANDX    E5,1631 =   127    1  328      DL205        1334  =  209                  DL505        1327  =  215
DLANDY    E5,1633 =   127    1  328      DL206        1335  =  209                  DL506        1300  =  215
DLANDZ    E5,1635 =   127    1  328      DL207        1336  =  209                  DL507     E6,1422  =  215
DLAYJOB   00,2000 =    29    1 1374      DL208        0025  =  209                  DL508     E6,1423  =  215
DLOAD        6073    1000    1 1009      DL209        1356  =  209                  DL509     E6,1635  =  215
DLOAD*       7754    1096    1 1004      DL210        0037  =  209                  DL510     E6,1636  =  215
DLOADCOD     7753    1096    1 1016      DL211        0040  =  209                  DL511        0033  =  215
DLY2         5214    1117    2 1117 1374 DL212        0041  =  209                  DL512        0034  =  215
DL101        1336 =   206                DL213        0113  =  209                  DL513        0035  =  215
DL102        0025 =   206                DL214        1327  =  209                  DL514     E6,1425  =  215
DL103     E6,1516 =   206                DL215        1300  =  209                  DL515        1241  =  215
DL104     E6,1517 =   206                DL216        0113  =  209                  DL516     E7,1460  =  215
DL105     E6,1520 =   206                DL217     E5,1741  =  209                  DL517     E7,1462  =  215
DL106        1356 =   206                DL218     E5,1743  =  209                  DL518        1331  =  215
DL107        1331 =   206                DL219     E5,1756  =  209                  DL601        1170  =  217
DL108        1334 =   206                DL220        1260  =  209                  DL602        1171  =  217
DL109        1335 =   207                DL301        1356  =  211                  DL603        1172  =  217
DL110        1336 =   207                DL302        0025  =  211                  DL604        1173  =  217
DL111        1327 =   207                DL303     E6,1516  =  211                  DL605        0025  =  217
DL112        1300 =   207                DL304     E6,1517  =  211                  DL606     E6,1516  =  217
DL113        0321 =   207                DL305     E6,1520  =  211                  DL607     E6,1517  =  217
DL114     E6,1422 =   207                DL306        0037  =  211                  DL608     E6,1520  =  217
DL115     E6,1423 =   207                DL307        0040  =  211                  DL609        1356  =  217
DL116     E6,1635 =   207                DL308        0041  =  211                  DL610        1327  =  217
DL117     E6,1636 =   207                DL309        0113  =  211                  DL611        1300  =  217
DL118        0033 =   207                DL310        1327  =  211                  DMENFBIT     4734  =   76
DL119        0034 =   207                DL311        1300  =  211                  DMENFLG      0121  =   76     7  595 1155
DL120        0035 =   207                DL312     E7,1460  =  211                  DMODE        7353    1036     1 1075
DL121     E6,1643 =   207                DL313     E7,1462  =  211                  DMP          7124    1029    23  412 1263
DL122     E6,1644 =   207                DL314        1331  =  211                  DMPNSUB      7337    1035     1  825
DL123        0375 =   207                DL401        0025  =  213                  DMPNTEMP     0135  =   99     2 1035
DL124        0111 =   207                DL402     E6,1516  =  213                  DMPR         7615    1042     1 1009
DL125     E6,1422 =   207                DL403     E6,1517  =  213                  DMPSU8       7130    1029    25 1031 1263

HEALTH KEY: NORMALLY DEFINED UNLESS FLAGGED AS FOLLOWS:

UN UNDEFINED           = DEFINED BY EQUALS              J DEFINED BY JOKER OR ERASE ANYWHERE      MD MULTIPLY DEFINED
BD BADLY DEFINED     CD DEFINITION ASSOCIATED WITH CONFLICT              XX MISCELLANEOUS TROUBLE
```

```
SYMBOL TABLE LISTING, INCLUDING DEFINITION, HEALTH, PAGE OF DEF, # OF REFS, PAGE OF FIRST REF, PAGE OF LAST REF.

SYMBOL       DEF     H       REFERENCES      SYMBOL      .DEF      H       REFERENCES      SYMBOL      DEF      H       REFFRENCES

DMPSUB2      7147     1029     1 1034        DODNADR  05,3533     990                      DOW..1   11,3740     1243     2 1243
DMP1         7613     1042     1 10[illegible]9   DODNCHAN 05,3601     990                      DOWNENT2 10,3564     1371     3 1361 1367
DNADRLCR  05,3540      990     1  992        DODNPTR  05,3625     991     1  990           DOWNFLAG     5520     1372   100  236 1363
DNDUMP    05,3736      995     1  995        DODOWNTM 05,3507     989     2  163  164 DOWNGTS  20,3664     1502     2 1488
DNDUMPI   05,3723      994     2  300  995 DOFSTART 05,2501     222     1  229      DOWNTELM 05,2000  =    30     3  204  989
DNDUMP1   05,3750      995     1  995        DOFSTRT1 05,2506     222     2  228  229 DOWNTORK E6,1513      137     7  137 1468
DNDUMP2   05,3752      995     1  995        DOINT    13,2036     247     2  247      DO1/NET+ 20,3702     1502     2 1498 1499
DNECADR      0336  =   102    18  102  992 DOINT2   13,2060     248     1  248      DP(-22)  27,3763     1280     1 1275
DNEDUMP   43,3040      300     2  275  300 DOIT     31,2256     791     1  792      DP-.01   35,3651      687     3  683
DNINDEX      1332  =   111     2  111      DOLEM    26,2466     595     1  595      DPAGREE      7276     1034
DNLADMM1  04,2525  =   246     1  243      DONBRD   25,2651     564     1  564      DPB-14   26,2422      499     2  496  498
DNLADPOC     4746  =   247     1  241      DONEADR  37,3653     875     1  875      DPBIT14  01,3502     1129     1 1129
DNLRALT      1336  =   111     3  206  209 DONEYET  21,3357    1478     2 1478      DPDAT1   20,2037      305     1  305
DNLRVELX     1333  =   111     4  111  208 DONTPULS 07,3652    1324     1 1324      DPDAT3   01,2323      308     1  307
DNLRVELY     1334  =   111     4  111  209 DOPAXIS  20,3246    1495     1 1495      DPHALF   23,2502  = 1098    12  365  766
DNLRVELZ     1335  =   111     5  111  209 DOPIF    31,2246     791     1  790      DPINCOM  40,3160      447     1  448
DNLSTCOD     0333  =   102    11  102 1391 DOPROC   40,3637     473     1  473      DPINORM  40,3166      448     1  447
DNPHASE1  05,3524      989     2  234  995 DOROTAT  17,2772    1451     2 1451      DPINSF   40,3143      447     4  445  448
DNPHASE2  05,3532      990     1  992      DORREPOS 25,2120     545     1  198      DPINSF2  40,3170      448     1  445
DNRRANGE     1330      111     7  111  589 DORROUT  25,3007     567     2  567      DPINSF4  40,3175      448     1  445
DNRRDOT      1331  =   111     6  111  328 DORSAMP  25,2003     505     1  505      DPIPAY   E5,1522  =   133     2  397
DNTABLE   05,2446      217     1  990      DORSAMP2 25,2007     505                 DPIPAZ   E5,1526  =   133     1  397
DNTMBUFF     0340  =   102    23  164  995 DORSTART 05,2732     226     1  226      DPL1     30,3706      920     1  920
DNTMERAS     0333      102     1  102      DOR52    14,3613     952     1  952      DPL3     30,3707      920     1  920
DNTMEXIT  05,3715      992     6  991  995 DOSAM    14,3046     938     1  938      DPL5     30,3710      920     1  920
DNTMFAST  06,2671      188     1  191      DOSHIFT  21,3467    1480                 DPL7     30,3711      920     1  920
DNTMGOTO     0335  =   102     9  102  995 DOSKIP   17,3037    1452     1 1451      DPL9     30,3712      920     1  920
DNTM1        0034  =    95     1  992      DOSSHFT  00,2322    1053     1 1053      DPMODE   14,3771     1398
DNTM2        0035  =    95     1  993      DOSTORE      6403    1012     1 1001      DPOSMAX      4723     1093     3  456 1398
DOACCFUN  20,3711     1502     1 1498      DOSUBLST 05,3701     992     1  991      DPOUT    40,2752      433     3  433
DOALARM      5146  =  1361                 DOSWITCH 11,3432    1237     2 1236 1237 DPPOSMAX 23,2512     1098     9  312  709
DOALIGN   15,3140      969                 DOT          7352    1036     1 1009      DPSELITE 20,2526     1485     1 1485
DOCKED    20,3063     1492     1 1485      DOTERM   40,3635     473     1  473      DPSTHRSH 32,2000       41     1  781
DOCKTEMP     0157  =  1494     4 1434 1489 DOTICK   22,3443     719     1  719      DPSVEX   33,2001       40     2  749  835
DOCKTEST  20,2755     1489     2 1488 1502 DOTINC       0136      99     7   99 1037 DPTEST   41,2306      423     4  423  444
DOCMBASE  37,3136      707     1  710      DOTIXBR  01,2430    1086                 DPTEST1  41,2330      424     4  424
DOCORS    14,3552      949     1  949      DOTPER   22,3624     724     1  724      DPZERO   12,2006  = 1244     3  934 1236
DOCSM     23,3217     1155     1 1154      DOTRET       0137      99     8   99 1076 DP0          0036  =   937
DOCSM1    23,3222     1155     1 1154      DOTSUB       7177    1031     3 1037      DP1          0040  =   937
DODAT     07,2067      257     1  257      DOTSWFMX 30,3752     922     1  916      DP1/12   14,2453      264     1  264
DODELVZ   37,3567      874     1  875      DOT6RUPT 17,2117    1402     1  164      DP1/2    12,2004  = 1134     5 1134 1146
DODES     25,2626      564     1  562      DOUBLK   40,2564     417     2  416  417 DP1/20   33,2740      883     1  882
DODESEND  25,3053      568     1  568      DOVLOAD      6504    1016     1 1013      DP1/4    12,3765     1244     3 1197 1244
DODLOAD      6501     1016     1 1013      DOVLOAD*     6507    1016     1 1013      DP1/4TH  23,2474     1098     7   38 1149
DODLOAD*     6165     1004     2 1013 1016 DOW..    11,3712    1243     2 1236 1241 DP1/8    07,2570      273     1  267

HEALTH KEY: NORMALLY DEFINED UNLESS FLAGGED AS FOLLOWS:

UN UNDEFINED           = DEFINED BY EQUALS            J DEFINED BY JOKER OR ERASE ANYWHERE      MD MULTIPLY DEFINED
BD BADLY DEFINED     CD DEFINITION ASSOCIATED WITH CONFLICT            XX MISCELLANEOUS TROUBLE
```

```
SYMBOL TABLE LISTING, INCLUDING DEFINITION, HEALTH, PAGE OF DEF, # OF REFS, PAGE OF FIRST REF, PAGE OF LAST REF.

SYMBOL      DEF     H     REFERENCES      SYMBOL      DEF     H     REFERENCES      SYMBOL      DEF     H     REFERENCES

DP1MIN    26,2123      353   1  351       DSPDCGET  41,2556      429   1  429       DSRUPTEM     0073 =   97   5  167
DP1OUTSF  40,2737      433   1  430       DSPDCPUT  41,2566      429   1  430       DSRUPTSW     1310     110  10  165  232
DP2(-3)   27,3765     1280   1 1277       DSPDCWD1  40,3262      456   4  457       DSU          7026    1026   1 1009
DP2(-4)   27,3767     1280   1 1271       DSPDC2NR  40,3315      457   3  436  458  DT        F7,1717 =  157   7  157  897
DP2/3     04,3253     1244.  3 1225 1244  DSPDECNR  40,3311      457                DT/DELT   30,3760     922   1  915
DP2OUTSF  40,2744      433   2  430       DSPDFCVN  40,3335      458   4  434  473  DT/TAU    27,3121     378   1  377
DP3OUTSF  40,2746      433   1  430       DSPDECWD  40,3255      456   4  430  435  DT/2      F4,1475 =  119  11  119 1241
DP9/10    04,3051     1183   4 1175 1181  DSPDELAY  40,3745      706   1  706       DT/2COMP  13,3356    1215   1 1216
DQUARTER  12,3765 =   1244   2 1230       DSPDPDFC  40,3020      438   1  421       DT/2MAX   13,3445    1216   2 1215 1216
DRDOT     F4,1727 =    124   4  124  849  DSPFLG       1067 =    105   4 1356 1364  DT/2MIN   13,3443    1216   1 1216
DRFD8     20,3630     1501  .1 1501       DSPFMEM   41,3425      455   1  422       DTDECAY   36,2004      39
DRFTBIT      4726 =     70   3  175 1312  DSPIN     40,3351      459   5  411  460  DUMLOOPS     1356     112   6  206 1114
DRFTSUB2  06,3544      344   1  348       DSPIN1    40,3376      459   2  459  460  DUMMYAD   04,2172     240   1  244
DRIFT/CN  17,3447     1461   1 1461       DSPLAY    06,2047      167   1  167       DUMMYJOB  01,3210    1114   3  224 1113
DRIFTBIT     4735 =     89   7  735 1507  DSPLIST      1042      104   6  233  480  DUMPCNIC  27,3431    1269
DRIFTDFL     0312 =     89   1  737       DSPLOCK      1011      104  12  233 1367  DUMPLOC      0336 =  102   5  994  995
DRIFTFR      0116 =   1504   3 1495 1496  DSPLV     41,3465      458   1  461       DUMPRPRA  27,3467    1271
DRIFTFLG     0036 =     70   3  867  949  DSPLYALT     4741 =   1417   2 1412       DUMPTFF1  27,3552    1275
DRIFTI    E5,1504 =    132   1  387       DSPLYMSK  20,2113      306   1  305       DUMPTFF2  27,3647    1276
DRIFTO    F5,1502 =    132   1  389       DSPLYTOT  20,2266     1413   1 1413       DUNFVLIM  30,3750     922   1  916
DRIFTSUB  06,3524      344   3  340       DSPMM     04,2657      472   1  484       DV/SC        7657    1043   2 1043
DRIFTT    E5,1442 =    132   1  388       DSPMMJ8   40,3572      473   2  472 1291  DV8YCOSM  30,3564     918   4  917
DRIVECN   21,3355     1478   1 1478       DSPMMJOB  40,3572 =   1291   1 1291       DVCNTR    F7,1515 =  154  52  154 1381
DRSAMP    25,2000 =     33   1  505       DSPMMTEM     0140 =     99   2  473       DVCNTR1   E7,1570 =  154   2  867
DSALMCUT     0011 =     95  36  181 1393  DSPMSK       4750 =    459   1  458       DVCNTSFT  33,2245     866
DSFXIT       0114 =     98   3  459  460  DSPOCTIN  40,3441      460   1  458       DVECTR       0010 = 1146   1 1142
DSKYFBIT     4726 =     75   1 1335       DSPOCTWD  41,3435      458   3  421  455  DVLOS     E4,1673 =  121   4  327  678
DSKYFLAG     0113 =     75                DSPOFF    05,3302      233   1  233       DVMAX1    34,2063     638   1  640
DSLV      40,3425      460   2  459  460  DSPDPTN   15,3412      974   3  974  975  DVMAX2    34,2065     638   1  640
DSMAG        0142 =     99   2  459  460  DSPOUT    06,2063      167   2  166       DVMON     33,2236     866
DSMSK     40,3427      460   2  459  460  DSPOUTSB  06,2024      167   2  167  170  DVMONCON  36,2547     735
DSPA      41,2414      427   1  421       DSPRND    40,3244      456   1  456       DVNORM    00,2505    1058   3 1057
DSPAB     41,2407      427   1  421       DSPRRLOS  41,2000      311   1  311       DVNORMCT     0137 =   99   6 1055 1066
DSPABC    41,2402      427   1  421       DSPSCAN   06,2032      167   2  167       DVOVF     00,2405    1055  11 1057 1068
DSPA8CRT     4220      470   3  470       DSPSFNOR  41,2611      430   1  430       DVOVSUB   20,2760    1490   5 1487 1493
DSPALARM  40,3447      460   8  422  445  DSPSIGN   40,3227      456   4  456  457  DVPRFV    E7,1575 =  147   4  644  645
DSPB      41,2422      427   1  421       DSPTAB       1022      104  59  166 1378  DVSIGN       0136 =   99  10 1055 1072
DSPC      41,2427      427   1  421       DSPTEMX      1050 =    105   7  105  704  DVTEMP       1173 =  107   2  865
DSPCADR   16,2215     1411   1 1411       DSPTEM1      1044      104  29  105  974  DVTHRUSH     1250 =  108   7  108  866
DSPCNT       0775      104   7  167  233  DSPTEM2      1047      105  12  105  393  DVTOTAL   E7,1507 =  154  10  154  865
DSPCOM1   41,2420      427   3  427  429  DSPWDRET     0144 =     99   3  456  .    DVTRANS   13,2272     712
DSPCOM2   41,2434      427   2  427       DSP2DEC   40,3322      457   1  438       DVXSC        7451    1039   2 1038
DSPCOM3   41,2442      427   1  427       DSQ       00,3174     1073   1 1011       DWNRPTB8     4062     164   1  163
DSPCOUNT     0776      104  66  168 1335  DSQSUB    00,3300     1076   5 1073 1081  DXCOMP    12,2155    1173   1 1173
DSPDCEND  41,2615      430   4  430  437  DSREL        0141 =     99   4  459  460  DXCRIT       0124 =  100   2  825  826

HEALTH KEY: NORMALLY DEFINED UNLESS FLAGGED AS FOLLOWS:

UN UNDEFINED          = DEFINED BY EQUALS              J DEFINED BY JOKER OR ERASE ANYWHERE      MD MULTIPLY DEFINED
BD BADLY DEFINED     CD DEFINITION ASSOCIATED WITH CONFLICT                 XX MISCELLANEOUS TROUBLE
```

```
SYMBOL TABLE LISTING, INCLUDING DEFINITION, HEALTH, PAGE OF DEF, # OF REFS, PAGE OF FIRST REF, PAGE OF LAST REF.

SYMBOL      DEF     H       REFERENCES      SYMBOL      DEF     H       REFERENCES      SYMBOL      DEF     H       REFERENCES

DXCRIT+1     0125   =  100                  ECC       E5,1751   =  130    3  130 1198 ENDCHKG   37,2366     391
DXERROR   E6,1446      135    9  135 1433 ECDUW     E6,1645   =  140    3  140  922 ENDDAPT4     5272   =  200
DYDOT     E4,1731   =  124    4  124  849 ECDUWL    30,3745      922    1  907      ENDDOT       7226     1031    1 1076
DYERROR   E6,1450   =  135    7  135 1446 ECDUWUSR  E6,1645   =  140    3  140  915 ENDDPDEC  40,3036      438    1  446
DYNMDISP  36,3366      752    2  750  752 EDOP         0023   =   94   14  454 1287 ENDDPUSH     6571     1018    1 1018
DZDOT     E4,1733   =  124    3  124  850 EDOT      E6,1427   =  138   23  135 1508 ENDECVN   40,3351   =  458    1  459
DZERROR   E6,1452   =  135    7  135 1446 EDOTP     E6,1427   =  135    4 1432 1436 ENDEXT       5474   = 1369   43  219 1393
D1/1024   04,3045     1183    1 1192      EDOTJ     E6,1436      135    5  135 1471 ENDEXTVB     5474   =  277    5  281  285
D1/128    04,3033     1183    3 1176 1187 EDOTR     E6,1437   =  135    2  135 1439 ENDFIND      5151     1103    4 1105 1109
D1/16     04,3041     1183    2 1189 1196 EDOTSQ    E6,1736   =  138    3 1460 1461 ENDHMSS   42,3617   =  451
D1/256    04,3047     1183    3 1177 1183 EDRIVEX   E6,1763      142    5  142 1417 ENDIDLE      4200      470    1 1366
D1/32     04,3043     1183    7 1183 1234 EDRIVEY   E6,1764   =  142    1 1416      ENDIMU    07,3633     1324    3 1308 1313
D1/4      04,3037     1183    4   38 1196 EDRIVEZ   E6,1765   =  142    1 1416      ENDINST      4210      470    6  414 1365
D1/64     04,3035     1183    5 1172 1198 EE        13,2543     1134    1 1134      ENDINT    13,2670     1207    1  248
D1/8      04,3031     1183    1 1198      EGRESS    E5,1767   =  131    5 1147 1218 ENDIT     10,3373     1367    1 1364
D29.9SEC  36,3141      744    2  729      EIGHT        4741   = 1097    2  266  271 ENDJASK   17,3273     1456    1 1456
D6OR9BIT     4743   =   73                EIGHTEEN  33,2366      872    1  871      ENDJOB1   01,3107     1111    1 1103
D6OR9FLG     0072   =   73   10  248 1241 EJSCAN    01,3124     1111    2 1108 1111 ENDLLJOB  31,3420   =  811
=================================== EJ1       01,3175     1113    7 1111 1112 ENDMANUV  26,2206      489
E         E6,1751   =  138   17 1433 1507 EJ2       01,3204     1113    1 1113      ENDMANU1  26,2207      489    2  489  490
E/BKCALL  04,2617      382                EL           1345   =  111    1  329      ENDMARK      5474     1351    2  267 1369
E/CALL    04,2636      383                ELBIAS       1353   =  112    1  304      ENDMARKS  07,2324      267    1  267
E/JOBWAK  04,2652      384                ELCALC    35,2722      670    1  673      ENDMAXDV  00,2624     1061    2 1061 1063
E/PROG    04,2000   =   29    2  382  384 ELEACH    11,2402   =  824    2  823      ENDMODE   07,3725     1325    2 1325
E/SWITCH  04,2634      382                ELEPS     35,3647      687    1  670      ENDMONDO  41,3420      454    1  454
EARSPH    11,3412     1236    1 1235      ELEV      E4,1647      121   13  205  673 ENDNMTST  40,2227      412    2  412
EARTCNTR  14,2531      932                ELEVEN       4751     1093    4  482 1469 ENDNUM    40,2237      412    1  412
EARTHCON  22,3531      720    1  720      ELEX      35,3177      673    1  670      ENDNVBSY  04,2676      479
EARTHL    06,3765     1145    2 1138 1140 ELINCR    E7,1554   =  156    4  156  802 ENDNVSB1  41,3661      469    1  482
EARTHLUC  06,2000   =   30    1 1145      ELINCR1   E7,1645   =  156    6  156  823 ENDOFJOB     5146     1103  151  239 1484
EARTHMU   27,2022       46    1  775      ELOOPFIN  43,3442     1286    2 1286      ENDOUT    10,3325     1366    2 1367
EARTHMX   26,3743     1144    2 1138 1140 ELRCODE   04,3371     1337    1 1336      ENDPASTE     4143      454
EARTHMXX     0051   = 1146    4 1141 1144 ELRCODE1  40,2136      411    1  410      ENDPINBF     4503   =  480
EARTHPAD  22,3371      718    1  717      ELVIRA    E7,1647   =  156    6  156  822 ENDPINS1  40,3737   =  486
EARTHR    37,2420      392    1  392      ENABLET6  17,2075     1401    1 1401      ENDPINS2  41,3777   =  484
EARTHR*   37,2447      392    4  387  400 END-ALIG  E7,1630   =  155    2  155  160 ENDPRCHG  01,2771     1107    2 1106 1113
EBANK        0003   =   94   94  223 1484 END-E5    E5,1777   =  133    2  815  886 ENDP76    13,2351      713    2  711  712
EBANKSAV     1067      105    3  105 1360 END-E6    E6,1775   =  143    1  820      ENDRADAP  25,3607      581    2  553  562
EBANKTEM     1071      105    5  222 1368 END-E7    E7,1777   =  160    4  815  895 ENDROLO   40,3017      434    1  438
EBANK3       5000   = 1097    3  234  892 ENDALL    40,2243      412    2  412      ENDRELDS  40,3543   =  465    1  471
EBANK4       4732   = 1097    7  288  925 ENDALM       6026      461                ENDRET    10,3355     1367    5 1361 1368
EBANK5       5005     1095   15  259 1431 ENDAXIS   14,2406      259    1  259      ENDRMODE     4607   =  541
EBANK6       5006   = 1097   11  223 1484 ENDBALL   26,2360      493                ENDRN     24,2145      512    1  511
EBANK7       5007     1095   16  259  955 ENDBLFF      4274   =  471    1  475      ENDROLL   22,3226      381
EBUF2        1166   =  108   10  382  383 ENDBSUB1  40,3572   =  472    1  472      ENDRQDAT  41,2345      424

HEALTH KEY: NORMALLY DEFINED UNLESS FLAGGED AS FOLLOWS:

UN UNDEFINED          = DEFINED BY EQUALS             J DEFINED BY JOKER OR ERASE ANYWHERE       MD MULTIPLY DEFINED
BD BADLY DEFINED    CD DEFINITION ASSOCIATED WITH CONFLICT                 XX MISCELLANEOUS TROUBLE
```

```
SYMBOL TABLE LISTING, INCLUDING DEFINITION, HEALTH, PAGE OF DEF, # OF REFS, PAGE OF FIRST REF, PAGE OF LAST REF.

SYMBOL        DEF   H      REFERENCES      SYMBOL        DEF   H      REFERENCES      SYMBOL        DEF   H      REFERENCES

ENDROWT   41,3564    463  1  467      ENTER     41,2022    419  2  411  461 EREXIT1   32,2560    590  1  588
ENDRRMON  06,3167 =  198  1  198      ENTERDAT  07,2066    257               ERMINUS   40,3713    486
ENDRSTRT  05,2643    224  2  228      ENTERJMP  40,2137    411  1  411      ERPLUS    40,3716    486  1  486
ENDRTOUT  41,2647 =  430  1  439      ENTEROR   17,2445   1445               ERROR     40,3646    485  1  410
ENDRUTIN  41,3302 =  445  1  452      ENTERUV   17,2504   1446  3 1445 1446 ERRORS    43,3262   1283  1 1283
ENDR03    01,2252    307  1  307      ENTEXIT      0136 =  420 10  420  462 ERRTEST   17,3361   1460
ENDSAM    14,2577    933  1  932      ENTMID1   13,3625   1221  1 1220      ERTHR     37,2431    392  1  392
ENDSCALE  40,3072    446  3  446  447 ENTMID2   13,3621   1221  1 1220      ERTHRVSF  37,2401    392  2  395  400
ENDSCAL1  40,3105    446  2  447  448 ENTPASHI  41,2032    419               ERVECTOR  E5,1404 =  132  5  132  392
ENDSPF    41,3434    455  1  458      ENTPASO   41,2062    420  3  419  469 ESCAPE       0136 =   99  4 1082 1083
ENDSPMIN  42,3462    438  1  449      ENTRET       0136 =   99  6  414  468 ESCAPE2      0137 =   99  2 1082 1083
ENDSPMM   04,2667    472  1  479      ENTSET    41,3637    468  2  468      ESTER1    E7,1565 =  151  4  151  262
ENDSPCCT  40,3444    460               EOURPERM  E7,1670 =  157  1  157      ESTER2    E7,1567 =  151  6  151  262
ENDSTATE  11,3604   1240  1 1239      EPHEM     15,2000 =   32  2   54  983 ESTICADR  37,2116    386  2  386
ENDSTEER  36,3647    757               EPHEM1    05,2000 =   30  3   53  985 ESTIMS    37,2500    395  2  386  389
ENDSTOR   07,2515    271               EPHEM2    04,2000 =   29  1   54      ETPIBIT      4736 =   71
ENDSUMS   43,3130    303  1 1289      EPSFOUR   35,3653    687  1  676      ETPIFLAG     0046 =   71  5  664  673
ENDS40.9  27,2727    772               EPSILN1   34,2075    638  1  646      EXBRAK    31,3307    809  1  795
ENDT(X)   27,3756   1279  1 1279      EPSILON      0155 = 1494  5 1486 1494 EXDSPRET  10,2632   1358  5  219  293
ENDTASK      5240   1119  4  232 1126 EPSILONL  E5,1763 =  130  3  130 1193 EXECBANK     5154   1103  8 1101 1103
ENDTEST1  37,2270    389  3  385  400 EPSILONT  E4,1567    120  2 1174      EXECTEM1     0061 =   97  6 1101 1109
ENDTFF    27,3644   1276  3 1276 1278 EPSSMALL  27,2725    772  1  772      EXECTEM2     0062 =   97  4 1104 1109
ENDTNCN   06,2266    174  1  174      EPS1      27,2405    762  2  762  772 EXGSUB    31,3266    809  1  795
ENDTNCN2  06,2306    175  1  174      EPS2      27,2407    762  2  762  772 EXIT         6764   1023  1 1001
ENDTPUSH     6573   1018  2 1018 1075 ERAD      04,2000     47  1 1137      EXITEM       0114 =   98  7  442  443
ENDTSLC   00,2212   1050  1 1050      ERADFBIT     4730 =   69               EXITGYRO  07,3526   1321  1 1321
ENDVDAT   33,3433 =  891  3  890  893 ERADFLAG     0021 =   69  5  660 1137 EXITSPOT  31,3264    808  2  808
ENDVLOAD     6532   1017  2 1019      ERADM     E7,1672 =  150  5  150 1137 EXITVR    30,2763    852  1  852
ENDVPUSH     6561   1018               ERASCHK   43,3342   1285  1 1284      EXITVR1   30,2774    852  1  853
ENDVXV       7021   1024  4 1024 1041 ERASCON1  43,3235   1283  1 1285      EXNORM    31,3315    809  1  795
ENDW      E5,1642 =  125  3  127  131 ERASCON2  43,3236   1283  1 1285      EXTLOGIC  31,3207    807  2  794
END2DEC   40,3334    457               ERASCON3  43,3237   1283  1 1285      EXTVBACT     1043    104 19  233 1380
ENEMA     05,2767    227  2  834 1380 ERASCON4  43,3240   1283  1 1285      EXTVB1    23,2000 =   33  1  283
ENGARM?   32,3135    816  1  815      ERASCON5  43,3246   1283  1 1286      EXTVERBS  43,2000 =   37  7  275 1385
ENGINCFF  36,3546    755  1  755      ERASCON6     5000 = 1283  3 1285 1286 E134567B  43,3353   1285  1 1286
ENGINCF1  36,3556    755  1  239      ERASER    10,3477   1369  1 1362      E2DPS     E7,1621 =  156  3  781  829
ENGINCF2  36,3552    755  1  854      ERASID       5002 =   38  1  995      E3J22R2M     1347    112  1 1235
ENGINCF3  36,3565    756  1  728      ERASLOOP  43,3372   1285  4 1285 1286 E32C31RM     1350    112  1 1234
ENGINCF4  36,3562    756  1  737      ERASZERO     0007 =  204  2  204      E7OVERLA  E7,1471 =  146  3  146  154
ENGOFF    34,3457    853  1  848      ERCNT        0117 =   98  7  482  486 =====================================
ENGOFFDT  E7,1644 =  160  3  160  854 ERCOM     40,3721    486  1  486      F         E7,1734    149  7  149  769
ENGOFF1   34,3512    854  2  853  854 ERCOMP    E5,1563 =  133  8  388  392 F(MASS)   20,2544   1485  3 1485
ENGOFTSK  36,3543    755  3  252  758 ERCON     40,3733    486  1  485      FACEREG      0154 = 1370  8 1360 1361
ENGONBIT     4736 =   76  6  184  912 ERCOUNT      1365 =  112  3  112 1283 FAIL-     20,3523   1499  1 1499
ENGONFLG     0123 =   76               ERESTORE     1360 =  112 11  112 1286 FAILOOP   17,3237   1456  2 1456

HEALTH KEY: NORMALLY DEFINED UNLESS FLAGGED AS FOLLOWS:

UN UNDEFINED            = DEFINED BY EQUALS             J DEFINED BY JOKER OR ERASE ANYWHERE       MD MULTIPLY DEFINED
BD BADLY DEFINED     CD DEFINITION ASSOCIATED WITH CONFLICT              XX MISCELLANEOUS TROUBLE
```

```
SYMBOL TABLE LISTING, INCLUDING DEFINITION, HEALTH, PAGE OF DEF, # OF REFS, PAGE OF FIRST REF, PAGE OF LAST REF.

SYMBOL       DEF    H       REFERENCES       SYMBOL       DEF    H       REFERENCES       SYMBOL       DEF    H       REFERENCES

FAILREG      0375       102  13  207 1378 FFTAG4        4000  =    29   2 1351 1376 FLAGORGY  32,2623       781
FAKEPRET     5155      1103   3 1101 1111 FFTAG5        6000  =    29   5   41  613 FLAGREF1     0010  = 1382
FALTOFF      4361       476               FFTAG6        6000  =    29   5  531 1457 FLAGREF2     0006  = 1382
FALTON       4355       476  10  243 1393 FFTAG7        4000  =    29   2 1378 1379 FLAGS     21,3007      1381   1 1380
FAPS      36,2006        39   2  753  770 FFTAG8        4000  =    29   1  454      FLAGWRD0     0074  =    67  37  175 1413
FASTCHNG  31,3751       829  10  791  811 FFTAG9        4000  =    29   1 1401      FLAGWRD1     0075  =    69  38  228 1382
FAZA      23,2754      1151   1 1153      FHNM       25,3640       586   1  585      FLAGWRD2     0076  =    70  26  175 1382
FAZAB     23,3131      1154   1 1155      FIFPSDP    34,2101       638   1  646      FLAGWRD3     0077  =    72  17  218 1381
FAZAB1    23,3157      1154   1 1154      FIFTYFPS   34,2663       646   1  645      FLAGWRD4     0100  =    74  32  233 1371
FAZAB2    23,3163      1154   1 1154      FIGTIME    35,2764       671               FLAGWRD5     0101  =    75  34  167 1451
FAZAB3    23,3172      1154   1 1154      FILDELV    F5,1460  =   133   1  133      FLAGWRD6     0102  =    77  15  197  978
FAZAB4    23,3202      1154   1 1155      FILLED     01,3374      1124   1 1123      FLAGWRD7     0103  =    79  34  197 1388
FAZAB5    23,3211      1155   2 1155 1219 FINALBIT      4737  =    71               FLAGWRD8     0104  =    80  16  265  970
FAZA1     23,2760      1152               FINALDV    00,2625      1062   3 1055 1061 FLAGWRD9     0105  =    82   8  265  952
FAZB      23,3053      1153   1 1152      FINALFLG      0047  =    71   7  621  696 FLAP         0216  =    83   3  836  842
FAZB1     23,3056      1153               FINDCDUW   30,3074       907   5  767  907 FLAPBIT      4735  =    83
FAZB2     23,3104      1153   1 1153      FINDGIMB   27,2160       498   2  496  497 FLASHH?   21,2061       831
FAZB5     23,3111      1153   1 1153      FINDKEY    07,2376       269   1  269      FLASHOFF     4424       477   6  286 1363
FAZC      23,3117      1153   2 1153      FINDMARK   07,2410       269   1  269      FLASHON      4420       477   4  420 1365
FBANK        0004  =     94  31  470 1374 FINDTIME   01,3603      1301   2 1301      FLASHSUB  10,3300      1365   3 1363 1365
FBANKMSK     4341  =   1008   2 1109      FINDVAC       5076      1101  43  222 1389 FLASHV?   21,2067       831   1  831
FBIASSUB  06,3714       348   3  346  347 FINDVAC2   01,2605      1104   2 1101 1103 FLAT      E6,1554  =   139   6 1461 1501
FBR3      11,2503      1227   1 1241      FINE       01,2344       308   1  306      FLATEMP      0151  = 1503   6 1495 1501
FC        E7,1615  =    156   4  156  789 FINEK2     43,2363       285               FLATOUT   31,2334       792   1  736
FCADRMM1  04,2440  =    245   1  244      FINEONLY   14,3357       944   1  944      FLATOUT1  31,2243       790   1  790
FCDUW     30,2000  =     35   1  907      FINETIME      4102       393   3  391 1333 FLATOUT2  31,2245       791   1  790
FCODD     E7,1465  =    146   6  146  791 FINIMU00   37,2320       390   1  386      FLATVAL   20,3741      1504   1 1495
FCOLD     E7,1620  =    156   5  156  798 FIREDB     E6,1600  =   139  10 1460 1501 FLESHLOC  10,2000  =    30   1 1262
FCOMPSET  31,2233       790   1  790      FIREFCT    E6,1740  =   138   7 1436 1467 FLESHPOT  10,2037      1262   2  865 1262
FDAIX     E4,1735       123   2  317  493 FIREQR     17,2257      1442               FLGWRD10     0106  =    84  36   84 1485
FDAIY     E4,1736       123               FIRSTIME   12,2606      1180   1 1180      FLGWRD11     0107  =    85  41  230  894
FDAIZ     E4,1737       123               FIRSTTME   27,3173       775               FLGWRD12     0110  =    87   2   87  589
FDOT      26,2006        55   1 1141      FIVE          4747      1093  23  234 1428 FLGWRD13     0111  =    89   1   89
FDPS      36,2000        39   1  749      FIXCLPAS   40,2371       414               FLIP         4577       541   2  831
FEEDBACK  17,3100      1453   1 1452      FIXDELAY      5223      1117  16  515 1310 FLOGSUB   30,2000  =    35   1  859
FETCHZNB  30,3202       910   1  910      FIXLOC        0120        98  68  257 1504 FLPASS0   E7,1623  =   156   7  156  808
FETCH2WD  05,3667       992   2  990      FIXMIN     20,3721      1503   1 1499      FLPC         0212  =    82   2  848
FEXTRA       4730  =    793   1  790      FIXRANGE   40,2701       432   1  431      FLPCBIT      4731  =    82
FFTAG1       4000  =     29   3 1291 1372 FIXROOT    00,3453      1078   3 1077      FLPI         0213  =    82   3  839  851
FFTAG10      4000  =     29   1  165      FIXY       27,2441       764   1  764      FLPIBIT      4732  =    82
FFTAG11      4000  =     29               FKP5RST    36,3364       752   1  254      FLRCS        0214  =    82   5  834  854
FFTAG12      4000  =     29               FLAGGON    22,3312       717   1  717      FLRCSBIT     4733  =    83   2  851
FFTAG13      4000  =     29               FLAGOFF    35,3512       682               FLTRSUB   30,3467       916   2  909
FFTAG2       4000  =     29   2 1301 1303 FLAGON     35,3446       681   2  681      FLTTHET   06,3320       263   1  261
FFTAG3       4000  =     29   1 1306      FLAGOODW   F6,1650  =   140   6  140  916 FLT59BIT     4741  =    83

HEALTH KEY: NORMALLY DEFINED UNLESS FLAGGED AS FOLLOWS:

UN UNDEFINED          = DEFINED BY EQUALS              J DEFINED BY JOKER OR ERASE ANYWHERE      MD MULTIPLY DEFINED
BD BADLY DEFINED     CD DEFINITION ASSOCIATED WITH CONFLICT              XX MISCELLANEOUS TROUBLE
```

```
SYMBOL TABLE LISTING, INCLUDING DEFINITION, HEALTH, PAGE OF DEF, # OF REFS, PAGE OF FIRST REF, PAGE OF LAST REF.

SYMBOL        DEF H       REFERENCES    SYMBOL        DEF H       REFERENCES    SYMBOL        DEF H       REFERENCES

FLT59FLG     0222 =   83   8  240  973 FWCOMP    31,2301    792   2  792      GEOIMUTT  37,2004    385
FLUNDBIT     4733 =   81   3  734  851 FWEIGHT   E7,1610 =  156   7  156  819 GEOM      04,3131   1186   2 1184 1191
FLUNDISP     0175 =   81   4  737  834 FXADRS    43,3562   1288   2 1289      GEOMSGN   E5,1672 =  130  11  130 1192
FLVR         0210 =   82   4  835  852 FXFX      43,3546   1288   1 1289      GEORGEJ   37,3107    401   2  399  400
FLVRBIT      4727 =   82               F2DPS*11  11,2000 =   30   1  822      GEORGEK   37,3111    401
FMAXODD   31,2002     41   1  790      F2DPS*31  31,2000 =   35   2   40  824 GEOSTRT4  37,3025    400
FMAXPOS   31,2003     41   1  790      F2DPS*32  32,2000 =   35   2   41  781 GET.LVC   21,2022    695   2  762
FORCELNE  20,2034    305   1  305      F2DPS*34  34,2000 =   36   1  787      GET+MGA   21,2006    695   1  683
FORCEV25  42,3614    451   2  450      ====================================== GETABVAL  33,2132    864   1  864
FORMULA1  17,3536   1463   1 1462      G(CSM)    E4,1707 =  124   4  124  884 GETAOSUV  20,3220   1495
FORMULA2  17,3546   1463   1 1462      G+N,AUTO  26,2267    491   3  489  743 GETAZEL   14,3655    953   3  953
FORMULA3  17,3651   1465   1 1465      G-VBIASX  E7,1676 =  157   3  157  896 GETCADR   01,3520   1130   1 1130
FORTYONE  13,3505   1217   1 1210      G-VBIASY  E7,1677 =  157   3  157  896 GETCOMP   41,2544    429   5  427  429
FORVEL    E7,1734 =  158   3  158  902 G-VBIASZ  E7,1700 =  157   3  157  896 GETDAT    07,2056    257   5  255  268
FORVMETR  E7,1733 =  158   5  158  903 GACC      E5,1706 =  128   4  963  964 GETDT     36,3736    758   2  755  758
FORVOUT   21,2454    900   1  899      GAINAPPR  E5,1450 =  125   1  125      GETECC    12,3720   1198   1 1198
FORVTEMP     0070 =  158   8  899  902 GAINBRAK  E5,1446 =  125   2  125  808 GETERAD   13,2523   1134   1 1137
FOUR         4742 = 1097  49  223 1470 GAINFLTR  30,3746    922   1  916      GETGNUV   33,3420    891   1  891
FOURSECS  27,2534    767   1  766      GAMCOMP   11,2653   1229   3 1228 1229 GETGOBL   27,3201    775   1  775
FOURTEEN     4310 = 1071   1 1068      GAMMA     E7,1477 =  151   5  151 1151 GETINREL  40,2313    413   5  411  417
FP        E7,1467 =  146   5  789  791 GAMPREV   E7,1607    147   7  148  646 GETLMATT  15,3523    978   1  974
FRANDRFS  05,2000 =   30   2   45  222 GAMRP        0010 = 1136   3 1132 1136 GETMAXDT  13,3403   1216   1 1215
FRCS2     36,2020     39   1  751      GCOMP     E3,1471    115  24  115  949 GETMKS    07,2140    265   2  259  267
FRCS4     36,2016     39   2  751  768 GCOMPSUB  06,3475    343   6  341  342 GETNEWNM     5431   1297   1 1296
FREEFBIT     4742 =   68   1  963      GCOMPSW   E3,1477    115  10  338  395 GETNOW    04,3007    705   1  704
FREEFLAG     0014 =   68  11  261  984 GCOMPZER  06,3751    348   1  963      GETPART2  01,3543   1300   1 1305
FRSTIME      0032 =   70   3  526      GCOMP1    06,3610    345   1  345      GETPRIO      5425   1296   2 1296 1299
FRSTMBIT     4741 =   70               GCTR      E5,1736 =  128  10  128  964 GETRANS   36,3657    757   1  756
FRSTPAS   34,2644    645   1  645      GDESELCT  07,3630   1323   1 1318      GETROOT   21,3233   1473
FSPASBIT     4733 =   68               GDT/2        1235    108  10  108  884 GETRPSV   11,2625   1229   1 1229
FSPASFLG     0005 =   68   3  511  512 GDT1/2    E7,1562 =  154   6  154  885 GETRVN    37,3320    709   2  707  710
FSUBO     26,2014     55   1 1141      GDUMP1    31,3407 =  811               GETRVN2   37,3355    710   1  709
FTHROT    31,2000 =   35   2   41  789 GEADDR       6157   1003   1 1003      GETULC    26,3332    605   3  596  606
FT99999   30,2057    617   2  616      GEFF      E4,1705 =  124   4  124  850 GETVRVG1  27,3115    774   1  775
FULLAPS   05,2000     45   1  223      GENDDV    00,2570   1060   2 1059 1063 GETVRVG2  27,3117    774   1  775
FULLDSP   41,3726    482   1  482      GENMARK   10,3033   1361               GETX      12,2767   1187   3 1184 1197
FULLDSP1  41,3727    482   1  482      GENMASK      0162 = 1370   4 1353 1367 GET45     35,3544    683   3  683
FULLTIME  17,3520   1462   6 1463 1467 GENPL     E5,1434 =  132   9  132      GFACTM    20,3057   1492   1 1487
FUNCTION  E6,1750 =  137  16 1472 1480 GENRET       1142    107   4  528  536 GHZ       32,3436    821   1  815
FUNCT2    21,3177   1473   2 1472      GENSCL    00,2346   1054   2 1054      GIMLOCK1  23,3414   1251   1 1250
FUNCT3    21,3202   1473               GENSCR    00,2277   1053   4 1052 1074 GL,ETC.   40,3735    486   1  485
FUNNYDSP  E7,1666 =  157   4  157  327 GENSHFT2  00,2224   1051   1 1051      GLAMPTST  06,2507    180   1  180
FUNTEM       0157 = 1504   2 1495 1496 GENSHIFT  00,2214   1051   1 1042      GLINVERT  06,2500    180   1  180
FV        E4,1461 =  118  15  118 1243 GENTRAN      5546   1376   4  309 1500 GLOCKCHK  06,2441    179   2  179
FVACCADR     4345 = 1305   1 1302      GEOCOMPS  E5,1562 =  133   3  396  397 GLOCKMON  06,2434    179   1  177

HEALTH KEY: NORMALLY DEFINED UNLESS FLAGGED AS FOLLOWS:

UN UNDEFINED            = DEFINED BY EQUALS             J DEFINED BY JOKER OR ERASE ANYWHERE      MD MULTIPLY DEFINED
BD BADLY DEFINED       CD DEFINITION ASSOCIATED WITH CONFLICT               XX MISCELLANEOUS TROUBLE
```

```
SYMBOL TABLE LISTING, INCLUDING DEFINITION, HEALTH, PAGE OF DEF, # OF REFS, PAGE OF FIRST REF, PAGE OF LAST REF.

SYMBOL      DEF     H        REFERENCES       SYMBOL      DEF     H        REFERENCES       SYMBOL      DEF     H        REFERENCES

GLOCKCK   06,3006      191    4  130          GOLOADLV  43,2375      286    6  275  276 GOSERV    33,2216      865
GLOKFAIL     0056  =    72    3  240 1251 GOLOC        0705  =   103   30 1300 1305 GOSHOSUM  43,3077  =   302    1  276
GLOKFBIT     4727  =    72                    GOMANUR   21,2764     1328    1  489      GOSLEEPS  10,2766     1360    3 1357 1369
GMBDRBIT     4733  =    78    1  777          GOMARK    10,2317     1351    1 1369      GOTO         6667     1021   13 1022 1089
GMBDRVSW     0137  =    78    2  777  778 GOMARKF   10,2323     1352   11  219 1369 GOTOFRS      6703     1021    1 1021
GMBLBITA  21,3563     1482    1 1481          GOMARKFR  10,2345     1352    7  272 1369 GOTOGE       6716     1022    1 1021
GMBLBITB  21,3565     1482                    GOMARKR   10,2342     1352    1 1369      GOTOGTS   17,2636     1448    1 1440
GMERGE    07,3465     1320    1 1323          GOMARK2   10,2331     1352    1  265      GOTOPOOH     6001      235   64  235 1334
GN/CCODE     4772     1094                    GOMARK2R  10,2350     1352    1  267      GOTOV56      6043      613   13  490  530
GNUFAZE5  37,3530      862    2  860  861 GOMARK3   10,2334     1352    1  220      GOUT      F5,1714  =   128    3  962  964
GNUR      E7,1656  =   157    4  889  892 GOMARK3R  10,2354     1352    1  308      GOVNUPDT  40,3346      458    1  425
GNURVST   33,3455      892    2  889  891 GOMARK4   10,2337     1352    1  289      GOXDSP    10,2317  =  1369
GNUTFAZ5  37,3524      862    2  860  862 GOMARS    10,2320     1352                GOXDSPF   10,2323  =  1369   13  281 1387
GNUV      E7,1656  =   157    1  891          GOMIDAV   36,2202      729    1  729      GOXDSPFR  10,2345  =  1369    3  305  307
GOABORT   32,3443      834    1  252          GOMOD     04,2256      241    1  243      GOXDSPR   10,2342  =  1369
GOAGIN    10,3062  =  1369                    GOMOVE    23,2111      500    1  500      GPMATRIX  06,3167      199    1  199
GOALMCYC  41,2377      425    1  445          GONXT3NK  43,3665     1289    3 1289      GRABGRAV  15,2755      964    1  964
GOANIDLE  10,3161     1363    1 1364          GOODARG   21,3410     1479    2 1479      GRAVEL    15,2635      962    1  962
GOBAC     13,3516     1217    2 1217          GOODEND   07,3704     1325    4  256 1325 GREED     15,2750      964    1  964
GOBACK    35,3740      743    3  743          GOODEPS1  20,2611     1486    1 1486      GRP2PC    24,3770     1223   24  508 1240
GOBAQUE   11,2776     1231    3 1233 1240 GOODEPS2  20,2635     1487    1 1487      GRP2SVQ   E5,1711  =   131    3  131 1224
GO88         4054      164    1  163          GOODMANU  22,3234      381    1  375      GRP4OFF   32,3574      836
GOBLTIME  E7,1511  =   154    3  154  775 GOODNEG   20,3002     1491    1 1490      GSAV      E4,1621      121   10  121  980
GOCH56    17,2115     1401    2 1401          GOODRAD   25,3246      572                GSCALE    22,3653      830    2  807  819
GOCLOSE   21,3555     1482                    GOPERFRS  10,2717     1359                GSCALE1   33,2636      881    1  879
GOCUTOFF  36,3061      742    2  726  728 GOPERFS   10,2637     1358                GSELECT   07,3420     1319    3 1318
GODSP     10,2436     1354    1  851          GOPERF1   10,2635     1358   10  513 1332 GSHIFT       7642     1042    1 1009
GODSPALM  41,2400      425   19  420  468 GOPERF1R  10,2715     1359                GTCTIME   F7,1752  =   152    2  213  789
GODSPR    10,2444     1354    2  512  941 GOPERF2   10,2642     1358                GTMP         0026  =   985    5  983  985
GODSPRET  10,2441     1354    4  751  947 GOPERF2R  10,2722     1359    1  489      GTS       21,3027     1470    1 1448
GODSPRS   10,2651     1358    8 1352 1359 GOPERF4   10,2645     1358    2  508  658 GTSCADR   17,2653     1448    1 1448
GODSPRS1  10,2653     1358    1 1354          GOPERF4R  10,2725     1359    2  925  973 GTSFIN    42,2154      317    1  444
GODSPR1   10,2445     1354                    GOPIN     43,2117      277   22  278  310 GTSFINLC  41,3227      444    1  445
GODSPR2   10,2446     1354    2 1352 1355 GOPINNER  25,3605      580    2  580      GTSFOUT   42,2146      316    1  430
GODSP2    10,2437     1354                    GOPLAY    10,3102  =  1370    1 1358      GTSFOUTL  41,2613      430    1  430
GOESTIMS  37,2113      386    1  386          GOPOODOO     5661     1380    1  253      GTSGO+ON  21,3043     1470
GOEXTVB   43,2000      275    1  421          GOPOOFIX  04,2040      236    2  235  253 GTSQAXIS  21,3063     1471    1 1471
GOFIND    24,3640      767    1  766          GOPOST    36,3046      741    2  726  727 GTSQRT    21,3371     1479    1 1480
GOFLASH   10,2471     1355   43  236  975 GOPROG    05,2671      226    2  163  164 GTSTEMPS  E6,1736  =   137   13  137
GOFLASHR  10,2647     1358    2  749  754 GOPROG2   05,2772      227    2  241  300 GUESS     37,2020      385
GOFLASH2  10,2473     1355   16 1352 1358 GOPROG2A  05,2773      227    1  227      GUESSBIT     4743  =    70
GOGOMARK  10,2400     1353                    GOPROG3   05,2777      227    2  227      GUESSW       0034  =    70    3  689 1192
GOGOPROG  04,2262      241    1  242          GOQ       41,3075      442    1  443      GUESS1    37,2255      389
GOINT     35,3400      680    2  673          GOQTRIMG  21,3045     1470    2 1470 1482 GUIDDURN  32,3067      785    1  782
GOITER    12,3415     1193    1 1193          GOREADAX  37,3425      860    1  862      GUIDINIT  34,3346      842    2  782  839

HEALTH KEY: NORMALLY DEFINED UNLESS FLAGGED AS FOLLOWS:

UN UNDEFINED         = DEFINED BY EQUALS                J DEFINED BY JOKER OR ERASE ANYWHERE       MD MULTIPLY DEFINED
BD BADLY DEFINED    CD DEFINITION ASSOCIATED WITH CONFLICT                XX MISCELLANEOUS TROUBLE
```

```
SYMBOL TABLE LISTING, INCLUDING DEFINITION, HEALTH, PAGE OF DEF, # OF REFS, PAGE OF FIRST REF, PAGE OF LAST REF.

SYMBOL     DEF      H      REFERENCES    SYMBOL     DEF      H      REFERENCES    SYMBOL     DEF      H      REFERENCES

GUIDSU8   31,2423     796   1  809      HIDESCNT  20,2002      45   1 1485      ======================================
GUILDEN   31,2436     797               HIDPHALF  23,2502 =    38   6  498 1248 I8NKCALL     4665     998  66  175 1495
GUILDRFT  31,2530     799   3  796  797 HIDP1/4   23,2474 =    38   1 1280      IC        E7,1655 =   149   6  772  775
GVDETER   15,2615     961   2  963  978 H1ENERGY  12,3432    1194   1 1193      ICDUFAIL  06,2703 =   190   1  191
GWAKE     07,3361    1317   1 1317      HIGATASK  33,2376     876   1  892      ICORK2    43,2222     281
GWAKE2    07,3321    1316   1 1317      HIGATCHK  33,3434     891               IDADDTAB  42,2661     326   2  316
GYCOARS   14,3174     941   1  928      HIGATJ08  33,3561     894   1  876      IDAD1TEM     0150      99   4  316  444
GYRCDR    15,3063     967   1  966      HIGHCRIT  E5,1473 =   126   1  126      IDAD2TEM     0151      99   2  316
GYROAGRE  07,3333    1316   1 1316      HIGHESTF  22,3651     830   1  807      IDAD3TEM     0152      99
GYROBUSY  07,3354    1317   1 1316      HIGH4        7763    1096   3 1004 1021 IDLADR    32,3435     821   1  816
GYROCMD      0047 =    94   8  185 1322 HIGH9        7765    1096   7  257 1004 IDLFADR   05,3363     234   1  230
GYROEXIT  07,3532    1321   1 1321      H1MINCON  42,3407     437   1  437      IDLEF8IT     4736 =    80   4  755  869
GYROFRAC  07,3631    1323   2 1320 1323 HINJECT   32,3645     838   1  842      IDLEFLAG     0161 =    80   7  735  854
GYROTRIM  15,3020     966   1  972      HIPRIO    10,2515    1355   1 1355      IDLEMASK  10,3022    1361   1 1365
======================================= HIRTHROT     4730 =    41   1  756      IDLERADR  16,2156    1410   1 1410
H         E4,1477 =   119   8  119 1241 HISCALAR     0003 =    95   2  393 1024 IDLERFT1  10,3314    1366
H*GHCR*T     0131 =   127   2  790      HISECON   42,3406     437   1  436      IDLESLFP  10,3542    1370   1 1361
HAFPA1    E7,1603 =   147   3  640  642 HITEMIN      0123 =    98   3  449      IERASTST     6146    1003   1 1003
HALF         4727 =  1097  33  346 1508 HITEMOUT     1006 =   104   4  435  438 IFAILINH  05,3365     234   1  227
HALFARG   E6,1746 =   137   4 1480 1482 HIUNITX   23,2502 =    38   1  503      IFAILJMP  06,2755     191   1  172
HALFDP    12,2004 =  1099   3  935 1230 HIUNITY   23,2500 =    38   2  503      IFAILOK   07,3221    1314   1 1313
HALFREV   22,3242     695   2  695      HIUNITZ   23,2476 =    38   4  503  534 IFLAGC    13,3132    1211   1 1212
HALFSEC   24,3205     527   1  525      HI10      04,3366    1337   1 1336      IFLAGP    13,3107    1211   1 1211
HANDADR   17,2622    1447   1 1446      HI5          4341     476  10  167 1289 IFLEGAL   10,2573    1357   1 1357
HANG2C    06,2071     167   1  166      HI6ZEROS  23,2504 =    38  17  311 1280 IGC       E5,1741 =   128   5  128 1251
HAPO      E4,1707 =   121   4  121  623 HLIGHT    25,3657     618               IGNALG    32,2637     782
HAPOX     E4,1512 =   119   4  119  723 HLITE        4740 =   619   2  618  831 IGNALGRT  32,3014     784
HAVEGUES  11,2002     689   1  772      HLROFF    E7,1451 =   145   2  782  877 IGNALOOP  32,2700     782   1  784
HAVENCRM  04,3163    1186   1 1186      HLROFFF   32,3073     786   1  782      IGNAOSQ   E6,1412     134   1  735
HAVEQUOT  21,3133    1472   1 1472      HMEAS     E7,1654 =   157   6  157  886 IGNAOSR   E6,1413     134   1  735
HBAD      25,3442     575   1  575      HMEASDL   E7,1776 =   159   2  213  576 IGNFLAG      0153 =    79   3  732  755
HBEAMNB   33,2002      42   1  886      HMSIN     42,3463     449   1  445      IGNFLBIT     4730 =    79   2  733  742
HCALC     E7,1534 =   154  10  154  388 HMSOUT    42,3241     435   1  430      IGNITE    36,3101     742   1  741
HCALCLAD  E7,1707 =   157   3  157  897 HOLD         0165 =  1504   2 1502      IGNITE1   36,3115     742   1  742
HCALC1    E7,1774 =   159   6  159  879 HOLDQ     E6,1744 =   138   2 1459 1463 IGNITION  36,2433     733   3  252  742
HDOTDISP  E7,1473 =   154  13  154  879 HOLDW     E5,1734 =   131   6 1152 1153 IGNYET?   36,2425     733   1  733
HDOTLAD   E7,1711 =   157   4  157  902 HOMEIN    15,2110     262   1  262      IGRET     E7,1675 =   151   2  604
HEADTJCT  16,3506    1436   1 1436      HPER      E4,1711 =   121   2  326  623 IGSAMEX   27,2125     497   1  497
HFAIL     33,3513     893   2  888      HPERMIN   E4,1571 =   120   6  120  724 IMEDIATE  01,3622    1302   4 1301 1304
HFAILBIT     4730 =    85               HPERX     E4,1514 =   119   2  326  724 IMODES30     1277     110  69  161 1329
HFAILFLG     0247 =    85   2  888  893 HRCON     42,3547     450   2  449      IMODES33     1300     110  48  168 1407
HFLSHBIT     4744 =    87   3  618  831 HRCON1    42,3310     435   1  435      IMPLBURN  36,3523     755   1  735
HFLSHFLG     0263 =    87   2  888  893 HSCAL     33,2062      43   1  886      IMPULBIT     4734 =    71   2  735  757
HH        E6,1746 =   138  15 1462 1465 HSTIL8AD  25,3443     575   1  575      IMPULSW      0044 =    71   5  755  769
HIASCENT  E6,1400     134   4  223 1485 HUGEQUOT  21,3130    1472   1 1471      IMUATTCK  43,2702     293   1  275

HEALTH KEY: NORMALLY DEFINED UNLESS FLAGGED AS FOLLOWS:

UN UNDEFINED           = DEFINED BY EQUALS             J DEFINED BY JOKER OR ERASE ANYWHERE      MD MULTIPLY DEFINED
BD BADLY DEFINED      CD DEFINITION ASSOCIATED WITH CONFLICT            XX MISCELLANEOUS TROUBLE
```

```
SYMBOL TABLE LISTING, INCLUDING DEFINITION, HEALTH, PAGE OF DEF, # OF REFS, PAGE OF FIRST REF, PAGE OF LAST REF.

SYMBOL      DEF     H       REFERENCES      SYMBOL      DEF     H       REFERENCES      SYMBOL      DEF     H       REFERENCES

IMUBACK  37,2005       385                  INCOR1B  23,2606      1148    1 1148         INJTARG  32,3516       835    1  837
IMUBAD   07,3656      1324    4  175 1324   INCOR1C  23,2614      1148    2 1148         INLINK      0045  =    94    2  233 1336
IMUCADR     1301  =    110    4  220 1324   INCOR2   23,2655      1149    2 1149 1156    INLUNCHK 11,3333      1236    1 1237
IMUCAGE  06,2565       184    1  191        INCOR2AB 23,2705      1150    1 1150         INREL       0137  =    99   24  412  417
IMUCHK   15,3634       981    2  947  973   INCOR3   23,2711      1150    1 1150         INRELTAB 40,2317       413    2  413  416
IMUCOARK 43,2213       281    1  280        INCR     01,2412      1086    1 1010         INT-ABRT 11,3021      1231    1 1231
IMUCOARS 07,2765      1309    4  231  949   INCRDCDU 22,3035       377    2  378  379    INT/W    13,3571      1219    2 1218
IMUCOARV 43,2234       281    2  281  282   INDEP    E5,1765  =    130    4 1180 1181    INTAOR   13,2357       713    1  712
IMUCOMP  06,2000  =     30    1  338        INDERASE    6227      1004    1 1004         INTBANK  13,3100      1210    1 1210
IMUFAIL  06,2703  =    190    1  191        INDEX       6167      1004    1 1002         INTBITAB 13,3521      1217    2 1216 1217
IMUFINE  07,3175      1313    4  285 1328   INDEXES  17,3134      1453    3 1452         INTBIT15    0115        98    6   98 1004
IMUFINED 07,3217      1313    2 1313 1318   INDEXI   23,3755      1261    1 1260         INTB15+     0114        98    5   98 1504
IMUFINEK 43,2344       285    1  275        INDEXLOC    0130  =     98   12 1004 1087    INTEGRV  13,3172      1213   13  247 1221
IMUFINEV 43,2374       285    1  285        INDEX2      6205      1004    1 1004         INTEGRVS 13,3145      1212    7  659  784
IMUFIN20 07,3175  =   1328                  INDJUMP     6315      1009    6 1003 1006    INTEGRV1 13,3174      1213    2 1211
IMUGOCD  07,3640      1324                  INDWORK     6225      1004    1 1004         INTEGRV2 13,3177      1213    1 1241
IMUMON   06,2172       171    2  169        INDXYZ   16,3573  =   1438    1 1427         INTEXIT  13,3263      1214    3 1215 1216
IMUOP    06,2622       186    1  191        INERCONA 20,3023      1491    1 1486         INTFLAG     0227  =    84
IMUOP2   06,2643       186    1  186        INERCONB 20,3041      1491    1 1486         INTFLBIT    4727  =    84    3  226 1217
IMUPULSE 07,3310      1316    7  265 1397   INERCONC 20,3042      1491    1 1486         INTGRATE 11,3370      1236    2 1236 1237
IMUSE       0007  =     68    7  243 1332   INFINAPO 12,3747      1198    2 1198         INTGRCAL 25,3642       604    7  595  603
IMUSEBIT    4735  =     68    3  175  220   INFINBIT    4736  =     81                   INTIME   E7,1607  =   148    5  666  692
IMUSEFLG    4735  =   1328    1  166        INFINFLG    0200  =     81    4 1184 1193    INTINIT  13,2000  =    31    5   48 1220
IMUSLLLG 37,2315       390    3  386  400   INFINITY 12,3205      1190    5 1187 1190    INTINT   35,3404       680    6  628  678
IMUSTALL 07,3735      1327   12  220  967   INFLIGHT 23,2000  =     33    2  336 1246    INTINT2C 34,3062       650    2  642  643
IMUSUPER 37,2000  =     37    1  362        INGTS    E6,1632  =    139    8 1409 1502    INTINT3P 34,3071       650    2  633
IMUVAR   26,3434       607    2  601  602   ININDEX  E6,1743  =    137    5 1479 1480    INTLOOP  35,2522       665    1  665
IMUZERO  07,2701      1307    3  220  390   INITABIT    4743  =     82    2  969  970    INTLZE   21,2644       903    1  903
IMUZEROA 07,2711      1307    1 1307        INITALGN    0205  =     82    4  969  978    INTMCT8S 41,2143       421    2  420
IMUZEROK 43,2131       278    1  278        INITBY   15,3145       969    1  969         INTOTHIS 13,2320       713
IMUZERO2 07,2744      1308    1 1307        INITCDUW 30,3063       907    2  729  834    INTPRET     6060      1000  237  219 1389
IMUZERO3 07,2753      1308                  INITDSP  10,3051      1362    1 1300         INTPRETX 31,3675       827    3  804  808
IMUZERR  37,2325       390    1  365        INITREAD 25,3076       569    6  569         INTPRET1 23,2000  =    33    1 1098
IMU2     37,2000  =     37    2   46  385   INITST   34,2061       638    2  639  645    INTPRET2 12,2000  =    31    1 1099
IMU4     37,2000  =     37    1  395        INITV    12,3516      1195    3 1193 1194    INTRSM      6071      1000    1 1108
IM30INIF 05,3377       234    1  223        INITVEL  11,2000       689    2  677  762    INTSTALL 13,3447      1216   38  240 1389
IM30INIR 05,3400       234    1  227        INITVELX 11,2260       693    1  693         INTVAL   37,3065       401    2  395  397
IM33INIT    5017  =    234    2  224  233   INITVEL1 11,2026       689    1  689         INTVEC   E5,1462  =   133
INBOUND  27,3553      1275    1 1274        INITVEL2 11,2062       690    1  692         INTVEL   11,2000  =    30    1  689
INCAZ    15,2430       955    1  957        INITVEL3 11,2105       690    2  690         INTWAKE  13,3460      1217    4  310 1214
INCORPEX E7,1674  =    150    5  150 1134   INITVEL4 11,2137       691    1  691         INTWAKEC 04,3220      1223    1 1223
INCORP1  23,2514      1147    1  606        INITVEL5 11,2166       692    1  692         INTWAKEM 04,3215      1223    1 1222
INCORP2  23,2726      1151    1  606        INITVEL6 11,2230       692    1  692         INTWAKEU 04,3172      1222    1 1391
INCOR1   23,2550      1148    1 1148        INITVEL7 11,2233       692    1  691         INTWAKEX 04,3232      1223    1 1223
INCOR1A  23,2557      1148    1 1148        INITWMX6 26,3237       603    1  603         INTWAKEO 13,3456      1216    3  510 1223

HEALTH KEY: NORMALLY DEFINED UNLESS FLAGGED AS FOLLOWS:

UN UNDEFINED          = DEFINED BY EQUALS               J DEFINED BY JOKER OR ERASE ANYWHERE       MD MULTIPLY DEFINED
BD BADLY DEFINED     CD DEFINITION ASSOCIATED WITH CONFLICT              XX MISCELLANEOUS TROUBLE
```

```
SYMBOL TABLE LISTING, INCLUDING DEFINITION, HEALTH, PAGE OF DEF, # OF REFS, PAGE OF FIRST REF, PAGE OF LAST REF.

SYMBOL      DEF    H       REFERENCES      SYMBOL      DEF    H       REFERENCES      SYMBOL      DEF    H       REFERENCES

INTWAKE1 13,3500      1217    3 1217      ITR12        6155      1003                JSWCHBIT     4727  =    67
INTWAKLM 04,3230      1223    1 1223      ITR13        6234      1005    1 1004      JSWITCH      0001  =    67    5 1236 1241
INTWAKUP 04,3241      1223    1 1222      ITR14        6260      1006                JTLST     17,3143      1454    2 1435 1453
INTY     E5,1470  =    132    6  397  398 ITR15        6144      1003                JUMPDSP   16,2212      1411    1 1407
INTYPBIT     4741  =    73                ITR7         6302      1007                JUSTOUT   16,3152      1431    1 1432
INTYPFLG     0070  =    73   20  508 1221 ITSAJOB   01,3637      1302    1 1301      JUSTTRIM  15,3053       966    1  970
INTZ     E5,1474  =    132                ITSAJOB2  01,3750      1305    1 1303      J1PARM    E5,1545  =   126    2  126  836
INVERT   20,3656      1502    4 1496 1502 ITSATBL   01,3653      1302    1 1300      J2PARM    E5,1551  =   126    2  126  836
INVFLAG  36,2644       738    1  737      ITSAVAR   01,3553      1300    1 1300      J2REQSQ   13,2022        48    1 1233
INVRSEQN 12,3127      1189    1 1189      ITSAWAIT  01,3572      1301    1 1301      J4REQ/J3  13,2012        48    2 1233
IRETURN  E4,1501  =    119    8  119 1214 ITSEVEN   01,3754      1305    1 1302      =====================================
IRETURN1 E7,1744       149    5 1220 1222 ITSINDIR     5440      1301    1 1301      K.01      24,3632       660    1  660
IRIGCOMP 06,3400       340                ITSLGCL1     5447      1303    2 1303 1304 K(AT)     32,3651       838    1  835
IRIGX    06,3426       341    2  340  346 ITSLGCL2  01,3711      1304    1 1304      K(1/OV)   27,2014        40    1  835
IRIGY    06,3443       341    2  340  346 ITSLIKEB  01,3624      1302    1 1300      KALCMAN3  22,2004       363    1 1328
IRIGZ    06,3460       341    2  340  347 ITSLNGCL  01,3736      1304    1 1300      KALCMON1  22,2000  =    33    4  363  377
IRIG1    06,3423       340    3  338  349 ITSNOVAC  01,3647      1302    1 1302      KALCMON2  22,2000  =    33    1  368
ISCADP+0     4211      470    2  470  479 ITSWBIT      4726  =    79                KALEBCON  21,3006      1328    1 1328
ISITAUTO 26,2274       491    1  377      ITSWICH      0151  =    79    5  633  670 KAOS      16,2627      1425
ISITNOO  10,3175      1364    1 1364      ITSWTLST  01,3743      1304    1 1303      KCENTRAL  E6,1740  =   137    8 1471 1473
ISITPRIO 10,3260      1365    2 1366      ITURNON   06,2533       182    1  191      KDPNOX    E6,1701  =   140    3  140  379
ISLIST+0     4215      470    2  470  479 ITURNON2  06,2556       183    2  182  186 KEEP-2    E7,1560  =   156    1  156
ISSERVCN 04,2127       239    1  238      ===================================== KEEPPRIO  10,2544      1356    2 1362 1366
ISSUP    06,2321       175                JACCUV    20,2647      1487    1 1486      KEEPVR    34,3451       853    1  853
ISSWOFF  06,2716       189                JAMPROC      4234       470                KEEPVR1   34,3453       853    1  852
ISSWON   06,2726       190    1  189      JAMTERM      4222       470    1 1365      KEL       E4,1621  =   121   12  372  497
ISSZERO  06,2361       176    1  184      JAPFG*    E5,1444  =   125    1  125      KEPCONVG  12,2333      1176    3 1174 1175
ISWCALL      4671      998                JBRFG*    E5,1442  =   125    2  125  829 KEPC1        0042  =  1199    3 1172 1188
ISWRETRN     4700      998    2  577  756 JDG2TTF   E5,1442  =   829    1  804      KEPC2        0044  =  1199    3 1172 1188
ITCTR    E7,1616  =    148    4  689  692 JETRATE   E6,1744  =   137    5  137 1423 KEPLERN   12,2023      1172    2 1226
ITEMP1       0061       97   69   97 1414 JETRATEQ  E6,1745  =   137    3 1421 1469 KEPLOOP   12,2166      1174    1 1175
ITEMP2       0062       97   36   97 1478 JETRATER  E6,1746  =   137    3 1421 1469 KEPPREP   11,2403      1225    3 1214 1231
ITEMP3       0063       97   25   97 1476 JETSALL   16,3555      1438    1 1438      KEPRTN    E4,1511  =   119    3 1176 1226
ITEMP4       0064       97   14   97 1323 JETSOFF   16,3443      1435    7 1429 1438 KEPZERO   12,2006  =  1183    3 1173 1197
ITEMP5       0065       97    9   97 1297 JETSON    17,3435      1461                KEYCOM    04,3266      1335
ITEMP6       0066       97    7  190 1476 JOBSLEEP     5124      1103    8  386 1374 KEYRPTBB     4060       164    2  163  164
ITERATOR 12,2536      1180    1 1193      JOBSLP1   01,3002      1108    1 1103      KEYRUPT   04,2000  =    29    1 1335
ITERCTR      0026  =  1201    4  691 1181 JOBSLP2   01,3013      1108    1 1110      KEYRUPT1  04,3257      1335    2  163  164
ITISMASK 10,3306      1366    1 1365      JOBWAKE      5130      1103   14  384 1375 KEYTEMP1     0073  =    97    7  164 1337
ITRPNT1  32,3264       818                JOBWAKE2  01,3027      1109    1 1103      KEYTEMP2     0332  =   101    2 1336
ITRPNT2  32,3421       820                JOBWAKE3  01,3041      1109    2 1109      KIGNV/B4  E5,1470  =   126    2  126  783
ITR0         6411     1012                JOBWAKE4  01,3033      1109    1 1109      KIGNX/B4  E5,1464  =   125    3  126  783
ITR1         6400     1012                JOBXCHS   10,3006      1361    2 1356      KIGNY/B8  E5,1466  =   126    2  126  783
ITR10        6163     1003                JOIN      10,3562      1371    1 1371      KILCLOCK  35,3561       683    2  683  684
ITR11        6223     1004                JPARM     E5,1571  =   127    3  127  856 KILLAOT   07,2053       256    6  257  272

HEALTH KEY: NORMALLY DEFINED UNLESS FLAGGED AS FOLLOWS:

UN UNDEFINED         = DEFINED BY EQUALS              J DEFINED BY JOKER OR ERASE ANYWHERE      MD MULTIPLY DEFINED
BD BADLY DEFINED     CD DEFINITION ASSOCIATED WITH CONFLICT             XX MISCELLANEOUS TROUBLE
```

```
SYMBOL TABLE LISTING, INCLUDING DEFINITION, HEALTH, PAGE OF DEF, # OF REFS, PAGE OF FIRST REF, PAGE OF LAST REF.

SYMBOL      DEF     H       REFERENCES      SYMBOL      DEF     H       REFERENCES      SYMBOL      DEF     H       REFERENCES

KILLBB       6057       745    1  745       LANAKPIP 21,2000        44    3  896       LEFTNCOM 40,3205       448    1  448
KILLCLCK 36,2732       739    1  739       LAND     E7,1634  =   156   18  156  886 LEFT5        4322       475    5  427 1289
KILLDFAO 27,2242       746    1  746       LANDALT  E5,1712  =   128    3  329  930 LEGAL?   21,2150       837    2  832
KILLMON  41,3366       453    2  453       LANDCNST 22,2000  =    33    1  830       LEGALTST 40,2516       416    2  416
KILLTASK     6050       745   12  239  741 LANDJUNK 34,3271       787    1  245       LEMALONE 01,2277       307    1  307
KILLTSK2 27,2200       745    2  745       LANDLAT  E5,1706  =   128    4  128  930 LEMCONIC 13,3136      1211    5  351  951
KILL2    04,2312       242    3  242  243 LANDLONG E5,1710  =   128    4  128  930 LEMGEOM  13,2000  =    31    1  332
KILMONON     4175       469    4  461  484 LANDRAD  25,3207       571             LEMMASS      1326       110   22  161 1493
KLEENEX  1[illegible],2222      1352             LANDTEMP E7,1544  =   156    7  156  803 LEMONM       0056  =    95
KONMAT   05,2001        53    5  933  985 LARGE    00,3065      1068    1 1068       LEMPREC  13,3115      1211   11   38  974
KPARM    E5,1573  =   127    2  127  855 LARGE2   00,3112      1070    2 1068 1069 LEMSTDRF 23,2417       700    1  700
KPIP     33,2072        43    1  364       LARGE3   00,3074      1070    1 1068       LEMVEC   43,3044       301    1  276
KPIP1    33,2073        43    4  818  882 LARMENT      5603      1378    1 1381       LENGTHOT E5,1412  =   132    9  132  400
KPIP2    33,2075        43    1  884       LASINEX  00,3631      1082    1 1082       LESCHK   05,3367       234    1  233
KQ       E6,1504       137    4  137 1488 LAST     16,3326      1433    2 1433       LETABBIT     4734  =    83    3  734  837
KRDAP    E6,1506  =   137    1 1488       LASTBIAS 06,3733       348    1  860       LETABORT     0215  =    83    3  787  855
KSPNDX   E6,1700  =   140    6  140  379 LASTCHG  17,3174      1455    1 1455       LETITLIV 27,2221       746    1  746
KT       E7,1575  =   147    3  669       LASTLRDT 25,3555       580    1  579       LGCLCADR 01,3774      1305    1 1304
K1ORK2   34,2542       644    1  644       LASTSEG  07,3515      1321    1 1322       LGCL2COR     5311      1129    1 1129
K1PARM   E5,1547  =   126    1  126       LASTTIME 01,3504      1130             LGCOMP   06,3601       345    3  338  348
K1VAL    27,2000        39    1  768       LASTTPIP E7,1757  =   158    4  158  819 LGCUPDTE 26,3400       606    4  597  602
K2.      34,2561       644    1  644       LASTXCMD     0113  =    98    7  209  546 LGRET    E7,1675  =   151    5  151  606
K2CNTRAL E6,1741  =   137   22 1472 1481 LASTYCMD     0112  =    98   10   98  551 LGWAKE   07,3371      1317    3 1317 1324
K2PARM   E5,1553  =   126    1  126       LAT          1117  =   107    8  107 1133 LGYRO        1311       110   10  233 1324
K2THETA  E6,1736  =   137   12 1471 1481 LAT-LONG 13,2406      1131    3  660  930 LGYROBIN 43,2372       285    1  285
K2VAL    27,2002        39    1  769       LATAZCHK 37,2021       385             LIGHTSET 05,3070       229    2  226  227
K3S1     22,2370       369             LATITUDE E5,1402  =   132    6  132  392 LIM(-22) 27,3761      1280    1 1275
K3VAL    27,2004        39    1  769       LATLONG  13,2000  =    31    1 1131       LIMALARM 26,3674       613    2  611
K4       22,2372       369             LATVEL       0072  =   158    7  900  902 LIMITCOM 42,3345       436    1  436
K4SQ     22,2374       369             LATVMETR E7,1732  =   158    6  158  903 LIMITS       4725  =  1093   10  920 1471
========================================== LATVOUT  21,2500       900    1  900       LIMITSUB 30,3713       921   10  815  916
L            0001  =    94  330   95 1507 LAXIS    E4,1673  =   124    5  124  853 LINRAT   17,2373      1444    2 1444 1445
L*WCR*T      0130  =   127    2  790       LBUF2    00,2470      1057    2 1081 1083 LINRATP  16,3131      1431    1 1432
L,PVT-CG E6,1527       138    1 1433       LCHAN        0001  =    95   16  168 1435 LINUS        5466  =  1370    1  490
LADLIMIT 21,2673       904    4  899  900 LDANZIG  00,3713      1083    1 1082       LINUSCHR 10,3402      1367    2 1355 1357
LAG/TAU  E5,1537  =   126    2  126  820 LDLOOP72 04,3675      1391    1 1391       LITEOK   06,3025       192    2  191  192
LAGSLIST     4744  =   221    1  220       LDNDUMP  05,3734       995    1  995       LITESWCH 06,3017       191    1  192
LALUTCRV 13,2457      1133    1  930       LDNDUMPI 43,3043       300    1  300       LITIT    25,3673       618    1  618
LAMBERT  12,3212      1191    1  691       LDNDUMP1 05,3735       995    1  995       LMAGSI02 05,2116  =   216    1  216
LAMBLOOP 12,3330      1192    3 1193 1195 LDNPHAS1 05,3366       234    1  230       LMAGSI03 05,2125  =   216    1  216
LAMENTER 12,2701      1182    1 1195       LDNPHAS2 05,3654       992    1  989       LMAGSI04 05,2134  =   216    1  216
LAMPBTST [illegible]6,3032       192    1  191       LDPOSMAX 12,2017  =  1199    1 1198       LMAGSI05 05,2140  =   216    1  216
LAMPTEST 06,2766       191    3  180  192 LEADTIME E7,1426       144    1  805       LMCSTA01 05,2107  =   208    1  208
LANADEND 21,2512       900    2  903       LEFT     00,2342      1054    1 1051       LMCSTA02 05,2116  =   208    1  208
LANADISP 21,2170       895    5  831  832 LEFT-    00,2336      1054    1 1051       LMCSTA03 05,2125  =   208    1  208

HEALTH KEY: NORMALLY DEFINED UNLESS FLAGGED AS FOLLOWS:

UN UNDEFINED          = DEFINED BY EQUALS            J DEFINED BY JOKER OR ERASE ANYWHERE      MD MULTIPLY DEFINED
BD BADLY DEFINED     CD DEFINITION ASSOCIATED WITH CONFLICT           XX MISCELLANEOUS TROUBLE
```

```
GAP:  ASSEMBLE REVISION 210 OF AGC PROGRAM LUMINARY BY NASA 2021112-161       17:11 MAR. 19,1971                PAGE 1531

SYMBOL TABLE LISTING, INCLUDING DEFINITION, HEALTH, PAGE OF DEF, # OF REFS, PAGE OF FIRST REF, PAGE OF LAST REF.

SYMBOL      DEF     H        REFERENCES         SYMBOL      DEF     H        REFERENCES        SYMBOL      DEF     H        REFERENCES

LMCSTA04 05,2134  =   208    1  208          LMSAL05  05,2207  =   214    1  214          LOOKANGL E7,1667  =   157    1  804
LMCSTA05 05,2207      208    3  208   214 LMTRAP   F6,1406      134    2  223 1423 LOOPCT   F7,1605  =   147    5  639   647
LMCSTA06 05,2213      208    2  211   213 LMVEL    E4,1750      123    3  516   583 LOOPFR   17,3034     1452    3 1447 1453
LMCSTA07 05,2215      209    2  203   215 LNCHTM   E7,1660  =   155    3  155   510 LOOPMX   34,2057      638    1  639
LMCSTA10 05,2144  =   209    1  208          LNGCALL2 01,3455     1129    1 1129          LOOPRATE 16,3671     1468    2 1468 1469
LMDSAS02 05,2116  =   212    1  212          LOADDAP  20,2000  =    32    1  304          LOOPSIN  22,2417      369    1  370
LMDSAS03 05,2125  =   212    1  212          LOADDAP1 01,2000  =    29    2   45   306 LOOP1    23,3710     1261    1 1260
LMDSAS04 05,2134  =   212    1  212          LOADITIS 10,3467     1369    1 1366          LOOP2    23,3707     1260    1 1261
LMDSAS05 05,2140  =   212    1  212          LOADLV   41,3045      442   10  419   450 LOOSF    37,2730      398    1  399
LMDSAS06 05,2151  =   212    1  212          LOADLV1  41,2021      419    1  286          LOSCALAR    0004  =    95    6  393  1452
LMDSAS07 05,2340      213    1  212          LOADSTAT    1013      104    4  442   473 LOSCMBIT    4731  =    71    1  568
LMDSAS08 05,2347      213    1  212          LOADTIME 10,3603     1394   38  219  1221 LOSCMFLG    0041  =    71    8  511   583
LMDSAS09 05,2213  =   213    1  212          LOASCENT 20,2001       45    1 1485          LOSCOUNT E7,1456      145   33  157   618
LMINT    24,3346      583    1  583          LOC         0164      101   46  383  1370 LOSDESRD E7,1711  =   150    6  150   612
LMKAOSN  E6,1410      134    1  224          LOCCTR      0064  =    97   31  384  1365 LOSVEC   E5,1413  =   132    3  132   399
LMLSAL01 05,2107  =   214    1  214          LOCKANGL 22,2402      369    1  363          LOSVEL   E3,1756      117    5  117   610
LMLSAL02 05,2116  =   214    1  214          LOCSAM   14,2515      932    3  932   960 LOS1     F5,1444  =   132
LMLSAL03 05,2125  =   214    1  214          LOCSKIRT 22,2744  =   376    7  365   367 LOS2     F5,1452  =   132
LMLSAL04 05,2134  =   214    1  214          LODESCNT 20,2003       45    1 1485          LOTEMIN     0124  =    98
LMLSAL06 05,2151  =   214    1  214          LODMIXNN 42,2126      316    1  316          LOTEMOUT    1007  =   104    1  437
LMLSAL07 05,2407      214    1  214          LODNLV   42,2144      316    1  316          LOTHRUST 33,2274      866    1  866
LMLSAL08 05,2215  =   215    1  214          LODNNLOC 41,2140      421    3  420   441 LOUNITX  12,2004  =    38
LMLSAL09 05,2145  =   215    1  214          LODNNTAB 42,2110      316    1  421          LOUNITY  12,2002  =    38
LMOMEGAN E6,1407      134    2  224  1423 LODPHALF 12,2004  =    38    3  334  1197 LOUNITZ  12,2000  =    38
LMONLY   16,2466     1423    1 1423          LODPMAX  12,2017     1099    3   38  1199 LOUPE    21,3551     1482    1 1481
LMOONBIT    4732  =    81                    LODPMAX1 12,2021     1099    1   38          LOWCRIT  E5,1472  =   126    3  126   790
LMOONFLG    0174  =    81    5   38  1209 LODP1/4  C4,3037  =    38    1 1135          LOWFCOLD 31,2236      790    1  790
LMORBM01 05,2107      205    4  205   214 LODSAMPT    4371      477    3  453  1336 LOWIDCOD 05,2045      204    1  995
LMORBM02 05,2116      205    6  205   216 LOENERGY 12,3452     1194    1 1193          LOWLOAD  10,3534     1370    1 1366
LMORBM03 05,2125      206    6  205   216 LOGSUB   30,3015      859    1  348          LOWSUPER 30,2000  =    35    8  221   658
LMORBM04 05,2134      206    6  205   216 LOKONBIT    4740  =    68    1  567          LOWVERB  41,2061      420    1  420
LMORBM05 05,2140      206    3  205   216 LOKONSW     0012  =    68    5  284   527 LOW10       5003     1095   21  244  1288
LMORBM06 05,2151      206    3  205   214 LOLIM    12,3513     1195    2 1192          LOW11       4347      476    7  166  1012
LMORBM09 05,2145      206    1  215          LOMAT    35,3365      680    2  677   678 LOW2        6266  =  1097    1 1051
LMORB10  05,2144      206    2  209   211 LONG        1121  =   107    7  107  1133 LOW3        4750  =  1097    2  243  1048
LMPOS    F4,1742      123    3  516   583 LONGBASE    1150      107    2 1298  1304 LOW4        4753     1093    3  740  1372
LMREND01 05,2107  =   210    1  210          LONGCADR    1146      107    2 1129  1130 LOW5        4337      476   16  411  1336
LMREND02 05,2116  =   210    1  210          LONGCALL    5301     1128    5  386  1305 LOW7        6115     1001   14  239  1369
LMREND03 05,2125  =   210    1  210          LONGCLCL 01,3731     1304    2 1304          LOW7+2K     5004     1095    1 1007
LMREND04 05,2134  =   211    1  210          LONGCYCL 01,3471     1129    2 1129  1130 LOW8        4350      476   21  202  1391
LMREND05 05,2207  =   211    1  210          LONGEXIT E3,1434      114    4 1129  1130 LOW9        4775     1094   14  223  1111
LMREND06 05,2213  =   211    1  210          LONGGYRO 07,3552     1321    1 1320          LO6ZEROS 12,2006  =    38    5  259  1183
LMREND07 05,2265      211    1  210          LONGPOOH 01,3523     1130    2 1129          LPS20.1  24,3337      583    5  511   590
LMREND08 05,2275      211    1  210          LONGRTRN 01,3510     1130    1 1130          LPS20.2  25,3626      585    1  511
LMREND10 05,2144  =   211    1  210          LONGTIME    1152      107   13 1128  1304 LP2ALM   25,3574      580    1  580

HEALTH KEY: NORMALLY DEFINED UNLESS FLAGGED AS FOLLOWS:

UN UNDEFINED          = DEFINED BY EQUALS             J DEFINED BY JOKER OR ERASE ANYWHERE      MD MULTIPLY DEFINED
BD BADLY DEFINED     CD DEFINITION ASSOCIATED WITH CONFLICT              XX MISCELLANEOUS TROUBLE
```

```
SYMBOL TABLE LISTING, INCLUDING DEFINITION, HEALTH, PAGE OF DEF, # OF REFS, PAGE OF FIRST REF, PAGE OF LAST REF.

SYMBOL        DEF   H       REFERENCES        SYMBOL        DEF   H       REFERENCES        SYMBOL        DEF   H       REFERENCES

LRALT     25,3062    569  1  506           LRWH1        1315 =  110  1  799           M/SNORM   42,3353    436  7  436  437
LRALTBIT     4740 =   88  1  618           LRWVFF    E5,1521 =  126  2  126  891      M/SOUT    42,3314    436  1  430
LRALTFLG     0276 =   88                   LRWVFX    E5,1520 =  126  1  126           MAGSUB       4503    537  9  539  560
LRBYBIT      4726 =   85  8  230  377      LRWVFY    E5,1517 =  126  1  126           MAGVEC2   E5,1717 =  130  6  130 1195
LRBYPASS     0245 =   85  1  781           LRWVFZ    E5,1516 =  126  2  126  891      MAINENG   30,2424    847  1  847
LRESC     20,2673   1487  1 1486           LRWVX     E5,1515 =  126  1  126           MAINLINE  30,2705    851  2  852
LRHEIGHT  25,3267    573  1  572           LRWVY     E5,1514 =  126  1  126           MAJ+      07,3454   1320  1 1319
LRHMAX    E7,1420    144  2  888           LRWVZ     E5,1513 =  126  2  126  891      MAJ-      07,3611   1323  1 1319
LRINH        0254 =   86  3  284  877      LSDISP    14,2471    930  1  930           MAKEACCS  37,3514    862  2  861  862
LRINHBIT     4735 =   86  3  811  890      LSORIENT  04,3014    981  2  929  974      MAKECADR     4636    997 15  233 1484
LRLCTR    E7,1670 =  157  5  157  893      LSPOS     15,3646    983  4  932 1235      MAKEGEN   10,3545   1370  1 1359
LRMCTR    E7,1672 =  157  5  157  893      LSR22.3   26,2424    595  2  522  605      MAKEMARK  10,2357   1352  1 1357
LROFF     43,2336    284  1  275           LSR22.4   26,3206    603  1  595           MAKEMAX   20,3011   1491  1 1491
LROFF?    33,2432    877  1  877           LSTBNKCH  43,3726   1290  1 1289           MAKEPLAY  10,2560   1356  3 1355 1370
LRON      43,2333    284  1  275           LSTLIM       4740 =  746  1  746           MAKEPRIO  10,2505   1355  1 1357
LRPOS     E7,1650 =  156  5  157  894      LST1      E3,1400    114 48  164 1300      MAKERUPT     7775   1457  2 1456 1457
LRPOSBIT     4737 =   88  1  579           LST2      E3,1410    114 41  232 1126      MANFLAG   16,2206   1411  1 1409
LRPOSCAL  43,2652    291  2  288           LST2CON   41,2172    421  1  421           MANMODE   16,3034   1428  1 1428
LRPOSCAN  25,3563    580  1  579           LST2FAN   43,2002    275  2  275  481      MANTHRT?  32,3177    816
LRPOSFLG     0275 =   88                   LS21X     E3,1755    117  4  516  583      MANUCALL  22,3177    379  1  379
LRPOSNXT  25,3537    579  2  579  580      LTHVACA   05,3372    234  4  232  233      MANUFBIT     4727 =   79
LRPOSOUT  40,2624    431  1  430           LT5       41,2053    419  2  419           MANUFLAG     0152 =   79
LRPOS2    25,3511    579  2  580  894      LUNABIT      4731 =   72                   MANUDEF   22,3113    378  1  378
LRPOS2K   43,2147    278  1  275           LUNAFLAG     0060 =   72  9  659 1137      MANUR     21,2000 =   32  1 1328
LRPOS2K1  43,2161    278  1  278           LUNDESCH  25,2412    555  1  334           MANUSTAL  22,3067    378
LRP2COMM  25,3566    580  1  279           LUNG      15,2722    963  2  961  962      MANUSTAT  22,3122    378  1  377
LRRCTR    E7,1671 =  157  4  157  893      LUNLANAD  36,3135    744  1  734           MANUSTOP  22,3213    381  1  378
LRSCK     25,3357    574  1  574           LUNLAND   31,2425    796  1  744           MANUVER   26,2000 =   34  1  488
LRSCTR    E7,1673 =  157  4  157  893      LUNPOS    15,3646 =  983  2  502 1237      MANUVER1  26,2000 =   34  1  498
LRSPEED   25,3217    572                   LUNRSALN     0005 =  247  2  246  247      MARKCHEX  07,2212    266  1  265
LRS22     32,2000 =   35  2   42  588      LUNSFCHK  24,2751    523  9  507  531      MARKCOP   10,2406   1353  1 1353
LRS22.1   32,2362    588  1  521           LUNSPH    11,3415   1237  1 1235           MARKCTR   E7,1462 =  146  5  511  713
LRS22.1X  E7,1737 =  152  6  152  593      LV           0044 =   95  2 1068 1070      MARKEND   10,2315   1351  1 1351
LRS22.2   24,3416    592  1  521           LVBUF        6314   1008  1 1032           MARKFLAG     1070    105  1 1353
LRS24.1   26,3441    608  2  531  612      LVELBIAS  25,2000     42  1  572           MARKFMSK  10,3043   1361  2 1352
LRS24.11  26,3470    609                   LVSQUARE     0042 =   95  2 1068 1073      MARKFORM  10,2332   1352
LRUPT        0011 =   94                   LVWTLIST     5217   1117  1 1121           MARKNV       0367    102  3 1353 1354
LRVELBIT     4735 =   88                   LXA       01,2360   1085  1 1010           MARKOCT   10,3540   1370  1 1361
LRVELFLG     0273 =   88                   LXC       01,2364   1085  1 1010           MARKOVER  10,3427   1368  1 1351
LRVELX    25,3070    569  1  506           L14/OUT   40,2740    433  2  432  433      MARKPERF  10,2433   1354  1 1364
LRVELY    25,3066    569  1  506           ======================================      MARKPLAY  10,2372   1353  4 1353 1369
LRVELZ    25,3064    569  1  506           M/SCON1   42,3410    437  1  436           MARKRET   10,3421   1368  1 1366
LRVF      E5,1512 =  126  3  126  890      M/SCON2   42,3411    437  1  436           MARKRUPT  07,2354    269  2  163  164
LRVMAX    E5,1511 =  126  3  126  891      M/SCON3   42,3413    437  4  436           MARKSTAT     1307    110 14  233  272
LRWH      E7,1421    144  2  799  888      M/SLIMIT  42,3337    436  2  436           MARKTEST  26,2516    596  1  595

HEALTH KEY: NORMALLY DEFINED UNLESS FLAGGED AS FOLLOWS:

UN UNDEFINED           = DEFINED BY EQUALS            J DEFINED BY JOKER OR ERASE ANYWHERE      MD MULTIPLY DEFINED
BD BADLY DEFINED     CD DEFINITION ASSOCIATED WITH CONFLICT             XX MISCELLANEOUS TROUBLE
```

```
SYMBOL TABLE LISTING, INCLUDING DEFINITION, HEALTH, PAGE OF DEF, # OF REFS, PAGE OF FIRST REF, PAGE OF LAST REF.

SYMBOL       DEF H      REFERENCES     SYMBOL       DEF H      REFERENCES     SYMBOL       DEF H      REFERENCES

MARKWAKE  10,3035   1361   1 1368      METHOD3   22,2266    367   2  366      MINPERE   22,3367    718   2  717  720
MARK2PAC     1072    105   2 1362 1363 MFI       E4,1621 =  121  12  363  365 MINPERM   22,3365    718   1  720
MARK3MSK  10,3513   1369   2 1352      MFISYM    E6,1702 =  140  12  365  367 MINQR     17,2320   1443   2 1443
MARK4MSK  10,3514   1369   1 1352      MFREF     15,3444    976   2  979  980 MINRTN    17,2325   1443   1 1444
MARSLEEP  10,3462   1368   1 1354      MFS       E4,1621 =  121   4  121  363 MINTIMES  16,3622   1439   1 1435
MASS         1243 =  108  18  108 1493 MGARET    30,3256    911   1  921      MINTIME2  05,3534    990   1  990
MASSCTR      0161 = 1494   5 1492 1493 MGC       E5,1743 =  128   4  128 1250 MINUS1       7770 = 1097   2 1320 1368
MASSFIX   20,2517   1485   3 1485      MGLVFBIT     4743 =   77              MINUS2       7767 = 1305   3  230 1300
MASSMGN   33,2146    864               MGLVFLAG     0130 =   77   2  695      MIS       E6,1645    140  20  140  498
MASSMULT  31,2344    793   2  789      MG2       07,3745   1327   1 1327      MISCJUMP     6355   1010   1 1007
MASS1     E7,1570 =  154   5  154  864 MIDAVBIT     4743 =   83              MIXAD     41,2305    423   1  423
MATINC       0140     99   9   99 1037 MIDAVFLG     0224 =   83   3 1221 1240 MIXBACK   40,3076    446   1  447
MATMOVE   13,2374    929   7  941  973 MIDDGIM   22,2000 =   33   1  695      MIXBR        0140 =   99  13  316  447
MATRIX    11,3277   1235   2 1232      MIDDGIM1  21,2000 =   32   1  695      MIXCON       4762 =  316   1  316
MAX          0016 = 1201   4 1180 1181 MIDFLAG      0002 =   67   5 1215 1243 MIXNN1    41,2261    423   1  423
MAXANG    22,2364    369   1  364      MIDFLBIT     4730 =   67              MIXNN2    41,2273    423   1  423
MAXCHECK  12,2625   1181   1 1181      MIDORLST  17,3163   1455   1 1454      MIXNOUN   41,2246    423   1  420
MAXCHK    22,3640    724   4  623  723 MIDTOAV1  13,3606   1220   1  729      MIXTEMP      0125 =   98   3  416  423
MAXCOGA   12,3302   1192   2 1192      MIDTOAV2  21,2760   1220   1  753      MKABORT   07,2037    255   1  255
MAXDB     05,3067    229   1  223      MID1FBIT     4742 =   83              MKALARM   07,2331    267   2  266
MAXDBITS  21,2002     44   2  900      MID1FLAG     0223 =   83   4 1220 1222 MKDEX     E7,1552 =  151  10  151  272
MAXDT     13,3377   1216   2 1215      MID2      13,3701   1222   1 1221      MKOVBIT      4742 =   75   2 1354 1361
MAXDV     00,2642   1063   1 1059      MID5         4340    476   1  442      MKOVFLAG     0110 =   75
MAXDVSW      0140 =   99   6 1055 1070 MID7         4144    454   5  454 1369 MKREJ     07,2572    274   1  269
MAXFORCE  E5,1543 =  126   2  126  820 MIMRET    17,2341   1443   1 1443      MKRELEAS  07,2042    255   1  267
MAXJETS   17,3373   1460   1 1460      MIN          0010 = 1201   4 1180 1181 MKRUPTBR     4061    164   1  163
MAXNM     22,3647    724   3  724      MIN+      07,3451   1320   1 1319      MKTIME    E7,1754 =  152   9  152  604
MAXPLUS   20,3017   1491   2 1490 1491 MIN-      07,3606   1323   1 1319      MKVAC     07,2007    255
MAXRA     27,3464   1271   2 1271      MINABDV   33,2115    858   1  844      MKVACFND  07,2024    255   5  255
MAXTEST   00,2565   1059   4 1053 1072 MINADR    17,2350   1444   1 1443      MKVB52    07,2567    273
MAXTFF    27,3654   1277   1 1276      MINANG    22,2362    369   1  364      MKVB53    07,2565    273
MAXTFF1   27,3653   1277   1 1274      MINB12       7762 =  993   1  990      MKVB54    07,2566    273   1  265
MAXTRIES  24,2366    515   2  525  526 MINB1314  05,3567    990   1  990      MLOSV     E3,1764    117   5  564  585
MAXTRYS   25,2465    558   1  559      MINCHECK  12,2571   1180   1 1180      MMADREF   41,2060    420   1  419
MAXVEL    21,2001     44   2  899  900 MINCOGA   12,3320   1192   1 1195      MMATRIX      0024 = 1146   8 1138 1235
MAX250    35,3643    687   1  670      MINCON    42,3551    450   1  449      MMCHANG   41,3470    461   2  420  422
MCTOMS    25,3060    568   2  564  567 MINCON1   42,3306    435   1  438      MMDSPLAY     5317   1291   1  228
MDOT      E7,1736 =  149   2  149  769 MINCON2   42,3304    435   2  435      MMNUMBER     0774    104  10  238  837
MDOTAPS   36,2010     39               MINCSM       4732 =   45   1  307      MMTEMP       1057 =  244   3  243  244
MDOTDPS   36,2002     39   1  835      MINDEX       0773    104   4  239  243 MNKEYIN      0015 =   95   2  229 1335
MD1          4353    476   4  473 1383 MINFORCE  E5,1541 =  126   2  126  820 MODABORT  07,3760   1327   3 1327 1328
MEASINC   23,2000 =   33   1 1147      MINIMP    43,3000    296   1  276      MODDONE   12,2124   1173   3 1173
MEASINC1  23,2000 =   33   1 1151      MINIRECT  13,3734   1238   3  510 1219 MODE         0163    101  32  338 1370
METHOD1   22,2242    366   1  366      MINLMD    01,2000     45   1  307      MODEA        1106 =  106   4  335  555
METHOD2   22,2216    366               MINMINLM  01,2001     45   1  307      MODEB        1110    106   4  106  558

HEALTH KEY: NORMALLY DEFINED UNLESS FLAGGED AS FOLLOWS:

UN UNDEFINED          = DEFINED BY EQUALS            J DEFINED BY JOKER OR ERASE ANYWHERE      MD MULTIPLY DEFINED
BD BADLY DEFINED    CD DEFINITION ASSOCIATED WITH CONFLICT              XX MISCELLANEOUS TROUBLE
```

```
SYMBOL TABLE LISTING, INCLUDING DEFINITION, HEALTH, PAGE OF DEF, # OF REFS, PAGE OF FIRST REF, PAGE OF LAST REF.

SYMBOL       DEF   H      REFERENCES      SYMBOL       DEF   H      REFERENCES      SYMBOL       DEF   H      REFERENCES

MODECADR     1301     110  11  110 1327 MOVEPLEM  13,3026    1209   3 1154 1209 MY        E7,1704 =   151   5  151  606
MODEEXIT  07,2742    1308   8 1307 1327 MPAC         0154     101 909  100 1504 MZ        E7,1712 =   151   3  151  600
MODEGOOD  07,3750    1327   1 1327      MPAC+     00,2437    1057   2 1056      M11       E6,1414     134   9  164 1435
MODESLP   07,3754    1327   1 1327      MPAC+6       0162 =   433   7  433  477 M21       E6,1415     134   4  200 1449
MODESW    07,2000 =    30   1 1307      MPAC-     00,2433    1056   2 1056      M22       E6,1417     134  10  199 1449
MODE2CHK     4541     539   2  538  560 MPACSHR   00,2033    1045   2 1053 1074 M31       E6,1416     134   4  200 1449
MODE70    05,3502     834   1  833      MPACSRND  00,2050    1046   1 1045      M32       E6,1420     134   8  200 1449
MODE71    05,3504     834               MPACTST   42,3565     450   1  449      =======================================
MODNGDEL  12,2600    1180   2 1180      MPACVBUF     7553    1041   4 1037 1259 NARROWDB  20,2151    1405   1 1404
MODPSDEL  12,2636    1181   2 1181      MPAC2SAV     0165 =  1369   2 1353 1363 NAVKEYIN     0016 =    95   5  229  269
MODREG       1010     104  23  223 1386 MPERFMSK  10,3526    1369   2 1352      NBDONLY   06,3625     346   1 1119
MODROUTB  04,2054 =   462   1  462      MPTEMP       0135      98  64   99 1084 NBDX      E3,1460     114   6  338 1119
MONADR    40,3467     461   1  460      MR.KLEAN  05,2645     224   2  223 1380 NBDY      E3,1461     114   2  340  347
MONBACK   41,3422     454   1  454      MRKIDBIT     4726 =    74               NBDZ      E3,1462     114   2  340  347
MONBUSY   41,3423     454   1  453      MRKIDFLG     0074 =    74               NBD2      06,3652     346   1  348
MONDEL    41,3372     453   1  453      MRKNVBIT     4734 =    74   1 1353      NBD3      06,3656     346
MONDO     41,3373     453   1  453      MRKNVFLG     0102 =    74   1 1363      NBPOSPL   37,2012     385
MONITOR   41,3302     452   7  422      MRUPTBIT     4740 =    75               NBRANCH   11,3262    1235   4 1232 1243
MONIT1    41,3304     452               MRUPTFLG     0106 =    75               NBUSMASK  10,3521    1369   1 1357
MONIT2    41,3317     452   2  452      MSKOATR1  20,2021     305   1  305      NB1NB2    23,2476 =    38
MONREF    41,3421     454   1  454      MSTORE1   01,2373    1085   2 1086 1089 NB2CDUSP  30,3517     917   1  910
MONREPOS  06,3144     198   1  198      MS100        7750 =  1411   2 1410 1419 NCDU      E6,1702 =   140   3  377  378
MONRET    41,3347     453   2  453      MU(P)        0032 =  1245               NCOARSE   14,3566     949   4  941  972
MONSAVE      1017     104   7  233  454 MU/A      E7,1720 =   149   4  149  773 NCSMVEL   E7,1664 =   155   2  510
MONSAVE1     1020     104  12  233  480 MUASTEER  E7,1716 =   149   5  149  774 NDCMPTST  41,2465     428
MONSAVE2     1021     104   4  452  467 MUCHTIME  01,3513    1130   2 1129      NDXCDUW   E6,1647 =   140   6  140  916
MOONBIT      4731 =    67               MUEARTH   13,2006      48   8  690 1243 NDXCHNGE  12,2240    1175   2 1174
MOONCNTR  14,2552     932   1  932      MULBUSH   21,3417    1479   1 1479      NDXCTR    E5,1414 =   132   7  132  388
MOONFLAG     0003 =    67  31  659 1243 MULTEXIT     5622    1379               ND1          4352     476   6  393  462
MOONGCN   22,3520     720   1  720      MUM       13,2004      48               NEARONE   27,3773    1280   4  847 1277
MOONMX    24,3674    1141   2 1138 1140 MUM(-37)  27,2024      46   1  856      NEEDLBIT     4741 =    68   1 1413
MOONMXA   25,3712    1142   1 1142      MUNFLAG      0141 =    78   8  240  871 NEEDLER   20,2336    1416   1 1413
MOONUTH      0173 =    38   2  309      MUNFLBIT     4735 =    78   4  197  869 NEEDLER2  20,2367    1416   1 1416
MOONPAD   22,3375     718   1  717      MUNG?     37,3371     710   1  706      NEEDLES   20,2407    1417   1 1417
MOONRATE  27,2026      46   1  842      MUNGRAV   33,3037     885   6  729  884 NEEDLES3  20,2376    1416   1 1416
MOONSPOT  33,2202     865   1  864      MUNRETRN  33,2410     877   1  885      NEEDLE11  20,2350    1416
MOONTHIS     0174 =    38   6  309 1218 MUNRVG    33,3000     884               NEEDLFLG     0013 =    68   3  279  488
MORECADR  20,2461    1418   1 1418      MUSCALE   E7,1766 =   149   2  772  773 NEED2BIT     4726 =    67   1 1413
MOREDES   25,2617     562   2  562      MUTABLE   04,2004      47   6  693 1191 NEED2FLG     0000 =    67   3  279  488
MOREIDLE  16,2160    1410   1 1409      MWAITBIT     4732 =    74               NEG          6762    1023   4 1023
MORNUM    40,2301     413   2  412      MWAITFLG     0100 =    74               NEGATE    21,3253    1474   1 1474
MOVATHIS  13,3005 =    38   1 1219      MX        E7,1676 =   151   3  151  600 NEGCHECK  21,3615    1506   1 1507
MOVEACSM  13,2732    1208   3 1155 1203 MXMYMZ    26,2771     599               NEGCOS    13,2567    1135   1 1135
MOVEALEM  13,3005    1209   4   38 1209 MXM3      22,2312     368   4  363  497 NEGDRIVE  21,3523    1481   1 1481
MOVEPCSM  13,2761    1208   3 1155 1208 MXV          7355    1036   1 1009      NEGEDDT   17,3320    1459   1 1459

HEALTH KEY: NORMALLY DEFINED UNLESS FLAGGED AS FOLLOWS:

UN UNDEFINED          = DEFINED BY EQUALS            J DEFINED BY JOKER OR ERASE ANYWHERE      MD MULTIPLY DEFINED
BD BADLY DEFINED    CD DEFINITION ASSOCIATED WITH CONFLICT            XX MISCELLANEOUS TROUBLE
```

```
SYMBOL TABLE LISTING, INCLUDING DEFINITION, HEALTH, PAGE OF DEF, # OF REFS, PAGE OF FIRST REF, PAGE OF LAST REF.

SYMBOL      DEF     H       REFERENCES      SYMBOL      DEF     H       REFERENCES      SYMBOL      DEF     H       REFERENCES

NEGEST2   15,2105      262   1  262       NEWLOAD   30,2156      840   1  840       NOADJUST  42,3732      503   1  503
NEGFIRE   21,3647     1507   1 1507       NEWLOC       0065 =    97   9 1101 1109  NOAGS     32,2472      589   1  589
NEGFNCT1  21,3162     1472   1 1472       NEWMODE      6101     1001   6 1017 1395  NOAOS     20,3431     1498   1 1498
NEGFNCT2  21,3174     1473   1 1472       NEWMODEA     5316     1291   2  244  389  NOATTCNT  30,3734      921   3  909  912
NEGMAX       4726 = 1097  13  379 1491  NEWMODEX     5313     1291   5  385 1391  NOATTOFF  07,3253     1314   4  175 1313
NEGONE       7770     1096  16  230 1503  NEWOPS       6111     1001   1 1000       NOBITS    E5,1442 =  132
NEGOUT    13,2575     1135   1 1135       NEWPAR    14,2741      936   1  936       NOCHG     35,3507      682   1  681
NEGP      12,3427     1193   3 1192 1193  NEWPHASE  31,2367      794   1  799       NODDOT    26,2004       55   1 1141
NEGPROD   27,3150      775   1  775       NEWPOS    E7,1652 =  155   4  155  510  NODESNB   25,2524      559   1  559
NEGSGN    40,2363      414   1  411       NEWPRIO      0063 =    97  12  243 1358  NODESSM   25,2462      558   2  555  558
NEGSHAFT  25,2561      560   1  560       NEWSTATE  12,2653     1182   1 1184       NODIO     26,2012       55   1 1141
NEGTFF    27,3650     1277   2 1276       NEWTN     34,2702      646   2  646       NODOBIT      4744 =    72   3  238 1382
NEGTHRST  21,3720     1508   1 1507       NEWVEL    E7,1644 =  155   3  155  510  NODOFLAG     0054 =    72   6  248 1334
NEGTORK   16,3733     1469   1 1468       NEWZCOMP  22,3712     1155   1 1149       NODOP07      0061 =    72
NEGTORKP  E6,1514 =  137   1  207       NEXTCOU   07,3045     1310   4 1310 1311  NODSPOUT  06,2130      170   2  167
NEGTORKU  E6,1516 =  138   6  162  217  NEXTCOL   11,3567     1240   2 1241       NODSPY    06,2152      170   1  170
NEGTORKV  E6,1520 =  138   5  206  217  NEXTCORE  01,2700     1105   2 1104       NODVMON1  33,2264      866   1  865
NEGTOVFL  12,2330     1176   1 1176       NEXTES    35,3131      673   1  672       NODVMON2  33,2270      866   1  865
NEGUO     E6,1501      137  11  137 1481  NEXTIME   E6,1705 =  140   3  379  380  NOEBANK   43,3365     1285   1 1286
NEGUR     E6,1503 =  137   4 1469 1474  NEXTINCL  05,3552      990   1  990       NOGIMLOC  22,2744      376   1  376
NEGUSUM   21,3516     1481   3 1474 1481  NEXTINSL  05,3702      992   1  990       NOGIMRUN  06,2462      180   2  179
NEG0         4745     1093  28  167 1455  NEXTIT    15,2132      262   2  262       NOGO      22,2732      375   3  375  377
NEG1         7770 = 1097   5  338 1097  NEXTLINE  22,3511      720   1  720       NOGO8L    27,3214      776   1  775
NEG1/2       4725     1093   6  231 1126  NEXTP     E6,1472      135   7  135 1428  NOGUFSS   12,3477     1194   1 1192
NEG1/3    21,3173     1473   2 1473       NEXTU     E6,1473 =  135   5 1402 1441  NOIBNKSW     6104     1001   1 1042
NEG100       5174     1114                NEXTV     E6,1474 =  135   5 1402 1442  NOINT     13,2711     1207   1 1206
NEG12     00,3733     1084   3 1052 1074  NGUIDSU8  E7,1647 =  157   3  796  809  NOKILL    43,3114      302   1  303
NEG180    40,3115      447   1  446       NICKELOP  34,2077      638   1  641       NOLITE    33,3546      893   2  893
NEG2         7767     1096  11  242 1479  NIGNLOOP  E7,1646 =  157   3  782  809  NOLOKON   23,2026      284   1  284
NEG3         7766     1096   8  575 1441  NINE         4311 = 1097   2 1500       NOLRRBIT     4733 =    86   2  570  877
NEG4         6133     1002   2 1006 1283  NJETSBIT     4726 =    69                NOLRREAD     0252 =    86   1  894
NEG5      41,2142      421                NJETSFLG     0017 =    69   1  751       NOMONLST  05,2153 =  204
NEG7         5652 =  244   2  257  953  NN        E7,1466      146   7  210  676  NOMINIMP  43,3003      297   1  276
NETNEG    20,3716     1502   1 1502       NNADTA8   42,2161      317   1  316       NOMKCNT   E7,1573 =  151   5  151  267
NETZERO      6142     1003                NNADTEM      0146       99   8  316  444  NOMTPI    E4,1707 =  121   9  633  680
NEWAGS    32,2014      219   1  219       NNTYPTAB  42,2325      321   1  316       NONAVKEY  05,3102      229   3  226  229
NEWANGL   22,3007      377   1  376       NNTYPTEM     0147       99   5  316  443  NONEEDLE  16,2012     1407   1 1407
NEWANGLE  24,3743     1143   4 1141 1144  NC.CORES  01,2640     1104   2 1104 1109  NOPIF     35,3266      676   1  676
NEWDEL    12,2634     1181   2 1180 1181  NO.PJETS  E6,1521      138   3  138 1468  NOP07BIT     4732 =    72   5  224 1336
NEWDELHI  22,3003      377   1  380       NO.UJETS  E6,1522 =  138   3  138 1468  NOQ8RSM      5276     1127   1 1426
NEWDELX   12,2260     1175   3 1175       NO.VJETS  E6,1523 =  138                NOQRSM       5274     1127   1 1457
NEWIBIT      4730 =    81                NO.WDS       6265     1006   5 1006 1075  NORATES   30,2500      848   1  848
NEWIFLG      0172 =    81   3 1212 1216  NO.9      36,3664      757   1  757       NOR8ACK   40,3100      446   1  447
NEWJOB       0067       97  24  232 1290  NO-ATP    30,2660      850   1  850       NORDSTAL  25,2447      557   3  555  558
NEWLIST   05,3545      990   2  990       NO-INT    13,2063      248   1  247       NOREASON  33,3215      888   1  888

HEALTH KEY: NORMALLY DEFINED UNLESS FLAGGED AS FOLLOWS:

UN UNDEFINED          = DEFINED BY EQUALS            J DEFINED BY JOKER OR ERASE ANYWHERE      MD MULTIPLY DEFINED
BD BADLY DEFINED     CD DEFINITION ASSOCIATED WITH CONFLICT                XX MISCELLANEOUS TROUBLE
```

```
SYMBOL TABLE LISTING, INCLUDING DEFINITION, HEALTH, PAGE OF DEF, # OF REFS, PAGE OF FIRST REF, PAGE OF LAST REF.

SYMBOL      DEF    H       REFERENCES        SYMBOL      DEF    H       REFERENCES        SYMBOL      DEF    H       REFERENCES

NOREMODE 43,2324      283    1  283        NOULLAGE 36,2652      738    4  735  755 NUMGRPS      4747 =  234    2  227  228
NORCSET  07,3415     1316                  NOUN     40,2357      414    1  411      NUVCSM   E3,1600      116    1  598
NORFINAL 13,3336     1215                  NOUNADD      0145 =   99   27  423  475 NUVLEM   E3,1652      116    1  598
NORLITE  33,3527      393    2  893        NOUNCADR     1016     104    9  420  475 NVBNKTEM     1037     104    1  467
NORMADR  42,3412      437    1  436        NOUNREG      1001     104   15  233  473 NVBUSMSK 10,3524     1369    1 1364
NORMAL   01,2343      308    1  306        NOUNTEM      0122 =   98    3  423      NVCADR   10,3515     1369    1 1365
NORMBNCH 10,3073     1362    1 1368        NOUNTEST 41,2507      428    2  439  440 NVCOM    40,2346      414    1  414
NORMEX   E7,1463      146   19  146  700 NOUPDOWN 43,3051      301    1  301      NVOSP    10,3102     1362    4 1356 1370
NORMEXIT 32,2547      590    1  590        NOUPFBIT     4737 =   70    1  521      NVOSP1   10,3137     1363    1 1363
NORMGAM  E4,1502 =    119    7  119 1156 NOUPFLAG     0030 =   70    2  301      NVMONOPT     4146     467    1 1363
NORMLIZ  23,2000 =     33                  NOUT         1015     104    9  167  432 NVQTEM       1036     104    2  467
NORMLIZE 32,3661      871    2  253  860 NOUTCON      4751 = 1097    1  233      NVSAVE       0370     102    3  222 1368
NORMLIZ1 33,2344      871    1  871        NOUVEAU  04,2346      243    1  240      NVSBBBNK     4172     467    2  467
NORMLIZ2 33,2347      871    1  871        NOVAC        5063    1101   29  168 1404 NVSBCOM      4155     467    1  479
NORMLOP  37,2604      397    1  397        NOVACADR     4342 = 1305    1 1302      NVSBENDL 40,3470      461    2  460  463
NORMRET  10,3435     1368    2 1366        NOVAC2   01,2631     1104    1 1101      NVSBWAIT     4436     479
NORMSBIT     4733 =     79                  NOVAC3   01,2634     1104    1 1105      NVSBWT1      4446     479    1  479
NORMSCL  16,3615     1439                  NOVRWRT  35,3342      678    1  679      NVSUB        4145     467    3  276 1369
NORMSW       0156 =     79    8  690 1186 NOV37MM  04,2524      246    1  239      NVSUBB   41,2020      419    1  467
NORMTEM1     1044 =    105    3  943 1359 NOWMATX  32,2253      509    1  509      NVSUBCOM     4161     467
NORMTEST 30,3512     1079                  NPGNCSBT     4744 =   85    3 1407 1408 NVSUBEND     4173     467    4  461  469
NORMT4   06,2007      165    2  165        NPGNCSEL     0244 =   85                NVSUBSY1 04,2670      479    1  479
NORMUNIT 10,3724     1398   11  351 1398 NPTRAPS  E6,1433 =  134    4 1410 1423 NVSUBUSY     4433     479    2  479 1365
NORMUNX1 10,3722     1398    3  605  772 NQTRAPS  E6,1434 =  135    4 1410 1424 NVSUB1   41,3613      468    2  419  467
NORMWAKE 10,3353     1366    1 1368        NRMAG        0040 = 1265    4 1268 1275 NVSUB2   41,3640      468    1  468
NORMZ1       0044 =   1156   12 1155 1156 NRMIDBIT     4730 =   74                NVTEMP       0123 =   98    9  467  479
NOROTAT  17,3026     1452    3 1451 1456 NRMIDFLG     0076 =   74                NVWORD       0366     102   11  740 1369
NORRGMON 06,3155      198    6  194  198 NRMNVBIT     4735 =   74                NVWORD1      1066     105    3  740 1364
NORRMBIT     4741 =     77    2  197  231 NRMNVFLG     0103 =   74    1 1363      NV50DSP  10,3140     1363    3 1354 1364
NORRMON      0126 =     77    6  253  529 NRTERM       0020 = 1265    2 1274      NWAITBIT     4733 =   74
NOSHIFT  10,3766     1399    6 1398 1399 NRTRAPS  E6,1435 =  135    4 1410 1425 NWAITFLG     0101 =   74
NOTALLOW 21,3347     1478    2 1477        NRUPTBIT     4741 =   75                NXAX     15,2533      957    1  956
NOTBIT12 40,3736      486    2  486        NRUPTFLG     0107 =   75                NXPOSVEL 31,2137      615    1  616
NOTERBIT     4732 =     69    1  886        NSAMP        1110 =  106    7  569  575 NXTBNK   43,3636     1289    2  303 1290
NOTFRFLG     0023 =     69    3 2[illegible]4  798 NSRCHPNT E7,1736 =  150    5  150  612 NXTFL33  06,2432      178    7  187  188
NOTHRBIT     4731 =     76    1  734        NSTEER   36,3673      757                NXTIBT   06,2420      178    3  178
NOTHRFTL     0116 =     76    6  749  781 NTARGBIT     4742 =   78                NXTIFAIL 06,2225      172   11  181  186
NOTIME   13,3711     1222    2 1220 1221 NTARGCHK 35,3465      681    1  681      NXTIFBIT 06,2213      172    3  172
NOTMIN   17,3061     1452    2 1452        NTARGFLG     0146 =   73    3  681      NXTRRLAY 25,2243      550    1  550
NOTMUCH  20,3410     1498    1 1496        NTP/2    34,2376      642    2  642      NXTRST   05,3032      228    1  228
NOTPLAN  07,2637      959    1  959        NUCHANG2 01,3015     1108    1 1114      NXTSUPR  43,3663     1289    1 1289
NOTP20   25,3031      568    1  567        NUDIRECT 01,3230     1114    1 1114      NXT6ADR  E6,1465      135    5  230 1454
NOTSHIFT 24,3404      583    1  583        NULLCLOK 36,3014      741    3  741  742 NZACCDOT     0063 = 1476    3 1477
NOTWCSM  26,2456      595    1  595        NUM      40,2155      411    9  410  411 N26/PRI  E4,1771 =  124    7  124  463
NOTWLEM  26,2510      596    1  596        NUMBERT  E6,1742 =  136   19 1427 1467 N26/2CAD E4,1772 =  124    1  463

HEALTH KEY: NORMALLY DEFINED UNLESS FLAGGED AS FOLLOWS:

UN UNDEFINED          = DEFINED BY EQUALS              J DEFINED BY JOKER OR ERASE ANYWHERE      MD MULTIPLY DEFINED
BD BADLY DEFINED     CD DEFINITION ASSOCIATED WITH CONFLICT             XX MISCELLANEOUS TROUBLE
```

```
SYMBOL TABLE LISTING, INCLUDING DEFINITION, HEALTH, PAGE OF DEF, # OF REFS, PAGE OF FIRST REF, PAGE OF LAST REF.

SYMBOL     DEF    H     REFERENCES   SYMBOL     DEF    H     REFERENCES   SYMBOL     DEF    H     REFERENCES

N45PRCC  35,3564    684  1  683      OCT203   26,2265    490              OCT501PV 24,3267    529  1  529
N49DSP   24,2726    523  1  522      OCT205   24,3270    529  1  528      OCT51    43,3207    310  1  309
N49FLAG  E7,1746 =  152  6  522  523 OCT21       4352 =  442  1  440      OCT54    06,2774    191  1  175
N63STAT  31,3441    812  1  811      OCT21103    5704   1380              OCT55000 41,3776    484  1  483
N71DISP  07,2061    257              OCT217      5710   1380              OCT57776 32,2565    591  1  589
N79DISP  07,2543    272  3  272      OCT220   15,3776   1330  1 1329      OCT60000    4101 = 1097  2 1297 1366
N89DISP  14,2455    930  2  929  971 OCT23       4351 = 1097  2  742 1006 OCT62       4765 = 1332  1 1332
N99LOCP  31,2034    614  1  614      OCT23146 21,3257   1476  1 1477      OCT6200  05,3061    229  1  224
==================================== OCT24       6007    235  6  242  871 OCT63    17,2351   1444  1 1443
OANB     04,2557    260  3  259  956 OCT24100 10,3274   1365  1 1353      OCT67777 10,3543   1370
O8LATE   11,3024   1232  2 1228 1229 OCT25       4353 = 1097  1  276      OCT7        4750 = 1371  3 1295 1300
OCCOS    14,2604    933  2  932      OCT26    04,2364    243  2  241  242 OCT700   04,2426    244  2  241  242
OCCULT   14,2746    936  2  935  936 OCT2600  10,3552   1370  1 1363      OCT740   06,3001    191  1  185
OCTAL27  05,3503    834  1  833      OCT27    04,3255   1244  1 1229      OCT74160 05,3374    234  1  231
OCTAL3      6266   1006  1 1097      OCT272   06,2776    191  1  184      OCT75    06,2775    191  1  190
OCTBACK  41,3463    458  1  460      OCT27470 05,3373    234  1  231      OCT77000 06,3002    191  1  184
OCT00010    4741 =  243              OCT30       4754 =  440  2  440  893 OCT77770    5652   1380  5  244 1381
OCT00012    4354 =  515  1  508      OCT30000    4346 =  229              OC24100  43,2125    277  1  276
OCT00240 21,3370   1478  1 1477      OCT30001 05,3375    234  1  231      OC40010  06,2773    191  1  190
OCT02100 06,3166    198              OCT30002    6512 = 1097              OFFCALC  26,3560    610  1  612
OCT05776 06,3062    194  1  193      OCT305   04,2363    243  1  242      OFFROT   27,3312    852  1  852
OCT10000    4730 =  229              OCT31       6010    235  4  221 1478 OFFSTFAC 26,3706    613  1  610
OCT10001    7704 = 1097  1  193      OCT32001 05,3371    234  1  231      OFFTUNIT 10,3764   1399  1 1399
OCT10200 10,3546   1370  1 1356      OCT32002 06,3164    198  1  197      OGABIAS  E6,1676 =  141  3  810  911
OCT11       4311 = 1093              OCT33       4755   1094  3  235 1094 OGC      E5,1737 =  128 17  128 1251
OCT11276 21,3564   1482  1 1480      OCT34BAR 42,3611    450  2  450      OGCPL    37,2475    393  1  400
OCT120      4766 = 1097  2  241  243 OCT3400  10,3520   1369  1 1360      OGCT     E5,1747 =  128  2  128  969
OCT13    15,2354    928  1  928      OCT34300 10,3527   1369  1 1352      OHWELL1  04,3424   1386  5 1386 1387
OCT14       5745   1381  7  191 1485 OCT35       4756   1094  3  740 1380 OHWELL2  04,3447   1387  4 1386 1388
OCT140      4767 = 1097  2  269 1444 OCT37667 04,2424    244  1  239      OKDESNB  25,2500    559  1  559
OCT1400     5000   1094 12  475 1427 OCT37737 06,2162    170  1  180      OKDESSM  25,2403    555  1  558
OCT14000    5015 = 1297  2 1296 1297 OCT37766    7750   1096  2  165 1411 OKEXIT   24,3432    592  1  592
OCT15       4752   1093  4  189 1071 OCT37771 37,3537    863  1  861      OKMANUR  21,2771   1328  1 1328
OCT15000    5016 =  191  1  189      OCT37774    7751   1096              OKMAY    35,3105    672  1  672
OCT16       4310 = 1071  2  267 1071 OCT37775 06,3031    192  1  192      OKPHI    22,2722    374  1  374
OCT1601  37,3054    400  1  400      OCT37776    7752   1096  3  169 1366 OKTHETA  22,2702    374  1  374
OCT1720  06,3000    191  1  187      OCT40001    6130   1002  5  231 1366 OKTOCOPY 10,2536   1356  2 1356 1361
OCT176   00,2126   1048  2 1054      OCT40010 07,3174   1312  2 1312 1314 OKTOENT  10,3324   1366  1 1369
OCT177      6115 = 1305  1 1302      OCT40072 04,2425    244  1  239      OKTOGO   43,2246    282  1  282
OCT17770    5021   1095  2 1295 1297 OCT40200    7756   1096              OKTOGRAB 13,3513   1217  1 1216
OCT17777 31,2364    793  1  789      OCT40201 01,3373   1123  1 1120      OKTOPLAY 10,2611   1357  3 1357
OCT20       4740 =  744              OCT40400    5634   1379  3 1356 1381 OKUPDATE 25,3502    576
OCT20002 06,3165    198  1  198      OCT40420 10,3544   1370              OKU12    22,2256    366  1  366
OCT201   24,2364    515  1  513      OCT50       4762   1094  7  231 1444 OKU21    22,2232    366  1  366
OCT20100 10,3550   1370  1 1355      OCT500   04,2362    243  3  242  243 OKU31    22,2302    367  1  367

HEALTH KEY: NORMALLY DEFINED UNLESS FLAGGED AS FOLLOWS:

UN UNDEFINED          = DEFINED BY EQUALS                J DEFINED BY JOKER OR ERASE ANYWHERE     MD MULTIPLY DEFINED
BD BADLY DEFINED     CD DEFINITION ASSOCIATED WITH CONFLICT               XX MISCELLANEOUS TROUBLE
```

```
SYMBOL TABLE LISTING, INCLUDING DEFINITION, HEALTH, PAGE OF DEF, # OF REFS, PAGE OF FIRST REF, PAGE OF LAST REF.

SYMBOL     DEF     H       REFERENCES     SYMBOL     DEF     H       REFERENCES     SYMBOL     DEF     H       REFERENCES

OK2DELAY 00,3753     1374    1 1374      ONLITES  25,3677     618    1  618      OUT      13,2347     713
OLDAGS   E3,1776      117    4  233  589 ONULLAGE 36,2656     738    1  732      OUTGOAVE 22,3710 =   868
OLDATAGD    1112 =    106    4  569  574 OP/INERT 43,2202     280    2  278  280 OUTHERE     0161 =  1370    3 1366 1368
OLDP1PAX E7,1763 =    158    5  158  820 OPJUMP      6120    1001    1 1001      OUTLINK     0057 =    95
OLDP1PAY E7,1764 =    158    3  158  817 OPJUMP2     6270    1007    1 1001      OUTOFLIM 24,3251     528    2  528  529
OLDP1PAZ E7,1765 =    158    4  158  818 OPJUMP3     6304    1008    1 1007      OUTOFPLN F5,1613 =   127    3  127  784
OLDPMIN  F6,1460      135    4 1409 1429 OPONLY   06,2347     176    1  174      OUTPULSE 07,3530    1321    2 1321
OLDPRIO     5404     1296    1 1299      OPTAXIS  14,2347     259    1  258      OUTSNUFF 43,3227     310    1  275
OLDQRMIN E6,1461      135    4 1409 1443 OPTCADR     1302 =   110    1  233      OUTO        0010 =    95    5  166  170
OLDSENSF E6,1744 =    141    4 1506 1507 OPTCOARV 43,2234 =   282    1  282      OUT22.1  32,2552     590    2  590
OLDTIME  32,3614      837    1  836      OPTFLAG     1235 =   109    5  711  713 OUT22.2  24,3435     593    1  592
OLDXFORP E6,1440      135    5  135 1421 OPTIONVN 22,3320     717    1  716      OVERFFIX 37,2275     390    2  388  392
OLDYFORP F6,1441 =    135    2 1421      OPTIONX     1050 =   105   13  283  717 OVERFLOW    7040    1026    3 1025 1049
OLDZFORQ E6,1442 =    135    3 1410 1422 OPTION1     1143     107    7  317 1359 OVERFLWY    7035    1026    4 1024 1049
OMEG/MS  37,2000       46    1  392      OPTION2     1144     107   15  508  978 OVERFLWZ    7032    1026    4 1024 1049
OMEGA    E7,1502 =    151    9  151 1151 OPTION3     1145     107                 OVERSUB  16,2314    1420   12 1422 1439
OMEGAC   E7,1734 =    150    3  328  530 OPTSTALL 07,3731 =  1327    1  939      OVERSUB2 20,2451    1417    3 1413 1414
OMEGAM1  E5,1712 =    131    3  131 1152 OPT4     15,2236     925    1  925      OVF+     00,2414    1055    2 1055
OMEGAM2  E5,1720 =    131    3  131 1152 ORBCHG0  24,2007     508    1  508      OVFDESC  31,3736     828    2  810  815
OMEGAM3  E5,1726 =    131    3  131 1153 ORBCHG1  24,2021     508    1  508      OVFIND      0121      98   15  810 1107
OMEGAP   E6,1421      134   19  134 1436 ORBCHG2  24,2033     508    1  508      OVFLCLR  12,3210    1190    1 1190
OMEGAPD  E6,1642      139   13  139 1436 ORBCHG3  32,2213     508    1  508      OVFLOWCK F5,1576 =   133    3  385  400
OMEGAQ   F6,1422 =    134   19  161 1445 ORBITAL  11,2000 =    30    3 1225 1244 OVERFT   F7,1456 =   157    2  828
OMEGAQD  E6,1643 =    139    9  162 1439 ORBITAL1 12,2000 =    31    2 1244      =====================================
OMEGAR   E6,1423 =    134   12  207 1445 ORBITAL2 13,2000 =    31    3   48 1244 P        F5,1737 =   130   14  130 1198
OMEGARD  E6,1644 =    139    8  207 1439 ORBITAL3 04,2000 =    29    1 1244      P-RATE   16,2514    1423
OMEGAU   E6,1426      134   12  134 1450 ORBITAL4 24,2000 =    33    1 1223      P-RHCCTR    0043 =    94    4 1431 1432
OMEGAV   E6,1427 =    134    2  135  138 ORBITAL5 21,2000 =    32    1 1220      PACCFUN  F6,1556 =  1503    2 1496
OMEGCALC 26,3607      611                ORBMANUL    0003 =   247    4  246  247 PACKOPTN 15,3373     974    2  973
OMEGDISP E7,1734 =    150    3  150  611 ORBMANUV 05,2046 =   205    1  217      PACTIVE  05,3040     228    1  228
OMEGMCON 13,2000       48    1 1210      ORBWFBIT    4737 =    73                 PARAM    04,3065    1184    3 1184 1198
OMITWALM 31,3537      814    1  814      ORBWFLAG    0066 =    73    3 1218 1241 PARAM30  35,2021     620
ONE         4744 =   1097  168  167 1507 ORDERBIT    4737 =    81                 PASSIVE  23,2433     700    4  628  700
ONE/SP   25,3637      585    1  585      ORDERSW     0201 =    81    3 1180 1181 PASTEOPT    4132     454    1  454
ONEB-2   23,2474 =    515    1  509      ORIGCHNG 11,3436    1237    1 1237      PASTEVB     4124     454    3  454  461
ONEBASE  37,3375      710    1  706      ORIGEX   F4,1511 =   119    4  119 1237 PASTIF   07,2160     265    1  265
ONEBIT   04,3057     1183    1 1194      OTHCONIC 37,3203     707    1  710      PAUTNO   30,3143     909    2  908
ONEDEG   15,2160      263    1  261      OTHERS   13,3531    1218    1 1219      PAXADIOL 16,2210    1411    1 1410
ONEDPP   37,3063      401    1  390      OTHINT   37,3214     708    1  710      PAXDIST  F6,1564 =  1503    2 1501
ONEOCT   26,3710      613    1  610      OTHPREC  13,3101 =    38    3  704  717 PAXFILT  16,2653    1426    1 1420
LNFURTWO    5372     1296    1 1298      OTHSHIP  22,3335     717                 PAXIS    16,2217    1419    2 1411 1504
ONESEK   22,3165      379    4  378  380 OURPERMS E7,1621 =   156    2  156      PAXISADP 20,3744    1504    1 1488
ONESTO2S 30,3727      921    3  915  919 OURRCBIT    4731 =    89    6 1430 1444 PBIASX   F3,1452     114    2  114  871
ONETENTH 20,2450     1417    1 1417      OURRCFLG    0306 =    89                 PBIASY   F3,1454     114    1  871
ONETHTH  34,2107      638    1  641      OURTEMPS E7,1544 =   156    1  156      PBIASZ   F3,1456     114    1  871

HEALTH KEY: NORMALLY DEFINED UNLESS FLAGGED AS FOLLOWS:

UN UNDEFINED           = DEFINED BY EQUALS             J DEFINED BY JOKER OR ERASE ANYWHERE      MD MULTIPLY DEFINED
BD BADLY DEFINED      CD DEFINITION ASSOCIATED WITH CONFLICT            XX MISCELLANEOUS TROUBLE
```

```
SYMBOL TABLE LISTING, INCLUDING DEFINITION, HEALTH, PAGE OF DEF, # OF REFS, PAGE OF FIRST REF, PAGE OF LAST REF.

SYMBOL      DEF    H       REFERENCES    SYMBOL      DEF    H       REFERENCES    SYMBOL      DEF    H       REFERENCES

PBIT         4733  =  136    4 1430 1433 PHSBB2   E3,1441     114                PINMASK      7761  = 1370    1 1362
PBODY     E4,1430     118   18  118 1243 PHSBB3   E3,1443     114                PINSUPBT     4172  =  467    5  286  471
PCLOOP    05,3000     227    1  228      PHSBB4   E3,1445     114                PINSUPER  40,2000  =   37    1  286
PCONS     E4,1735  =  124    5  124  855 PHSBB5   E3,1447     114                PINTEST   43,2002  =  481
PDB1      E6,1560  = 1503    1 1501      PHSBB6   E3,1451     114                PIPABIAS  E3,1452  =  114    1  338
PDB2      E6,1561  = 1503    1 1501      PHSCHNGA     5361    1295    1  239      PIPACHK   37,2126     387    1  386
PDB3      E6,1563  = 1503    1 1501      PHSCHNG2 10,2213    1297    1 1296      PIPAGE       1256  =  108    5  111  875
PDB4      E6,1562  = 1503    1 1501      PHSNAME1 E3,1436     114    5 1297 1302 PIPASC    37,3077     401    1  397
PDDL         6544    1018    1 1009      PHSNAME2 E3,1440     114    1  329      PIPASCF   E3,1453  =  114    1  338
PDSPFBIT     4727  =   75    2  489  490 PHSNAME3 E3,1442     114    1  829      PIPASCFX  E3,1453     114    1  114
PDSPFLAG     0114  =   75    3  490  535 PHSNAME4 E3,1444     114                PIPASCFY  E3,1455     114
PDVL         6600    1019    1 1009      PHSNAME5 E3,1446     114    2  892      PIPASCFZ  E3,1457     114
PDXCHNGE  12,2274    1175    2 1175      PHSNAME6 E3,1450     114                PIPASR    37,3540     873    4  346  960
PEGI      16,3301    1433    2 1433      PHSPART2 01,3765    1305    1 1305      PIPATASK  37,2151     387    2  387
PERFCHEK  10,3155    1363                PHSPRDT1     1053     105    5 1296 1304 PIPATMPX     1157     107    4  817  896
PERFDLAY  E5,1574  =  133    1  336      PHSPRDT2     1055     105    3  105  522 PIPATMPY     1160     107    4  817  896
PERFERAS  37,2772     399    1  397      PHSPRDT3     1057     105    1  244      PIPATMPZ     1161     107    4  817  896
PERFMASK  10,3503    1369    2 1358 1359 PHSPRDT4     1061     105    1  243      PIPAX        0037  =   94   17  161 1315
PERF2MSK  10,3507    1369    2 1358 1359 PHSPRDT5     1063     105                PIPAY        0040  =   94    8  161 1315
PERF4MSK  10,3511    1369    1 1359      PHSPRDT6     1065     105                PIPAZ        0041  =   94   11  209 1315
PERIAPO   23,2347     698    1  640      PHS2CADR 01,3772    1305    1 1300      PIPCTR       1055  =  105    2  831  862
PERIAPO1  23,2337     698    3  623  666 PI/16    27,3757    1280    2 1276 1278 PIPCTR1   E7,1722  =  158    2  831  895
PERIODCH  12,2112    1173    1 1173      PICAPAR  14,2620     934    1  934      PIPFAIL   06,2650     187    1  191
PERROR    E6,1464     135    8  164 1436 PICBXT   14,3021     937    1  937      PIPFREE   07,3275    1315    1  867
PFAILCK   07,3241    1314    1  176      PICEND   14,2774     936    1  935      PIPFREE2  07,3272    1315    1 1315
PFAILCK2  07,3234    1314    1 1314      PICGXT   14,3000     937    1  937      PIPINDEX  E5,1415  =  132    6  132  391
PFLITEDB  20,2143    1405    3  749  841 PICKANG1 27,2147     497    1  497      PIPJOBB   37,2166     387    1  387
PFRATBIT     4741  =   72    1  924      PICKAXIS 27,2170     498    2  496      PIPSDONE  37,3440     861    1  875
PFRATFLG     0051  =   72    4  764  941 PICKX    26,2404     498    2  498      PIPSRINE  37,3543  =  960    2  964
PGUIDE       1246  =  108    6  108  384 PICNSWP  14,3017     937    1  937      PIPTIME      1233     108   27  206 1219
PHASCHNG     5355    1295  123  240 1392 PIC1     14,2654     935    3  935      PIPTIME1  E7,1560  =  154   11  154 1221
PHASETAB  10,2000  =   30    1 1297      PIC2     14,2657     935    1  935      PIPUSE    07,3260    1315
PHASE1       0752     103    3  228 1299 PIC3     14,2667     935    5  935  936 PIPUSE1   07,3264    1315    1  348
PHASE2       0754     103    2  756  862 PIC4     14,2672     935    1  935      PITCH     E4,1755  =  124    2  328  841
PHASE3       0756     103    1  732      PIF      E7,1612  =  156   11  156  810 PITCHANG  E4,1571  =  122    7  122  503
PHASE4       0760     103    1  866      PIFPSET  E7,1606  =  156    5  156  792 PITCHOFF  27,3262     778    2  777
PHASE5       0762     103    1  732      PINACT   05,3045     228    1  228      PITFALL   11,2302     822    2  164
PHASE6       0764     103    1  737      PINBALL1 40,2000  =   37    4  311  485 PITTIME   E6,1402     134    2  326  777
PHASJUMP     5365    1296    1 1295      PINBALL2 41,2000  =   37    3  311  483 PJETCTR   E6,1766     142    4  142 1426
PHASTAB1  14,2000  =   32    1 1291      PINBALL3 42,2000  =   37    3  293  434 PJETSLEC  16,3357    1434    5 1429 1437
PHEXIT    13,3234    1213    1 1213      PINBALL4 04,2000  =   29    1  472      PLANET    07,2607     959    9  259  968
PHI          0024  =  536                PINBRBIT     4737  =   75                PLANTIN   24,2000  =   33    2 1139 1143
PHILEM    E4,1575  =  120    4  329  705 PINBRFLG     0105  =   75    1 1362      PLANTIN1  26,2000  =   34    2 1138 1144
PHIV      E4,1445  =  118    6  118 1239 PINBRNCH 10,3062    1362    8  239 1369 PLANTIN2  26,2000  =   34    1   54
PHSBB1    E3,1437     114                PINIDMSK 10,3367    1367    1 1367      PLANTIN3  25,2000  =   33    1 1142

HEALTH KEY: NORMALLY DEFINED UNLESS FLAGGED AS FOLLOWS:

UN UNDEFINED          = DEFINED BY EQUALS                   J DEFINED BY JOKER OR ERASE ANYWHERE      MD MULTIPLY DEFINED
BD BADLY DEFINED    CD DEFINITION ASSOCIATED WITH CONFLICT              XX MISCELLANEOUS TROUBLE
```

```
GAP:  ASSEMBLE REVISION 210 OF AGC PROGRAM LUMINARY BY NASA 2021112-161      17:11 MAR. 19,1971              PAGE 1540

SYMBOL TABLE LISTING, INCLUDING DEFINITION, HEALTH, PAGE OF DEF, # OF REFS, PAGE OF FIRST REF, PAGE OF LAST REF.

SYMBOL      DEF     H        REFERENCES     SYMBOL      DEF     H       REFERENCES      SYMBOL      DEF     H       REFERENCES

PLANVEC  E7,1553  =  151    5  151  943 POSITA    15,3662     983    1  984      PRERRORS 43,3251     1293    3 1284
PLAST    E6,1454     135    5 1422 1432 POSITB    15,3665     983    1  984      PRESINE  00,3526     1080    2 1080
PLAYJUM1 10,2627    1357    3 1362 1369 POSITD    15,3704     984    1  985      PRESTAND 37,3656     1332    1 1332
PLAYTEM1    0155  = 1370   29 1351 1360 POSITE    15,3752     985    1  984      PRESTORE    6442     1014    1 1014
PLAYTEM3    0157  = 1370    3 1360 1367 POSITF    15,3725     984                 PRETIMCK 16,2673     1426    2 1425
PLAYTEM4    0160  = 1370   11 1351 1367 POSITON   E5,1416  =  132    6  132  393 PRIMNMSK 10,3553     1370    1 1352
PLUSFIRE 21,3653    1507    1 1507      POSMAX       4724    1093   47  181 1504 PRIOBORT 10,2607     1357    2 1355 1365
PLUSX    27,2423     764                POSNV     E5,1520  =  133    2  398  399 PRIOCHNG    5137     1103   20  287 1367
PMINF    34,2073     638    2  647      POSTAND   37,3733    1333    2 1332 1333 PRIOCH2  01,3076     1110    1 1103
PMINM    34,2103     638                POSTBURN  36,3222     749    4  252  755 PRIODBIT    4727  =    74    1 1362
PMMASK   10,3522    1369    1 1357      POSTCDH   E7,1603     147    3  147  647 PRIODFLG    0075  =    74
POINTER     0156  = 1305    7 1303 1305 POSTCOM   37,3762    1334    2 1334      PRIODSP  10,2502     1355    2  521  523
POINTVSM E7,1772  =  153    9  261  953 POSTCSI   E7,1601     147    2  640  647 PRIODSPR 10,2477     1355    2  530 1379
POLISH      0117      98   39   93 1092 POSTHRST  21,3607    1506    5 1507 1508 PRIOENT     5577     1378    2 1379 1381
POLLEY      5042    1100    2 1100      POSTJUMP     4626     996   64  175 1399 PRIOLARM 10,3572     1379    5  513  529
POLY        7243    1032    7  859 1279 POSTORKP  E6,1513  =  137    3  162  206 PRIOMONR 10,2326     1352    1  527
POLYCNT     0140  =   99    4 1032 1033 POSTORKU  E6,1515  =  137    6  162  216 PRIOOCT  10,3537     1370    2 1353 1360
POLYCOEF 12,3031    1187    1 1189      POSTORKV  E6,1517  =  138    6  162  217 PRIOPLAY 10,2630     1357    1 1353
POLYCOM     7253    1032    1 1032      POSTST    33,2450     877                 PRIORITY    0167      101   36  232 1358
POLYLOOP    7263    1033    1 1033      POSTTPI   E7,1605     147    4  147  666 PRIOTIME    1164      107    2 1356 1366
POLYRET     0141  =   99    3 1032 1033 POSUP     33,3222     888                 PRIO1       4733  = 1097
POLYTEMP E6,1740  =  136   10 1428 1456 POSUPDAT  33,3070     886                 PRIO10      4730  = 1097    5  296  777
POLY2       7266    1033    1 1033      POS1/2       4727  = 1097    2 1120      PRIO11      5013     1095
PON      37,2251     388    1  388      POS1/4    12,3765  = 1244                 PRIO12      4635      996    3  222  755
PON2     37,2240     388                POWERDB   20,2153    1405    2 1404 1405 PRIO13      5014     1095    3  741 1352
PON4     37,2245     388    1  388      POWFLITE  23,2000  =   33    1 1256      PRIO14      5015     1095    3  519 1300
POODOO      5644    1380    4  461 1231 POWFLIT1  23,2000  =   33                 PRIO15      5016     1095    6  191 1368
POODOO1     5722    1381    2 1077 1130 POWRSERS     7236    1032    2  826      PRIO16      5017     1095    6  191  736
POOFIZZ  04,2315     242    1  242      PQRBIT    16,3130    1431    1 1431      PRIO17      5020     1095    5  730  854
POOH     04,2217     240                PRATE     E4,1741  =  124    9  124  855 PRIO2       4732  = 1097
POOHBIT     4726  =   72                PRDTTAB   01,2000  =  250    3 1303 1305 PRIO20      4727  = 1097    8  282  861
POOHFLAG    0055  =   72    3  240 1216 PREBJUMP     5320    1291                 PRIO21      5022     1095    3  340  860
POOKLEAN 05,2651     225    1  241      PRECIBIT     4735  =   73                 PRIO22      7731     1095    6  283  860
POSALPH  21,3321    1477    2 1477      PRECIFLG     0064  =   73    6  247 1216 PRIO23      7732     1095    1  816
POSCHECK 21,3633    1507    1 1506      PRECSET   23,2401     700    4  628  669 PRIO24      7733     1095    1  568
POSCHNG2 33,2471     878    2  878      PREDOT       7175    1031    2 1036 1039 PRIO25      7734     1095    4  505  866
POSCODE     0734     103    6  328  957 PREDSPAL  40,3445     460    1  430      PRIO26      7735     1095    9  380  562
POSDEL   12,2620    1181    1 1180      PREGUIDE  31,2373     794    1  801      PRIO27      7736     1095    5  203 1404
POSDELX  12,2246    1175    1 1174      PREMM1    04,2472  =  246    2  239  243 PRIO3       5006     1095    5  706 1097
POSDRIVE 21,3525    1481    2 1471 1481 PREMON1   11,2323     822    1  823      PRIO30      4346  = 1097   12  184 1368
POSEC    42,3425     437    2  437      PREMON2   11,2324     822    1  822      PRIO31      7737     1095    5  348 1439
POSENCT1 21,3160    1472    1 1472      PRENVBSY     4430     479    1  479      PRIO32      7741     1095    2  876 1365
POSGMBL  37,2064     386                PREPAST   07,2203     265    3  272  274 PRIO33      7742     1095    1 1356
POSGN    40,2376     414    1  410      PRERADAR  25,3110     569    2  569  570 PRIO34      7743     1095    1 1097
POSINDEX 33,3501     892    2  886  889 PREREAD   37,3401     860    1  732      PRIO35      7744     1096    1 1119

HEALTH KEY: NORMALLY DEFINED UNLESS FLAGGED AS FOLLOWS:

UN UNDEFINED           = DEFINED BY EQUALS              J DEFINED BY JOKER OR ERASE ANYWHERE      MD MULTIPLY DEFINED
BD BADLY DEFINED     CO DEFINITION ASSOCIATED WITH CONFLICT             XX MISCELLANEOUS TROUBLE
```

```
SYMBOL TABLE LISTING, INCLUDING DEFINITION, HEALTH, PAGE OF DEF, # OF REFS, PAGE OF FIRST REF, PAGE OF LAST REF.

SYMBOL      DEF     H      REFERENCES       SYMBOL      DEF     H      REFERENCES       SYMBOL      DEF     H      REFERENCES

PRIO36      7745      1096   1  578         PLSHUP      6236      1006   1 1002         P20LEMD2 24,2355       515   1  515
PRIO37      7746      1096   9  243 1401    PUTADD   41,2361       424   3  424         P20LEMF  24,2307       514
PRIO4       4731  =   1097   4  286  504    PUTCOM   41,3145       443   8  439  442    P20LEMWT 24,2310       514   6  512  536
PRIO5       5010      1095  10  240 1206    PUTCOM2  41,3225       444   4  444  446    P20LEM1  24,2065       511   1  531
PRIO6       5011      1095   4  552 1427    PUTDCSF2 41,3257       445   1  445         P20LEM2  24,2071       511   1  512
PRIO7       5012      1095   7  287  720    PUTDECSF 41,3244       445   2  444         P20LEM3  24,2164       512   1  512
PRLIMIT  33,2113       858   2  849         PUTDPCOM 41,3200       444   1  444         P20LEM5  24,2156       512   2  512
PROCEED  10,3417      1367   1 1366         PUTNORM  41,3207       444   1  444         P20LMWT1 24,2317       514
PROCEEDE 06,2075       168                  PUTSENOR 41,3256       445   1  445         P20REG   04,2365       243   1  242
PROCKEY  40,3501       463   1  168         PUTXY    41,2764       441                  P20S     24,2000  =    33   6  507  658
PROCKEY1 40,3507       464                  PUTXYZ   41,2663       439                  P20S1    25,2000  =    33   4  542  603
PROCTNON 06,2242       174   1  174         PVALVEST    1273       109   7  202  223    P20S2    25,2000  =    33
PRODUCT  21,3455      1480                  PWRCNT      0140  =    100   2  825  826    P20S3    26,2000  =    34   2  595  604
PROGLARM    5616      1378   2 1378         PWRPTR      0117  =    100   4  825  826    P20S4    32,2000  =    35   1  508
PROGRAV  15,2706       963   1  963         POOHCHK  13,3407      1216   2 1215 1216    P21ALT   E7,1715  =   155   2  329  660
PROG20   24,2000       507   2  245  507    P05P06   37,2000  =     37   1 1332         P21BASER E7,1675  =   155   3  155  659
PROG20A  24,2040       510   3  508  510    P06      37,3654      1332   1  245         P21BASEV E7,1703  =   155   3  155  659
PROG21   24,3441       658   1  245         P12      30,2000  =     35   1  839         P21CONT  24,3510       659   1  658
PROG22   24,2000  =    507   1  245         P12A     23,2000  =     33                  P21DSP   24,3566       659   1  659
PROG25   24,2462       518   1  245         P12ADRES 30,2306       842   1  840         P21FLAG     0004  =    68   2  658  659
PROG52   15,2201       924   1  245         P12IGN   36,2523       735   1  726         P21FLBIT    4732  =    68   1  228
PROJMAX  31,3766       830   1  810         P12INIT  30,2243       841   2  836  839    P21GAM   E7,1713  =   155   3  155  659
PROJMIN  31,3767       830   1  810         P12LM    30,2061       839   1  245         P21ORIG     1162  =   155   2  659
PROK     30,2550       849   2  849         P12LMB   30,2120       839                  P21PROG1 24,3454       658   1  660
PRONVBIT    4736  =     75                  P12RET   30,2210       841   1  851         P21PROG2 24,3466       658   1  660
PRONVFLG    0104  =     74   1 1363         P12SPOT  36,2150  =    728   1  726         P21PRTM  24,3623       660   1  658
PRSHRTMP    4406       477   4  433  435    P12TABLE 36,2024       726   1  842         P21TIME  E7,1762  =   153   9  149  660
PRT2CADR 01,3773      1305   1 1302         P20FLGON 35,2366       635   4  627  669    P21VEL   E7,1711  =   155   4  155  659
PSEUDO55 E7,1614  =    156   3  156  791    P20LEMA  24,2167       512   3  511  525    P21VSAVE 24,3532       659   1  659
PSIV     E4,1453  =    118   3  118 1239    P20LEMB  24,2175       512   6  512  513    P25FLAG     0006  =    68   3  518 1382
PSKIPADR 16,3624      1439                  P20LEMB1 24,2241       513   1  528         P25FLBIT    4734  =    68   4  239  518
PSTHIBIT    4732  =     86   2  388  891    P20LEMB2 24,2244       513   1  513         P25LEM1  24,2476       518   3  251  519
PSTHIGAT    0251  =     86                  P20LEMB3 24,2246       513   2  513  514    P25LEM2  24,2521       519   1  519
PTBAD    05,3056       228   3  227         P20LEMB4 24,2263       514   1  513         P25LMWT1 24,2515       519   1  519
PTIGINC  E7,1402       144   1  669         P20LEMB5 24,2213       513   1  521         P3XORP7X 35,3614       686   1  683
PTOACSM  13,2743      1208   1 1213         P20LEMB6 24,2231       513   2  513         P30      35,2000       620   1  245
PTOALEM  13,3016      1209   2  309 1213    P20LEMB7 24,2206       513                  P30N33   35,2004       620
PULSEFLG    0303  =     89   4  296  787    P20LEMC  24,2275       514   3  521  523    P30S     35,2000  =    36   1  620
PULSEIMU 10,3715      1397   1  392         P20LEMC1 24,2322       514   3  251  515    P30S1    34,2000  =    35   1  622
PULSEM   14,3237       942                  P20LEMC2 24,2337       515   1  515         P30ZERO  35,2424       637  10  627  664
PULSES      4726  =     89   3  733 1442    P20LEMC3 24,2267       514   3  513  525    P32      35,2034       627   1  245
PURGENCY 16,3464      1436   3 1430 1433    P20LEMC4 24,2274       514   1  516         P32/P72A 35,2060       627   1  627
PURRS4   10,2727      1359   2 1358 1359    P20LEMC5 24,2155       512   1  511         P32/P72B 35,2136       628   1  629
PUSH     00,3247      1075   1 1011         P20LEMD  24,2342       515   1  514         P32/P72C 35,2157       629   1  647
PUSHLOC     0166       101  35  266 1107    P20LEMD1 24,2346       515   2  515         P32/P72D 35,2163       629   1  629

HEALTH KEY: NORMALLY DEFINED UNLESS FLAGGED AS FOLLOWS:

UN UNDEFINED           = DEFINED BY EQUALS              J DEFINED BY JOKER OR ERASE ANYWHERE      MD MULTIPLY DEFINED
BD BADLY DEFINED      CD DEFINITION ASSOCIATED WITH CONFLICT             XX MISCELLANEOUS TROUBLE
```

```
SYMBOL TABLE LISTING, INCLUDING DEFINITION, HEALTH, PAGE OF DEF, # OF REFS, PAGE OF FIRST REF, PAGE OF LAST REF.

SYMBOL       DEF    H       REFERENCES       SYMBOL      DEF    H       REFERENCES       SYMBOL      DEF    H       REFERENCES

P32/P72E 35,2165     629   1  629      P41LM    36,3271     750   1  245      P57OPT3  15,3617     980   1  978
P32/P72F 35,2173     629   1  629      P41MANU  36,3214     749               P57POST  15,3225     970   3  969  970
P32STRT  35,2037     627   1  627      P41NORM  36,3324     751               P63ADRES 32,3063     785   1  781
P33      35,2223     633   1  245      P41SPOT  36,2153     729   2  727  728 P63DISPS 31,3426     811   1  795
P33/P73A 35,2226     633   2  633  634 P41TABLE 36,2055     727   2  744  758 P63IGN   36,2465     734   1  728
P33/P73B 35,2240     633   1  634      P42ADRES 36,3134     744   1  753      P63IGN1  36,2516     734
P33/P73C 35,2307     634   1  633      P42IGN   36,2540     735   4  727  735 P63LM    32,2602     781   1  245
P33/P73D 35,2313     634   1  634      P42LM    36,3411     753   1  245      P63SPOT  36,2153  =  728   1  727
P33/P73E 35,2321     634   1  634      P42SPOT  36,2150  =  728   1  727      P63SPOT3 32,3034     785   1  785
P33/P73F 35,2332     634   1  634      P42STAGE 36,3421     753   1  727      P63SPOT4 32,3046     785   1  785
P34      35,2455     664   1  245      P42TABLE 36,2063     727   1  744      P63TABLE 36,2100     727   2  744  785
P34/P74A 35,2460     664   2  664  665 P47BOD   36,3505     754   1  755      P63ZOOM  35,3673     736
P34/P74B 35,2510     665   1  664      P47BODY  36,3514     755   2  754      P64CEED  31,3462     812   1  812
P34/P74C 35,2512     665   1  666      P47LM    36,3437     753   1  245      P64DB    31,3761     829   1  799
P34/P74D 35,2553     665   1  665      P50S     15,2000  =   32   6  261  972 P64DISPS 31,3444     812   2  795  812
P34/P74E 35,2556     665   1  665      P50S1    14,2000  =   32   6   47  972 P66      31,3517     814   2  798
P35      35,2643     669   1  245      P50S2    13,2000  =   31   1  929      P66HZ    32,3074     815   1  814
P35/P75A 35,2652     669   1  669      P50S3    21,2000  =   32   1  950      P66LOC   32,2000  =   35   1  815
P35/P75B 35,2657     669   1  669      P51      14,3404     947   3  245  948 P66PROBT    4744  =   69   1  816
P40/RET     1141     107   4  741  749 P51B     14,3436     947   1  947      P66PROFL    0016  =   69   2  797  813
P40A/P   35,3712     743   1  743      P51C     14,3447     947   1  948      P66VERT  32,3164     816   3  815  816
P40A/PMD 35,3742     744   1  743      P51D     14,3465     948   1  947      P70      21,2132     832   1  244
P40ADRES 36,3132     744   1  748      P51F     14,3505     948   1  948      P70A     21,2133     832   2  253  832
P40ALM   36,3120     743   2  743  753 P51G     14,3527     948   1  948      P70CADR  04,2436     244   1  244
P40AUTO  35,3710     743   2  723  836 P52A     15,2211     925   2  924  925 P70INIT  32,3465     835
P40IGN   36,2506     734   1  727      P52B     15,2213     925   1  925      P70NOW?  21,2121     832
P40IN    36,3177     749   1  753      P52D     15,2300     927   2  927  929 P7071BIT    4730  =   82
P40LM    36,3146     748   1  245      P52E     15,2233     925               P7071FLG    0211  =   82   3  834  850
P40PHS1  36,3235     750   2  750  754 P52F     15,2321     927   1  925      P71      21,2135     832
P40S     36,2000  =   37   7   39  753 P52H     15,2310     927   1  925      P71A     21,2136     832   2  253  832
P40SJUNK 36,2372     732   2  727      P52LS    15,2355     929   1  926      P71NOW?  21,2102     831
P40SPOT  36,2150     728   3  726  728 P52OUT   15,2323     927   1  928      P71PET   32,3577     836   1  835
P40SXT4  36,3212     749   2  749  751 P52T     15,2243     925   2  925      P72      35,2036     627   1  245
P40S1    27,2000  =   34   5   39  767 P52V     15,2265     926               P73      35,2225     633   1  245
P40S2    35,2000  =   36   1  743      P52W     15,2274     927   1  926      P74      35,2457     664   1  245
P40S3    35,2000  =   36   1  736      P57      15,3274     973   1  245      P75      35,2647     669   1  245
P40S4    32,2000  =   35   1  752      P57A     15,3335     973               P76ER77  13,2207     711   2  245
P40TABLE 36,2040     726   1  744      P57AA    15,3337     973   1  973      P76LOC   13,2000  =   31   1  711
P40ZOLM  35,3700     736   1  736      P57C     15,3362     974   2  974      P76SUB1  13,2363     713   1  712
P40ZOLMA 35,3705     736   1  736      P57D     15,3364     974   1  974      ======================================
P41ADRES 36,3133     744   1  750      P57JUMP  15,3543     978   2  970      Q           0002  =   94 432   95 1507
P41BLANK 36,2265     730   1  730      P57OPT   15,3302     973   2  973      Q+1         6760    1023   7  167 1371
P41FJET  36,3315     751               P57OPT0  15,3557     979   2  978      Q+10000     4634     996   1  998
P41FJET1 36,3317     751   1  751      P57OPT1  15,3600     979   1  978      Q+2         6762  = 1023   7  537 1376
P41IN    36,3322     751   1  751      P57OPT2  15,3616     980   1  978      Q-RATE   16,2550    1424   2 1424

HEALTH KEY: NORMALLY DEFINED UNLESS FLAGGED AS FOLLOWS:

UN UNDEFINED         = DEFINED BY EQUALS            J DEFINED BY JOKER OR ERASE ANYWHERE      MD MULTIPLY DEFINED
BD BADLY DEFINED    CD DEFINITION ASSOCIATED WITH CONFLICT           XX MISCELLANEOUS TROUBLE
```

```
SYMBOL TABLE LISTING, INCLUDING DEFINITION, HEALTH, PAGE OF DEF, # OF REFS, PAGE OF FIRST REF, PAGE OF LAST REF.

SYMBOL       DEF    H      REFERENCES     SYMBOL       DEF    H      REFERENCES     SYMBOL       DEF    H      REFERENCES

Q-RHCCTR     0042  =   94     3 1431      R         E7,1520  =  154    23  154  884 RATEDONE  16,3132    1431     1 1430
Q,RORGTS  17,2136    1440     1 1440      R(CSM)    E3,1715  =  116     5  709  884 RATEINDX     1322     110     3  223  376
QACCDOT   E6,1510  =  137     7 1409 1488 R*TL**P   23,3672    1260     2 1261      RATELIM1     4757  = 1508     1 1507
QAXIS     E5,1577  =  127     4  127  856 R-OTHER   E3,1715     116     6  116  333 RATELIM2  21,3606    1506     2 1508
QCDUWUSR  E6,1646  =  140     3  140  915 R-RATE    16,2606    1425     2 1424      RATELOOP  16,3642    1468     2 1426 1468
QCHAN        0002  =   95     2 1091      R-RHCCTR     0044  =   94     3 1431      RATERROR  16,3227    1432     1 1432
QDIFF     E6,1450  =  137     3 1470 1475 R-TO-RP   24,3644    1140     6  787 1232 RATES     30,2505     848     1  848
QERRCALC  17,2655    1449     2 1410 1440 RACCDOT   E6,1512  =  137     6 1409 1438 RATESP    04,2024      54     2  984
QERRCALL  16,3640    1439     1 1439      RACT1     E4,1673     121    11  121  652 RATESTOP  31,3402     811     1  828
QERROR    E6,1450  =  135     5  137 1450 RACT2     E4,1701     121     9  121  653 RATESTRT  05,3063     229     1  223
QGIMBITS     5000  = 1427     1 1426      RACT3     E7,1535     147    20  628  700 RATEVAR   E3,1770     117     1  598
QGIMTIMR  E6,1631     139     9  139 1478 RADARANG  26,3360     606     2  600  601 RATT         0000  = 1245    33  351 1221
QHZ       E5,1475  =  126     2  126  815 RADAREAD  25,3157     571     2  164      RATT1        0016  = 1245    11  221  784
QLAST     E6,1455     135     5 1422 1445 RADARFF      4000  =   29     1  536      RBRFGX    E5,1402  =  125     2  125  829
QMAJ      E5,1746  =  128    16  128  981 RADARUPT  25,2000  =   33     3   42  618 RBRFGZ    E5,1406  =  125     1  125
QMIN      E5,1745  =  128    16  128  969 RADBITS      1332  =  111     5  571  573 RC8-13    15,2002      54     1  984
QMINEXIT  15,3011     964     1  967      RADCADR      1303  =  110     4  233  557 RCDUFAIL     0274  =   88
QOK       26,2617     597     1  597      RADDEL       1270     109     2  577      RCDUFBIT     4736  =   88     6  195  581
QPLACE    E5,1417  =  132     7  132  393 RADIN     25,3325     573     1  573      RCDUOBIT     4730  =   87     5  513  553
QPLACES   E5,1420  =  132     3  132  392 RADLITES  25,3651     618     4  572  576 RCDUOFLG     0266  =   87
QPRET        0052  =   95    16  310 1240 RADMODES     0110  =   87   100  161  618 RCNORM       0042  =  130     3 1176 1177
QRATEDIF  E6,1436  =  135     2 1445      RADNOOP   25,3532     579     2  553  579 RCO       E7,1630  =  160     5  160  856
QRAXIS    16,3625    1439     4 1427 1435 RADSAMP   15,2162     505     2  289  505 RCS       17,2141    1440     4 1447 1448
QRBIT        4732  =  136     4 1430 1446 RADSTALL  07,3733    1326    12  278  894 RCSFLAGS  E6,1774     142    51  143 1481
QRCNTR    E6,1747  =  137     9 1470 1482 RADSTART  17,2000     577     3  570  577 RCSMON    06,3213     202     1  202
QRCONTRL  17,2232    1442     1 1441      RADTIME      1267     109     2  577      RCSMONEX     5272  =  201     2  202  203
QRNDXER      0066  = 1476     9 1477 1478 RADUSE       1077  =  106     8  569  576 RCSMONIT  06,3213  =  202     2  169
QRTIME    17,2544    1446     2 1446      RAMIN     E5,1557  =  126     3  126  856 RCSMONT   06,2000  =   30     1  201
QRUPT        0012  =   94    13  165 1426 RANGCONV  32,2003      42     1  590      RCV       E3,1534  =  115    28  115 1238
QSAVED    E7,1464     146     2  683  684 RANGE     E4,1613  =  120     4  120  708 RCVCSM    E3,1606     116     1  605
QTEMP     E7,1632     148     5  622  762 RANGEBQ   26,2522     596     3  596  603 RCVLEM    E3,1660     116     2  516  605
QTEMP1    E7,1665     148     5  148  757 RANGEBQ1  26,2532     596     1  596      RDBADEND  25,3623     581     4  562  581
QTPROLOG  23,3600    1258     1  819      RANGEDSP  E5,1613  =  127     3  127  804 RDCDUS    14,3370     945     1  944
QTSN45    23,3516    1254     1 1248      RANGEVAR  E3,1766     117     1  597      RDE       13,3773    1245     1 1232
QUADGUID  31,3056     805                 RANGRDOT  E7,1760  =  152     5  153  589 RDES         1313  =  110     4  110  550
QUARDUMP  21,2252     896                 RAPFGX    E5,1404  =  125     1  125      RDESGAIN  25,3055     568     2  566
QUARTER      4730  = 1097     4 1079 1084 RAPFGZ    E5,1410  =  125     1  125      RDESIRED  E5,1755  =  130     3  130 1196
QUICTRIG  23,3607    1258     3  865 1258 RAPO         0020  = 1271     1 1271      RDG       E5,1402  =  829     2  804  806
QUIKDSP   06,2134     170     1  165      RAPREC    E7,1477  =  147     2  670  673 RDIFF     E6,1452  =  137
QUIKFAZ5  33,3473     892    13  865  891 RASFLAG      0106  =   84     6 1216 1217 RDLONOR   40,3016     434     1  434
QUIKOFF   06,2165     170     1  170      RASTEER1  27,2733     772     1  766      RDM       13,3771    1245
QUIKRUPT  06,2144     170     1  170      RATEBIAS  22,3133     379     1  379      RDOT      E7,1473  =  154     5  841  855
QUITBIT      4740  =   83                 RATEDAMP  16,3215    1432     3 1430      RDOTBIAS  25,2001      42     1  574
QUITFLAG     0221  =   83     4  310 1215 RATEDB1      4760  = 1508     1 1507      RDOTCONV  32,2001      42     1  589
========================================= RATEDISP  43,2174     279     1  275      RDOTD     E4,1663  =  123     5  123  847

HEALTH KEY: NORMALLY DEFINED UNLESS FLAGGED AS FOLLOWS:

UN UNDEFINED          = DEFINED BY EQUALS           J DEFINED BY JOKER OR ERASE ANYWHERE      MD MULTIPLY DEFINED
BD BADLY DEFINED     CD DEFINITION ASSOCIATED WITH CONFLICT               XX MISCELLANEOUS TROUBLE
```

```
SYMBOL TABLE LISTING, INCLUDING DEFINITION, HEALTH, PAGE OF DEF, # OF REFS, PAGE OF FIRST REF, PAGE OF LAST REF.

SYMBOL       DEF  H       REFERENCES       SYMBOL       DEF  H       REFERENCES       SYMBOL       DEF  H       REFERENCES

RDCTONCM  34,3373     842   1   841       REFLASH   10,2452    1354   4   740   812 RENDRAD   25,3273     573   1   571
RDOTM     E7,1750 =   152   4   152   593 REFLASHR  10,2455    1354   1   750       RENDVOO   04,2264     241   1   241
RDOTMSAV  E7,1746 =   152   4   152   589 REFME     15,3470     977   3   788   978 RENDWBIT     4744 =    77   1   302
RDOTV     E7,1616     147   4   148   642 REFSMBIT     4730 =    72   7   218  1329 RENDWFLG     0131 =    77  13   247  1241
RDRET     E7,1675 =   151   3   151   606 REFSMFLG     0057 =    72   7   633   970 REPETE    35,3115     672   1   672
RDRLOCS   25,2045     506   1   506       REFSMMAT  E3,1731     117  56     1   977 REPIP1    37,3556     874   1   875
RDRPTBB      4063     164   1   163       REFTAG1      4727 =   283                   REPIP3    37,3564     874   1   875
RDRUSECK  43,2653     292   5   278   288 REFTAG10     4732 =   282                   REPIP4    37,3570     874   4   875
RE-IN66   31,2464     797   1   798       REFTAG2      4732 =   283                   REPOSBIT     4732 =    87   8   198   573
RE-IN662  31,2523     798   1   797       REFTAG3      4733 =   531                   REPOSCNT  E7,1423 =   145   4   145   526
READACCS  37,3430     861   1   875       REFTAG4      4726 =   531                   REPOSMON     0270 =    87
READALT   25,3423     575   1   575       REFTAG5      4736 =   299                   REPOSRRT  25,2135     546   1   550
READALT2  25,3420     575   1   575       REFTAG6      4734 =   299                   REPOSTM   E7,1424 =   145   5   145   527
READCDUD  23,2320     536   1   534       REFTAG7      4736 =   300                   RER40ALM  36,3122     743   2   727   743
READCDUK  22,2413     369   2   363   496 REFTAG8      4734 =   300                   REQADD    41,2111     420   1   420
READLO    40,2776     434   4   433   436 REFTAG9      4727 =   282                   REQCOM    41,2337     424   2   424
READLC1   40,3007     434   1   434       REGCOARS  15,2313     927   1   928       REQDATX   41,2332     424   3   439   441
READRDOT  32,2400     588   1   590       REGODSR   10,2460    1355   3   731   812 REQDATY   41,2334     424   3   439   441
READVEL   25,3414     575   2   575       REGODSPR  10,2463    1355                   REQDATZ   41,2336     424   3   420   441
RECAL1ST  40,3605     473   2   442   463 REGSLEEP  07,3357    1317   1  1317       REQEXLOC  41,2234     422
RECAL1    40,3610     473   1   473       REGUP        6254    1006   3  1006       REQEX1    41,3535     462   1   463
RECAL2    40,3621     473   2   473   474 REINTBIT     4736 =    84   3  1217  1381 REQMM     41,3512     462   1   461
RECAL3    40,3633     473                   REINTFLG     0236 =    84   5   713  1389 REQRET       1012     104  17   233   471
RECRATIO  13,3765    1245   1  1236       REJMK     07,2600     274   1   274       REQUESTC  41,3541     462   1   463
RECTEST   11,3340    1236   3  1235  1237 RELDSP       4450     479  10   238   837 REREADAC  37,3613     875   3   253
RECTIFY   13,3720    1238   8  1154  1237 RELDSPDN     4365     476   3   410   479 REREPOS   33,3555     894   1   250
RECTOUT   13,3236    1213   2  1213  1214 RELDSP1      4473     480   2   453   465 RERRCALC  17,2675    1449
RED-OVER  31,3475     812   1   812       RELDSP2      4464     480   2   480       RERROR    E6,1452 =   135   5   137  1450
REDES-OK  31,3477     812   1   812       RELINTQ   10,3251    1365   2  1360  1365 RER60     26,2251     490   1   490
REDESIG   31,2643     801   1   794       RELINUS   26,2231     490   1   251       RESETRPT  11,2342     823   2   823
REDESMGN  11,2326     822   1   822       RELDADSV  11,3647    1241   1  1240       RESETX2   12,3120    1189   1  1187
REDES1    31,2714     802   1   802       RELRET       0144 =    99   4   479   480 RESET22   04,2306     242   2   241   242
REDFLAG      0143 =    78   4   791   812 RELTAB       4066     165   4   167   458 RESIGN    35,3141     673   1   673
REDFLBIT     4737 =    78   2   801   812 RELTAB11     4101     165   2   166  1097 RESQ      33,2105      46   1   882
REDO      37,2002     385   1   302       REMARK    07,2516     272   1   271       REST      10,3265    1365   1  1363
REDOCTR      0320     101   4   101   226 REMDIST   42,2000      48   1   502       RESTART   01,2000 =    29   4   250  1304
REDOMANC  26,2162     489   1   489       REMODBIT     4727 =    87   7   282   609 RESTARTS  01,3530    1300   1   228
REDOMANN  26,2127     488                   REMODCHK  43,2314     283   1   283       RESTORDR  20,2115    1404   8   300  1406
REDOMASK  10,3512    1369   2  1354  1355 REMODE    25,2162     547   1   562       RESTREG      1264     109   4   222  1362
REDOPRIO  10,2542    1356   1  1369       REMODFLG     0265 =    87                   RESTSLEP  10,3271    1365   1  1365
REDO2.17  36,2341     731   1   251       RENDEND   26,3204     602   1   599       RESULTCT  E5,1537 =   132   5   387   391
REDO4.2   36,2344     732   2   252   754 RENDEZ    22,2000 =    33   1  1155       RESUME       5272    1127  24   170  1410
REDO5.5   37,3442     861   1   253       RENDEZVL     0002 =   247  14   246   247 RETJADR   E6,1477     136   4  1443  1452
REDO6.7   36,3355     752   1   254       RENDEZVU  05,2221 =   217   1   217       RETNMDRC  20,2456    1418   7  1413  1417
REDSPTEM  32,2017     219   2   218   219 RENDNOO   04,2320     242   2   242       RETNON    06,2264     174   1   175

HEALTH KEY: NORMALLY DEFINED UNLESS FLAGGED AS FOLLOWS:

UN UNDEFINED          = DEFINED BY EQUALS              J DEFINED BY JOKER OR ERASE ANYWHERE       MD MULTIPLY DEFINED
BD BADLY DEFINED     CD DEFINITION ASSOCIATED WITH CONFLICT              XX MISCELLANEOUS TROUBLE
```

```
SYMBOL TABLE LISTING, INCLUDING DEFINITION, HEALTH, PAGE OF DEF, # OF REFS, PAGE OF FIRST REF, PAGE OF LAST REF.

SYMBOL      DEF     H        REFERENCES       SYMBOL       DEF     H         REFERENCFS       SYMBOL       DEF     H        REFFRENCES

RETROCT      0132   =  100     3  825  827 RNOVZFLG      0010   =    68     7  510 1382 ROUNDSUB      7157       1030     4 1042 1053
RETURNTJ 17,3521      1462     7 1461 1465 RNGEOATA      0260   =    86                 RP         E5,1575   =   127     6  127  856
REVCNT       6263     1006     3  959 1097 RNGEDBIT      4741   =    86     2  575  886 RP-TO-R   26,3716       1138     8  782 1210
REVERS   35,3144       673     1  673      RNGSCBIT      4733   =    76     1  590      RPAD      23,2335        698     4  699 1280
REVERSAL 21,3540      1481     1 1481      RNGSCFLG      0120   =    76     2  574  588 RPADTEM   F4,1573   =   120     6  120  724
REVN1645 35,2026       621     1  621      RNRAO         0046   =    94     5  571  573 RPAD1     23,2335   =  1280
REV83    37,3147       707     1  709      RN1        E7,1544   =   154     7  154 1221 RPASS1    F7,1477        147     4  147  648
RFAILCNT E4,1566       119     3  288  506 ROADBACK  25,2357        553     4  553  579 RPASS2    E7,1521        147     7  147  653
RFAILS-  40,3734       486     1  485      RODCOMP   32,3167        816     1  816      RPASS3    E7,1551        147    11  639  700
RFAILS2  41,3775       484     1  483      RCDCOMPA  32,3213        817     2  817      RPASS36   E4,1577   =   122     3  122  704
RGIMBITS     5011   = 1427     1 1427      RODCOUNT  E7,1746   =    158     4  270  816 RPCOMP1   34,3571        855     1  847
RGIMTIMR E6,1633   =  139     5 1409 1470 ROOFLAG       0022   =    69     2  798  814 RPCOMP2   34,3575        855     1  850
RGOODEND 25,3616       581     5  548  581 RODFLBIT      4731   =    69     2  228  798 RPCRTIME  E7,1427        144     3  580  892
RGU      E5,1623   =  127     8  127  806 RODIN     07,2462        270     1  270      RPCRTQSW  F7,1430        144     2  580  892
RGVGCALC 31,2752       803     4  794  803 RODSCALE  E5,1534   =    126     2  126  798 RPER          0016   =  1271     3  723 1271
RHCACTIV 17,2377      1444     1 1444      RCDSCAL1  E7,1756   =    158     3  158  816 RPPREC    E7,1521   =   147     2  670  673
RHCMOVED 16,3220      1432     1 1430      RODTASK   32,3157        816     1  816      RPQFLAG       0170   =    80     6 1212 1237
RHCSCALE     4736   =   90     1  306      RODTRAP   23,2000   =     33                 RPQFLBIT      4726   =    80
RHCSCFLG     0313   =   90                 RCE       14,2006         47     1  932      RPQV      E4,1503   =   119     8  119 1237
RIGHT    00,2236      1052     1 1054      ROLLOVER  27,3251        777     1  778      RPREXIT       0050   =  1146     3 1138 1140
RIGHT-   00,2332      1054     1 1051      ROLLTIME  E6,1401        134     4  308  777 RPRPXXXX  24,3662       1140     1 1138
RIGHTR   00,2031      1045     1 1053      RONE      E4,1577        120    16  120 1274 RPSV      E4,1512   =   119     7  119 1229
RIGHT5       4313      475     2  442  443 ROO       04,2167        240                 RPTORA    26,3733       1138     1 1138
RIGNX    E5,1460   =  125     2  125  783 ROOAD     04,2423        244     1  240      RPTOR8    26,3725       1138     1 1139
RIGNZ    E5,1462   =  125     2  125  783 ROOTCYCL  21,3566       1482     3 1480      RR-AZ     F4,1571   =   122     5  122  327
RIMUZ    32,3442       821     1  820      ROOTHALF  21,3562       1482     1 1480      RP-ELEV   E4,1573   =   122     2  312  327
RINIT    E4,1713       122    10  676  762 ROOTLOOP  31,3616        826     2  826      RRANGE        0024   =   583     2  511  583
RLAST    E6,1456       135     5 1423 1445 ROOTMU        0020   =  1199     3 1177 1195 RRANGLES  13,2133        334     1  555
RLM      E4,1575   =  122    16  502  503 ROOTPS        0126   =   100     5  825  827 RRANGOUT  40,2634        431     1  430
RLMSRCH  E7,1675   =  150     6  150  612 ROOTPS+1      0127   =   100                 RRATE     F4,1615   =   120     5  120  708
RLMUNIT      0014   =  613                 ROOTPSRS  31,3545        825     1  805      RRATEOIF  E6,1437   =   135     1 1445
RLS      E4,1420       118    16    1 1209 RCOTSTOR  31,3662        827     3  826  827 RRAUTCHK  06,3035        193     2  169
RM       F7,1756   =  152     4  152  597 ROPFCHK   43,3523       1287     1 1284      RR8ADEND  25,3264        572     3  573  574
RMAG     F7,1714   =  149     5  149  773 ROT-TOUV  17,3200       1455     4 1440 1495 RRBORSIT  E7,1740   =   152     5  152  592
RMAG1        0014   = 1265     4 1268 1277 ROTATE    34,3052        649     2  648      RRCDUCHK  06,3066        195     2  193
RMAX     E4,1404       118     1  606      ROTCOMP   15,2141        263     2  261      RRCHECK       4567        540
RMF      12,2021   =   38     1 1215      ROTEMP1   E6,1736   =    136     3 1455      RRDATA8T      4741   =    88     1  540
RMM      12,2017   =   38                 ROTEMP2   E6,1737   =    136     4 1455      RROATAFL      0277   =    88
RMODINIT 05,3402       234     1  230      ROTFLAG       0220   =    83     5  836  852 RRDESOUN  25,2775        567     1  567
RMODINV  25,2224       548     7  548  559 ROTFLBIT      4737   =    83                 RROESENO  43,2310        283     1  275
RN           1217      108    17  206 1218 ROTINOEX  E6,1743   =    136    10 1427 1456 RRDESK2   43,2267        282     1  282
RND/TST  42,3554       450     3  449      RCTURQUE  16,3717       1469     1 1468      RRDESNB   25,2466        559     3  282  527
RNDCUN   42,3313       435     2  437      ROTSENSE  E6,1737   =    138     9 1459 1467 RRDESNBK  43,2235        282     1  280
RNDREFDR 07,3162      1312     3  184 1332 ROT180    26,2362        498     1  498      RRDESSM   25,2364        554     3  525  611
RNDVZBIT     4736   =   68    10  196  612 ROUNO     00,2116       1047     1 1011      RROOTOUT  40,2651        432     1  430

HEALTH KEY: NORMALLY DEFINED UNLESS FLAGGED AS FOLLOWS:

UN UNDEFINED            = DEFINED BY EQUALS              J DEFINED BY JOKER OR FRASE ANYWHERE      MD MULTIPLY DEFINED
BD BADLY DEFINED       CD DEFINITION ASSOCIATED WITH CONFLICT           XX MISCELLANEOUS TROUBLE
```

```
SYMBOL TABLE LISTING, INCLUDING DEFINITION, HEALTH, PAGE OF DEF, # OF REFS, PAGE OF FIRST REF, PAGE OF LAST REF.

SYMBOL       DEF  H       REFERENCES     SYMBOL       DEF  H       REFERENCES     SYMBOL       DEF  H       REFERENCES

RRECT     E3,1502 =  115  15  115 1238 RSCALE    32,2173    221   1  221      RUFSETUP  17,3745   1467   4 1466 1467
RRECTCSM  E3,1554    116  11  116 1210 RSFLGBTS  05,3066    229                RUNITX    E7,1714 =  157   6  157  901
RRECTHIS  E3,1626 =  116   4  309 1207 RSPHERE   13,3767   1245   2 1236 1237 RUNITY    E7,1715 =  157   3  157  897
RRECTLEM  E3,1626    116   3  116 1209 RSTACK    E4,1571 =  122  10  288  505 RUNITZ    E7,1716 =  157   4  157  901
RRECTOTH  E3,1554 =  116   1  309      RSTOFGTS  21,3454   1480   2 1474      RUPDATED  33,3260    889
RRGIMON   06,3120    197   1  195      RSUBC        1100 =  106   3  509      RUPTAGN      0332    101   6  101 1127
RRIMUDIF  43,2212    281   1  281      RSUBE     14,2004     47   1  932      RUPTREG1     0070     97  44  158 1405
RRINDEX      1314 =  110   3  549  550 RSUBEM    14,2000     47   2  932      RUPTREG2     0071     97  24  172 1478
RRINIT    06,2564    183   1  183      RSUBL     E7,1630 =  155   4  155  510 RUPTREG3     0072     97  15  158 1478
RRLEADIN  15,2000 =   32   1  505      RSUBM     14,2002     47   1  932      RUPTREG4     0073     97   7   97 1335
RRLIMCHK     4514    538   4  198  558 RTARG     E7,1443    145   7  205  772 RUPT10BB     4065    164   1  164
RRLIMNB   25,2531    559   2  559      RTARG1    E7,1471 =  150  11  689  693 RUTH      16,3116   1430   1 1430
RRLIMCK      4551    539   2  539  560 RTB       01,2454   1088   1 1088      RUTMXTAB  42,3145    330   1  316
RRLOSDSP  40,2000    311   2  311  312 RTB/BHIZ  01,2453   1088   1 1010      RUTMXTEM     0153     99   2  316  443
RRNB      23,2041    336   3  559  611 RTBCODES  10,2000 =   30   2 1394 1398 RVARMIN   E3,1772    117   1  596
RRNBBIT      4737 =   68               RTBCODE1  14,2000 =   32   1 1398      RVBOTH    33,2744    884   1  865
RRNBMPAC  23,2065    336   1  311      RTERM        0022 = 1265   3 1274 1276 RVCON     13,3301   1214   1 1213
RRNBSW       0011 =   63   5  555  583 RTHETA    E4,1617 =  120   5  327  709 RVEC      E5,1654 =  130  10  509 1198
RRNB1     23,2054    336   1  336      RTIG      E7,1641    148   9  148  764 RVQ       00,3274   1075   1 1011
RROUT     25,2277    551   2  550  568 RTMAG     E7,1722 =  149   5  149  773 RVSW         0157 =   79   7  509 1184
RROUTLIM  25,2326    552   1  551      RTMU      E4,1711    121   4  639  696 RVSWBIT      4734 =   79
RROUT2    25,2301    551   1  552      RTNAPSE   E5,1710 =  130   3 1198      RWAITK    43,2143    278
RRRANGE   25,3074    569   3  506  589 RTNHOLD   E7,1607 =  156   4  156  792 RXZ       E7,1721 =  152  10  152  606
RRRDOT    25,3072    569   4  506  588 RTNLAMB   E5,1710 =  130   8  130 1195 RO2       04,2000 =   29   1 1329
RRRET        1312    110   5  110  550 RTNPRM    E5,1753 =  130   3  130 1185 RO2BNK15  15,2000 =   32   1 1329
RRRSBIT      4742 =   88   2  538  589 RTNSAVER     0145 =  100   3 1260 1261 RO2BOTH   15,3757   1329  10  351  924
RRRSFLAG     0300 =   88               RTNTR     E5,1710 =  130   1 1196      RO2ZERO   15,3773   1330   1 1329
RRSHAFT   E7,1735 =  152   3  152  600 RTNTT     E5,1710 =  130   3 1184      RO4       43,2430    288   1  275
RRSONLY   25,2235    549   3  546  548 RTORPA    24,3666   1140   1 1140      RO4A      43,2462    288   1  289
RRSPGAIN  25,2276    550   1  550      RTORPB    24,3655   1140   1 1140      RO4B      43,2504    289   1  289
RRSPTODP  40,2664    432   2  431  432 RTRN      E7,1465    146   7  656  686 RO4C      43,2521    289   2  289  291
RRTARGET     1100 =  106  12  106  610 RTRNCADR  01,3567   1300   5 1300 1305 RO4END    43,2614    291   6  289  290
RRTONLY   25,2232    549   4  546  548 RTRNMU    10,2022    696   1  696      RO4FLAG      0063 =   73   4  240  511
RRTRKF       4561    540   2  618      RTSR1/MU  E4,1707    121   4  121  696 RO4FLBIT     4734 =   73   3  288  289
RRTRUN    E7,1733 =  152   3  152  602 RTSTBASE  E4,1766    123   4  289  505 RO4K      43,2606    290   1  288
RRTURNON  25,2053    542   1  194      RTSTDEX   E4,1764    123   5  289  506 RO4L      43,2610    291   1  289
RRWAIT    43,2237    282   1  282      RTSTLOC   E4,1767    123   7  288  506 RO4LR     43,2556    290   3  290
RRZERO    25,2334    553   1  278      RTSTMAX   E4,1765    123   2  289  506 RO4RR     43,2542    290   2  290
RRZERCK   43,2140    278   1  278      RTX1      E5,1776 =  129  13  129 1221 RO4X      43,2477    289   1  290
RRZEROSB  25,2062    543   2  542  553 RTX2      E5,1777 =  129  17  623 1221 RO4Y      43,2572    290   2  290
RRZ2      25,2361    553   1  553      RUFLAW1   17,3663   1466   1 1459      RO4Z      43,2434    288   1  288
RR1AXIS   25,2237    549   1  549      RUFLAW12  17,3671   1466   2 1466      R1           0040 = 1199  19  641 1198
RR1AX2    25,2245    550   1  549      RUFLAW2   17,3717   1466   1 1459      R1A       E5,1741 =  130  15  130 1198
RSAMPDT   E4,1770    123   8  124  505 RUFLAW3   17,3725   1467   1 1460      R1C       E7,1724 =  149   4  149  773
RSBBQ     E3,1432    114   2  206  226 RUFRATE   17,3776   1467   2 1466      R1D1         4310    475  13  415 1071

HEALTH KEY: NORMALLY DEFINED UNLESS FLAGGED AS FOLLOWS:

UN UNDEFINED          = DEFINED BY EQUALS              J DEFINED BY JOKER OR ERASE ANYWHERE      MD MULTIPLY DEFINED
BD BADLY DEFINED     CD DEFINITION ASSOCIATED WITH CONFLICT              XX MISCELLANEOUS TROUBLE
```

```
SYMBOL TABLE LISTING, INCLUDING DEFINITION, HEALTH, PAGE OF DEF, # OF REFS, PAGE OF FIRST REF, PAGE OF LAST REF.

SYMBOL       DEF  H      REFERENCES     SYMBOL       DEF  H      REFERENCES     SYMBOL       DEF  H      REFERENCES

R1S      E7,1572 =  154  15  154  892 R22LEM12 24,2541    520               R51K     14,3145    939   2  939  941
R1VEC    E5,1654 =  130   6  130 1191 R22LEM2  24,2607    521   2  521      R51P63   14,3146    939
R10      21,2000 =   32   2   43  895 R22LEM3  24,2627    521   2  521      R52      14,3603    952   1  939
R10,R11  21,2042    831   3  251  862 R22LEM42 24,2713    523   5  515  522 R52A     14,3621    952   2  952  953
R10,R11A 21,2060    831   1  831      R22LEM44 24,2706    522   1  522      R52B     14,3627    952   1  952
R10CALL  37,3473    862   1  861      R22LEM45 24,2720    523   1  523      R54      14,3265 =  942   2  939  969
R10FLAG     0015 =   68   1  839      R22LEM7  24,2674    522   1  522      R55      14,3234    942   1  939
R10FLBIT    4743 =   68   2  833  900 R22LEM93 24,2644    522   1  602      R55.1    14,3240    942
R11      21,2000 =   32   2  831  837 R22LEM96 24,2650    522   2  606      R55.2    14,3246    942   1  942
R12      33,2444    877   3  877      R22RSTRT 24,2735    523   1  251      R55CDR   14,3264    942   2  941  942
R12DL    25,3456    576   1  576      R22WAIT  24,2724    523   3  520  521 R55RET   14,3260    942   1  942
R12EXIT  25,3403    575   2  572      R23LEM   24,3220    528   1  513      R56      14,2620 =  934   1  938
R12RDBIT    4742 =   86   4  231  889 R23LEM1  24,3226    528   1  529      R59      15,2402    955   5  952  968
R12RDFLG    0261 =   86               R23LEM11 24,3237    528   1  528      R59A     15,2414    955   1  955
R12RDSFT 25,3146    570               R23LEM2  24,3261    529   2  528  529 R59ALM   15,2542    957   1  957
R12READ  25,3142    570   1  861      R23LEM3  24,3264    529   2  528  529 R59D     15,2515    956   1  956
R12SCHNG 25,3401    574   1  574      R24END   24,3313    531   1  530      R59F     15,2564    957   1  957
R12STUFF 34,2000 =   35               R24LEM   24,3271    530   1  526      R59OUT   15,2574    957   2  955  957
R12THRU? 33,3262    889   1  889      R24LEM1  24,3275    530               R59RET   15,3073    968   1  958
R2       E5,1717 =  130   3 1182      R24LEM2  24,3301    530   1  531      R60LEM   26,2125    488   6  352  953
R2D1        4311    475   7  415 1097 R24LEM3  24,3317    531   1  530      R61      23,2000 =   33   1  533
R2VEC    E5,1662 =  130  10  130 1191 R24LEM4  24,3333    531   1  531      R61C+L01 23,2131    533   1  535
R21-503  24,3044    525   1  525      R29/SERV 33,2000 =   35               R61C+L02 23,2152    534   2  533  534
R21DISP  24,3207    527   1  525      R3D1        4312    475   5  415  472 R61C+L03 23,2156    534
R21END   24,3053    525   1  525      R30LOC   22,2000 =   33   2   46  716 R61C+L04 23,2300    536   1  534
R21LEM   24,2756    524   1  514      R300K    27,3771   1280               R61C+L05 23,2234    535   1  535
R21LEM00 24,3077    526   1  526      R31      37,2000 =   37   1  706      R61C+L06 23,2257    535   3  535  536
R21LEM1  24,3017    525               R31CALL  40,3741    706   1  295      R61C+L1  23,2305    536
R21LEM10 24,3011    525   2  524  527 R31LOC   40,2000 =   37   1  706      R61C+L2  23,2273    535   1  535
R21LEM11 24,3173    527   1  526      R31SURF  37,3362    710   1  707      R61C+L4  23,2303    536   2  535
R21LEM12 24,3075    526               R33      42,2002    287   1  287      R61FLAG     0024 =   69   2  533
R21LEM13 24,3121    526   1  526      R36      04,2677    704   2  296  705 R61FLBIT    4733 =   69   1  535
R21LEM2  24,3015    525   1  563      R36INT   04,2714    704   1  705      R61LEM   23,2116    533   4  512  531
R21LEM3  24,3026    525               R36LM    04,2000 =   29   1  703      R61LEM1  23,2162    534
R21LEM4  24,3065    526   1  525      R36TAG2  04,3000    705   1  705      R61LEM2  23,2216    534
R21LEM5  24,2771    524   1  524      R47      32,2000 =   35   1  218      R61TEST  26,2254    490   1  489
R21LEM50 24,3126    526   1  526      R51      14,3023    938   1  927      R62      23,2000 =   33   1  500
R21LEM6  24,3001    525   1  524      R51.1    14,3025    938   1  252      R62DISP  23,2103 =  500   1  298
R21LEM7  24,3124    526   1  526      R51.2    14,3073    939               R62FLASH 23,2103    500   2  500
R21LEM8  24,3131    526   1  526      R51.3    14,3074    939   1  940      R65CNTR  E7,1745 =  152   6  158  596
R21LEM9  24,3163    527   1  527      R51.4    14,3156    940   1  939      R65LEM   23,2123    533   3  519  596
R21SRCH  24,3060    526   1  525      R51C     14,3030    938   2  938  939 R65WAIT  23,2312    536   2  534
R22DISP     0314 =  101   6  327  606 R51E     14,3071    938   4  938      R77      43,2420    288   1  276
R22LEM   24,2527    520   4  522  523 R51F     14,3060    938               R77END   43,2630    291   1  276
R22LEM1  24,2577    521   1  521      R51I     14,3061    938   1  938      R77EXIT  25,3253    572   1  571

HEALTH KEY: NORMALLY DEFINED UNLESS FLAGGED AS FOLLOWS:

UN UNDEFINED          = DEFINED BY EQUALS                  J DEFINED BY JOKER OR ERASE ANYWHERE      MD MULTIPLY DEFINED
BD BADLY DEFINED     CD DEFINITION ASSOCIATED WITH CONFLICT                    XX MISCELLANEOUS TROUBLE
```

```
SYMBOL TABLE LISTING, INCLUDING DEFINITION, HEALTH, PAGE OF DEF, # OF REFS, PAGE OF FIRST REF, PAGE OF LAST REF.

SYMBOL     DEF     H      REFERENCES    SYMBOL     DEF     H      REFERENCES    SYMBOL     DEF     H      REFERENCES

R77FLAG     0117  =   76   2  288  291 SBIT4       4741  = 1282   1 1286       SELFCHK  43,3341    1284   5  234 1284
R77FLBIT    4732  =   76   4  231  571 SBIT5       4740  = 1282                SELFERAS    1357     112   1  112
R77IN    25,2030     506   2  505  506 SBIT6       4737  = 1282                SELFRET     1361  =  112   7  112 1284
====================================== SBIT7       4736  = 1282   1 1289       SELFSUPR 40,2000  =   37
S(X1)       0032  = 1199   6 1176 1182 SBIT8       4735  = 1282                SEND1D   05,3766     995   2  990  994
S+ZERO      4746  = 1282   9  302 1288 SBIT9       4734  = 1282   1 1286       SENDPULS 07,3120    1311   1 1310
S+1         4744  = 1282   9  302 1290 SBNK03      5011  = 1283   1 1288       SENSEGET 17,2146    1440
S+2        -4743  = 1282               SCALADJ  25,3342     574   1  574       SENSETYP E6,1500     136   5 1436 1460
S+3         6266  = 1282               SCALCHNG 25,3364     574   1  573       SENSOR   17,3757    1467   2 1459
S+4         4742  = 1282               SCALDONE 21,3437    1480   1 1479       SENSTEST 17,3377    1460   1 1460
S+5         4747  = 1282               SCALECHK 25,3316     573   1  573       SEPMIN   42,3446     437   2  435  436
S+6         6263  = 1282               SCALEDOT 17,3352    1460   1 1460       SEPMNRET    0144  =   99   2  437  438
S+7         4750  = 1283   1 1284      SCALEF   17,3340    1459   1 1459       SEPSCRET    0144  =   99   2  437
S-ZERO      4745  = 1283   1 1287      SCALEFAC 31,2005      41   2  793  819 SEPSEC   42,3415     437   1  436
S-1         7770  = 1283   2 1288 1290 SCALFLO  40,2646     432   2  432       SEPSECNR 42,3430     437   3  435  437
S-2         7767  = 1283               SCALEVEC 32,2126     220   2  219       SEPSEC1  42,3423     437   1  437
S-3         7766  = 1283               SCALLOOP 21,3423    1479   1 1479       SERV     32,2000  =   35   1  870
S-4         6133  = 1283               SCALPREP 37,3713    1333   2 1332 1333 SERVCADR 36,2107  =  744   1  750
S-7         5652  = 1283   1 1284      SCALSAVE    0316     101   3 1332 1333 SERVDURN    1355     112   7  161  867
SAMETYP  15,3572     979   1  979      SCALSHFT E7,1720  =  151   4  152  606 SERVEXIT 32,3656     870   7  726  870
SAMPLIM     1077     106   3  106  579 SCALSTRT 21,3415    1479   1 1479       SERVICER 33,2121     864   2  253  861
SAMPLSUM    1100     106   9  106  590 SCAXIS   E7,1764  =  153  27  149  956 SERVICES 33,2000  =   35   8   40  894
SAMPTIME    0013  =   94   5  219  477 SCHZEROS 37,3056     400   4  392  395 SERVIDLE 27,3324     869   2 1380 1381
SAVEDEN  27,3540    1275   1 1275      SCLNORM  17,3141    1454                SERVOUT  33,2322     867   3  866  867
SAVEHAND E6,1462     135   7 1431 1445 SCNDSOL  34,2776     647   7  639  647 SERV1    37,2000  =   37   2  860  873
SAVELOCK 10,2741    1360   1 1359      SCOUNT      1366  =  112   4  112 1287 SERV2    22,2000  =   33   1  867
SAVELCCS 10,2734    1360   2 1355 1359 SCOUTEND 40,2731     433   4  433       SERV3    27,2000  =   34   1  869
SAVESR   E6,1505  =  137   2 1470 1482 SCRATCH  E6,1745  =  137   2 1482       SERV4    34,2000  =   35
SAVET-30 E7,1477  =  154   8  154  731 SCRATCHX    0160  = 1494   5 1490 1494 SETAUG   40,2674     432   1  431
SAVLEMV  E7,1737  =  150   4  609  610 SCRATCHY    0161  = 1494   3 1490 1491 SETBANK  13,3074    1210   4 1208 1209
SAVQR52  E7,1665  =  148   3  952  958 SCRATCHZ    0162  = 1494   4 1490 1491 SETCOARS 07,3131    1312   2  179 1309
SAX      E5,1730  =  128   5  935  937 SD       22,2366     369                SETCTR   21,3623    1506
SBAND    42,2000  =   37   4   48  501 SDISPLAY 43,3112     302   1 1290       SETEBANK    4304     475   2  423  434
SBANDANT 42,3617     501   2  292  504 SECAD    22,2027     363                SETGAMMA 13,2605    1136   2 1131 1133
SBANDEX  42,3754     503   1  503      SECMAX   E7,1573  =  147   5  670  672 SETGLOCK 06,2465     180   4  179  180
SBAND40  40,2000  =   37   1  504      SECON1   42,3300     435   1  437       SETGMEX  13,2613    1136   1 1136
SBIT1       4744  = 1282               SECON2   42,3302     435   1  435       SETIFLGS 13,2702    1207   8  247 1218
SBIT10      4733  = 1282               SECO1       4770  =  758                SETINFL  05,2733     226
SBIT11      4732  = 1282   2 1288 1289 SELCTSUB 17,3225    1455   3 1441 1452 SETISSW  06,2703     189   7  175 1315
SBIT12      4731  = 1282   1 1288      SELECTMU 10,2000     696   4  628  669 SETLOC   01,2665    1105   3 1105 1109
SBIT13      4730  = 1282               SELECTP  16,3532    1438   2 1434 1438 SETMARK  10,2526    1356
SBIT14      4727  = 1282               SELECTYZ 16,3552    1438   1 1427       SETMAXDB 20,2130    1404   3 1404
SBIT15      4726  = 1282   1 1289      SELFADRS 43,3250    1283   2  302  303 SETMGA   21,2017     695   1  695
SBIT2       4743  = 1282               SELFBANK 01,3227    1114   1 1114       SETMINDB 20,2141    1404   6  528 1404
SBIT3       4742  = 1282               SELFCHEC 43,2000  =   37   1 1282       SETMOON  13,2754    1208   3 1208 1237

HEALTH KEY: NORMALLY DEFINED UNLESS FLAGGED AS FOLLOWS:

UN UNDEFINED        = DEFINED BY EQUALS                   J DEFINED BY JOKER OR ERASE ANYWHERE      MD MULTIPLY DEFINED
BD BADLY DEFINED   CD DEFINITION ASSOCIATED WITH CONFLICT              XX MISCELLANEOUS TROUBLE
```

```
SYMBOL TABLE LISTING, INCLUDING DEFINITION, HEALTH, PAGE OF DEF, # OF REFS, PAGE OF FIRST REF, PAGE OF LAST REF.

SYMBOL      DEF     H      REFERENCES      SYMBOL      DEF     H      REFERENCES      SYMBOL      DEF     H      REFERENCES

SETMUER   10,2011       696    1  696      SFRUTMIX  41,3104       442    5  423  447 SINESLOC  23,3754      1261    1 1261
SETNADD      4302       475    2  420  444 SFRUTNOR  41,3076       442    5  429  447 SINGIMLC  26,2407       498    1  496
SETNCADR     4274       475    7  420  475 SFTEMP1      .0123  =    98   21  316  448 SINI      26,2002        55    2 1142
SETNEGU   21,3313      1477    1 1477      SFTEMP2       0124  =    98    2  448      SINNODI      0010  =  1146    1 1142
SETNORM   10,2534      1356    1 1354      SGNAGREE  10,3622      1394    4  388 1215 SINTH        0022  =   129   21  312 1251
SETOVF       7024      1025    1 1028      SGNCHECK  12,2562      1180    2 1180 1181 SINTHETA  E7,1731  =   152    3  152  606
SETOVF2      7173      1030    1 1026      SGNCOM    40,2411       415    1  415      SINVEC1   26,2411       498    1  497
SETPD        7634      1042    1 1009      SGNDVOVF  00,2402      1055    1 1055      SINVEC2   26,2413       498    1  497
SETPRIO  10,2503       1355                SGNOFF       0123  =    98    3  415      SINZERO   30,3651       919    1  919
SETRAD    23,2365       699    1  698      SGNON        0122  =    98    3  415      SIN60DEG  26,3704       613    2  610
SETRAOX   23,2400       699    1  699      SGNRDOT   E5,1754  =   130    2  130 1196 SITIME       1241  =   108    3  930  971
SETRE     13,2615      1137    2 1131 1133 SGNTAB    40,2432       415    2  415      SIX          6263  =  1097   34  179 1485
SETREX       0051  =   1137    2 1137      SGNT01    40,3117       447    1  446      SIXTY     43,3241      1283    1 1289
SETROUND  00,2272      1052    3 1052      SGNTST1   40,2451       415    3  415      SIZETAB   01,2002       250    2 1303 1305
SETRRCTR  25,2310       551    1  552      SHAFTBQ   26,3023       600                SIZETST   42,3572       450    2  449
SETRRECR  25,2147       546    2  545  556 SHAFTCMD     1352       112    1  566      SKEEP1       1371  =   112   20  112 1290
SETRXX    13,2630      1137    3 1137      SHAFTLIM  25,2555       560    1  560      SKEEP2       1372  =   112   10  112 1288
SETSENSE  17,3330      1459    1 1459      SHAFTVAR  F4,1410       118    1  601      SKEEP3       1373  =   112   14  112 1289
SETSURF   07,2156       265    1  265      SHFTFACT  32,3440       821    1  819      SKEEP4       1374  =   112   14  113 1290
SETTIME   17,2615      1447    1 1447      SHFTFLAG  F6,1740  =   137    4 1479 1480 SKEEP5       1375  =   113   10  113 1289
SETTIME4  06,2074       167    1  170      SHIFTR1   23,2447       702    8  623  666 SKEEP6       1376  =   113    6  113 1290
SETTIME5  16,2153      1410    1 1411      SHIFT11   33,2742       883    3  384  885 SKEEP7       1377  =   113   22  226 1289
SETTRKF      4555       540    2  196  544 SHOLTS    41,3733       483    1  482      SKIPADD   10,2762      1360    1 1360
SETUPDSP  14,3754      1291    1 1291      SHORTMP      7330      1034   10  412 1334 SKIPDB1   20,3350      1497    1 1496
SETUPER1  37,3005       400    1  399      SHORTMP2     7334      1034    1  888      SKIPDB2   20,3434      1498    3 1497 1498
SETUP70   04,2430       244    1  238      SHORTT    00,2017      1045    2 1008      SKIPPAXS  16,2740      1427    2 1426 1439
SETUP71   04,2427       244    1  238      SHORTV    00,2121      1048    1 1008      SKIPSIM   05,2463       222    1  222
SETVAC    41,3555       463    1  462      SHOW      37,2457       392    3  337  389 SKIPTPFR  22,3630       724    1  724
SETWO     05,3571       990    3  990  992 SHOWSUM   43,3077       302    1  302      SKIPU     E6,1534       138    9  138 1470
SETXFLAG  23,2453  =    852                SHOW1     37,2461       393    1  393      SKIPV     E6,1535  =   138    3 1410 1470
SETXTACT  43,2105       276                SHUTDOWN  16,2164      1410    1 1407      SLAP1     05,2454       222    1  422
SETX2     26,2540       596    1  596      SIDLOOP   43,3272      1283    1 1284      SLCTMU    10,2000  =    30    1  696
SEUDOPOO  04,2236       241    1  243      SIGN         7676      1044    1 1009      SLEEPIE   37,3034       400    2  395  399
SEVEN        4750      1093   23  165 1493 SIGNADS      0163  =  1504   12 1496 1503 SLEFT5       4331       476    1  459
SFAIL        1357  =    112    4  112 1284 SIGNFIX   40,3060       446    2  446      SLOAD        6522      1017    1 1009
SFCOM     42,2152       317    1  317      SIGNLCHK  25,2757       567    2  567      SLOAD2       6076      1000    5 1017 1398
SFCONUM   41,3117       443    2  429  445 SIGNMPAC  14,3765      1398   15  365 1277 SLOPEBIT     4742  =    70
SFINTAB   42,2471       323    1  317      SIGNTEST  40,2435       415    2  414      SLOPEHI   00,2314      1053    1 1078
SFINTABR  41,3262       445    1  445      SIM2CADR  05,2461       222                SLOPELO   00,3007      1067    1 1079
SFMIXCAL  40,3107       446    1  446      SINBLANK  40,2561       417    1  417      SLOPESW      0033  =    70    3 1180 1193
SFNORCAL  40,3112       447    1  446      SINCDU       0735  =   103    6  103 1261 SLOPE0    E5,1527  =   126    2  126  887
SFOUTAB   42,2565       325    1  317      SINCDUX      0741  =   103    6  493 1263 SLOPE1    E5,1530  =   126    1  126
SFOUTABR  41,2627       430    1  430      SINCDUY      0735  =   103    5  493 1263 SLOPE2    F5,1531  =   126    1  126
SFRET     41,3134       443                SINCDUZ      0737  =   103    7  493 1263 SLOPE3    F5,1532  =   126    1  126
SFRET1    41,3116       443                SINF      00,3530      1080    2 1011 1257 SLOPE4    E5,1533  =   126    1  126

HEALTH KEY: NORMALLY DEFINED UNLESS FLAGGED AS FOLLOWS:

UN UNDEFINED          = DEFINED BY EQUALS              J DEFINED BY JOKER OR ERASE ANYWHERE      MD MULTIPLY DEFINED
BD BADLY DEFINED    CD DEFINITION ASSOCIATED WITH CONFLICT             XX MISCELLANEOUS TROUBLE
```

```
SYMBOL TABLE LISTING, INCLUDING DEFINITION, HEALTH, PAGE OF DEF, # OF REFS, PAGE OF FIRST REF, PAGE OF LAST REF.

SYMBOL     DEF    H       REFERENCES     SYMBOL     DEF    H       REFERENCES     SYMBOL     DEF    H       REFERENCES

SMALL    00,3133    1071    1 1068       SPIRAL      1241 =  108    5  108  957 STARTP47 36,3450     754    1  754
SMALLEPS 27,2366     762    1  762       SPLRET   22,3543 =  721    1   38      STARTP64 31,2550     799    1  794
SMALLTJU 16,3710    1468    1 1468       SPNDX       1261    109    8  377  378 STARTP66 31,2452     797    1  794
SMALL2   00,3062    1068    1 1071       SPSCODE     4734 = 1306                STARTSB1 05,3116     230    1  227
SMALPDIF 16,2513    1423    2 1423       SPSCONT  20,2716   1488    1 1493      STARTSB2 05,3156     231    3  227  231
SMALRATE 17,3707    1466    1 1466       SPSIN       5024   1100    3  199 1258 STARTSIM 05,2457     222
SMODE       1362 =   112    7  112 1284  SPSLOOP1 20,3064   1492    1 1493      STARTSTO    6455    1015
SMODECHK 43,3304    1284    3 1284 1287  SPSLOOP2 20,3101   1492    1 1493      STARTSUB 05,3107     230    4  222  229
SMPAC+   00,3405    1077    3 1077       SPSRCS   21,3667   1507    2 1436 1450 STARTSW  05,2456     222
SNAPAGN  05,3647     991                 SPSSTART 21,3675   1507    1 1507      STATE       0074      97   41   67 1091
SNAPEND  05,3666     992                 SPT         5027   1100    1 1100      STATEBIT    4740 =    73    1 1381
SNAPLOOP 05,3636     991    1  992       SPVAC       5107   1101    3  244 1359 STATEFLG    0067 =    73    9  595 1241
SNBCOMP  14,2413     264    2  261  262  SPVACIN     5103   1101    1 1101      STATEINT 13,2641    1206    3  251 1207
SNBTEST  15,2062     262    1  262       SQ          1076    106    2 1100      STATEUP  13,2026     247    1 1207
SNGLCD   22,2376     369                 SQRT     00,3207   1074    1 1011      STATINT1 13,2650    1206    2  251 1206
SNTH     F5,1727 =   130   14  130 1197  SQRTABRT 00,3402   1077    2 1077      STATQUO  04,2342     243    2  242  243
SNUFFBIT    4730 =    76    1 1451       SQRTNEG  00,3373   1077    1 1077      STCLOK1  36,2662     738    1  737
SNUFFER     0115 =    76    2  310       SQRTNM2  00,3475   1079    1 1079      STCLOK2  36,2663     738    2  729  784
SNUFFOUT 43,3224     310    1  275       SQRTNORM 00,3502   1079    1 1079      STCLOK3  36,2664     738
SN1      00,3553    1081    1 1080       SQRTSHFT 00,3221   1074    1 1074      STCTR    20,2550    1485    1 1486
SN359+   35,2420     637    1  640       SQRTSUB  00,3343   1077    3 1068 1082 STCTR1   20,2553    1486    1 1487
SOB         0042 =  1146    4 1141 1142  SR          0021 =   94   30  417 1482 STDESIG  25,2573     562    3  527  562
SOLNSBIT    4742 =    77                 SRCHOBIT    4727 =   71    1  609      STDESIG1 25,2607     562
SOLNSW      0127 =    77    5 1191 1197  SRCHOPTN    0037 =   71    4  299  530 STEER?   31,3371     810    1  809
SOMEACS  20,3422    1498                 SRDOV    00,2024   1045    1 1068      STEERBIT    4732 =    71    3  810  866
SOMERRRR 37,3040     400                 SRTEST   00,3456   1079    1 1078      STEERING 36,3667     757    2  727
SOMERR2  37,3047     400    1  390       SR30.1   22,3553    723    2  718  720 STEERSW     0042 =    71    2  766
SOPT     43,3710    1290    1 1290       SS       E7,1732 =  149    9  773  774 STEERSW? 31,3376     810    1  810
SOPTION  43,3673    1289    2 1288       SSP         6641   1019    1 1009      STERN    31,2437     797
SOPTIONS 43,3315    1284    2 1284       STADR       6375   1012    1 1011      STIKLOAD 01,2214     306    1  306
SOPTION1 43,3325    1284    1 1284       STALL    07,3736   1327    2 1326      STIKSENS F6,1444     135    8  223 1445
SOPTION2 43,3326    1284                 STAR     E5,1730 =  128    8  128  964 STIKSTRT 05,3062     229    1  223
SOPTION3 43,3327    1284                 STARAD   F5,1706 =  128   39  128 1253 STILBADH E7,1674 =   157    7  157  785
SOPTION4 43,3330    1284                 STARALGN    0735    103    2  103      STILBADV E7,1675 =   157    6  157  785
SOPTION5 43,3331    1284                 STARCODE    1235 =  108    3  952  953 STILLRCS 17,2710    1450    3 1444 1450
SOPTION6 43,3332    1284                 STARIND  E5,1757 =  128   15  128  968 STMIN-   20,3505    1499    2 1503
SOPTION7 43,3333    1284                 STARSAV1 E5,1760 =  128   12  128  980 STMP        0020 =   985    7  984
SOPTON10 43,3334    1284                 STARSAV2 E5,1766 =  128   11  128  979 STOPCLOK 36,3012     741    3  740
SOUPLY   37,3071     401                 STARTAB  14,2000 =   32    1   49      STOPFIRE 31,3511     813    2  813
SOUTHDR  F5,1421 =   132    3  132  383  STARTDAP 16,2047   1409                STOPRATE 20,2166    1405   11  300 1406
SPARCSIN 30,3657     920    3  804  910  STARTDES 25,2423    556    2  555  559 STORALT  25,3425     575    1  575
SPARE       0007 =   204    3  210  216  STARTDP1 16,2043   1409    1 1408      STORANG  27,2046     496    1  496
SPCOS       5023    1100    3  199 1258  STARTEB     5000 =  234    1  231      STORBNOS 12,2140    1173    1 1176
SPECSTS  37,2572     396                 STARTMNV 26,2204    489    2  489      STORDELT 35,3153     673    2  672  673
SPECTEST 01,2655    1105    1 1109       STARTPIP 37,2161    387    1  387      STORE       6443    1014    6 1013

HEALTH KEY: NORMALLY DEFINED UNLESS FLAGGED AS FOLLOWS:

UN UNDEFINED          = DEFINED BY EQUALS             J DEFINED BY JOKER OR ERASE ANYWHERE      MD MULTIPLY DEFINED
BD BADLY DEFINED     CD DEFINITION ASSOCIATED WITH CONFLICT              XX MISCELLANEOUS TROUBLE
```

```
SYMBOL TABLE LISTING, INCLUDING DEFINITION, HEALTH, PAGE OF DEF, # OF REFS, PAGE OF FIRST REF, PAGE OF LAST REF.

SYMBOL      DEF    H      REFERENCES      SYMBOL      DEF    H      REFERENCES      SYMBOL      DEF    H      REFERENCES

STORE,1      6435     1014   1 1013       SURFDISP 15,3200      970   2  969  972 S33/34.1 35,2702      670   2  633  665
STORE,2      6440     1014   1 1013       SURFFBIT     4735 =    81   8  309  864 S34/35.1 35,3212      675   2  669  670
STOREMAX 12,2077     1173   3 1172 1173  SURFFLAG     0177 =    81  17  247 1209 S34/35.2 35,3224      676   2  666  669
STOREMIN 12,2152     1173   1 1173       SURFLINE 15,3120      969   2  968  979 S34/35.3 35,3315      678   1  682
STORETGO 27,2666      770   2  770       SURFSTAR 15,2004      261   2  266      S34/35.4 35,3360      679   1  682
STORE1       6644     1019   1 1050       SURFSUP  15,3170      969   1  969      S34/35.5 35,3440      681   2  666  669
STORE1S  26,3666      612   1  612       SVCT3        5242     1119   2 1119      S3435.23 35,3243      676   1  676
STORHAPO 22,3602      723                SVCT3X       5260     1119   3 1119      S3435.25 35,3245      676
STORHPER 22,3614      724                SVDWN1   13,2114      333   3  309 1207 S40.1    27,2246      760   2  749  751
STORJUMP     6413     1013   1 1012       SVDWN2   13,2070      332   2 1154 1209 S40.1B   27,2336      762   1  761
STORLP71 04,3651     1390   2 1390 1391  SVEXITAD 05,3500      834   1  834      S40.13   27,2536      768   2  251  732
STORPARM 32,3552      836   1  836       SVEXTADR 27,3361      870   1  369      S40.13D  27,2624      769   2  768  769
STORPCTR 21,2054      831   1  331       SW/      01,2522 = 1092   1 1010      S40.130V 27,2653      770   1  769
STORTCRK 16,3703     1468   1 1469       SWANDBIT     4732 =    79   2  880  895 S40.131  27,2606      769   1  768
STORV    20,3570     1500   1 1500       SWANDISP     0155 =    79   1  868      S40.132  27,2614      769   2  769  770
STORVEL  25,3445      575   1  575       SWBIT        0131 =    98   5 1090 1092 S40.132* 27,2616      769   1  770
STORY    27,2431      764   1  764       SWBRANCH     6736     1022   1 1092      S40.133  27,2647      770
STRAT    14,2730      936   1  936       SWCALL       4613      996   4  382 1088 S40.134  27,2650      770   2  769  770
STRATGY  14,2722      936                SWCHCLR  35,2543      665   1  665      S40.136  27,2006       39   1  769
STRTGYRO 07,3372     1318   2 1316 1321  SWCHSET  35,2521      665   1  665      S40.136_ 27,2010       39   1  770
STRTGYR2 07,3376     1318   4 1319 1323  SWINIT   05,3403      234   9  224      S40.137  27,2637      769
STRTIDLE     5675     1380   1 1380       SWITCHES 01,2522     1090   1 1092      S40.138  27,2661      770   1  769
STRTMNAD 26,2213      489   1  489       SWRETURN     4622      996  10  255 1330 S40.2,3  27,2413      764   2  749  751
STSHOSUM 43,3525     1287   2  302  303  SWSKIP   01,2603     1092   2 1092      S40.8    27,2447      766   1  756
ST511CTR 33,2467      878   1  878       SWSTORE  01,2557     1091   2 1091      S40.9    27,2711      772   1  757
SUBDIVDE 16,2267     1420   3 1422       SWWORD       0130 =    98   2 1090 1091 S408NK   24,2000 =    33   1  767
SUBEXIT  E7,1470      146  23  627  706  SXA      01,2370     1085   1 1010      S40RFT   36,3615      756   3  766  767
SUBLIST      0337 =   102  13  102  952  SYNCT4   06,2154      170   1  170      S41.1    27,3271      780   4  751  754
SUBTP    06,3702     1083   1 1084       SYSTEST  43,3057      302   1  276      S50      14,2515 =   932
SUFFCHEK 12,3460     1194   4 1193 1194  S1           0050 =    95  30  369 1252 S52.2    21,2707      950   2  927  944
SUHALFA  22,2677      374   1  374       S10BITS      5003 = 1283   2 1285      S52.2.1  21,2727      950
SUHALFAP 22,2717      374   1  374       S13BITS  43,3243     1283   1 1289      S52.2A   21,2720      950   1  950
SUPDACAL     4642      997   2  455 1288  S2           0051 =    95  46  261 1252 S52.3    21,2740      951   1  927
SUPDXCHZ     5167     1114   7  295 1130  S24.9SEC 36,3143      744   1  731      S8BITS       4350 = 1283   1 1290
SUPERADR 16,2671     1426   1 1426       S30.1    34,2000      622   1  620      ======================================
SUPERBNK     0007 =    95  27  226 1378  S32.1F1      0132 =    77   4  638  647 T            0036 = 1199  12  509 1194
SUPERJOB 16,2672     1426   2 1426       S32.1F2      0133 =    77   4  638  647 T(X)     27,3740     1279   2 1276 1277
SUPERSW      4720      999   3  239 1380  S32.1F3A     0134 =    77   8  639  647 T-OTHER  F3,1570 =   116   3  162  205
SUPER011     4764     1094   3  860 1308  S32.1F3B     0135 =    77   8  639  647 T/2SEC   15,3014      964   1  963
SUPER100     4736 = 1094                S32/33.X 34,3120      652   2  636  651 TABLNTH  06,2037      167   1  167
SUPER101     4766     1094   1 1097       S32/33.1 34,3100      651   2  629  634 TABLTTF  F7,1562 =   156   7  156  829
SUPER110     4767     1094   2  885 1097  S32BIT1      4726 =    77               TABLTTFL 31,3757      829   1  805
SUPRCON  43,3242     1283   1 1289       S32BIT2      4727 =    77               TAD          7112     1028   1 1009
SURFACAN 07,2555      272   1  272       S32BIT3A     4730 =    77               TAGSUB   01,2445     1087   4 1085 1086
SURFALIN 05,2353 =   214   1  217       S32BIT3B     4731 =    77               TALIGN   F5,1774 =   128  10  129  974

HEALTH KEY: NORMALLY DEFINED UNLESS FLAGGED AS FOLLOWS:

UN UNDEFINED        = DEFINED BY EQUALS              J DEFINED BY JOKER OR ERASE ANYWHERE     MD MULTIPLY DEFINED
BD BADLY DEFINED   CD DEFINITION ASSOCIATED WITH CONFLICT            XX MISCELLANEOUS TROUBLE
```

```
SYMBOL TABLE LISTING, INCLUDING DEFINITION, HEALTH, PAGE OF DEF, # OF REFS, PAGE OF FIRST REF, PAGE OF LAST REF.

SYMBOL      DEF     H       REFERENCES        SYMBOL      DEF     H       REFERENCES        SYMBOL      DEF     H       REFERENCES

TANG         1106       106   20  106  590 TDECAY    E7,1740  =  149     1  766      TEPHEM    E3,1706      116   11  117 1392
TANGNB    E7,1752  =  152   10  152  611 TDECAYFX     4761     1094                 TEREND    33,3157      887    1  887
TARGETDB  E6,1476  =  135    4 1433 1446 TDEC1        0040  = 1245    57  219 1241 TERLOOP   33,3131      886    1  887
TARGETV   12,3551     1195    1 1195      TDEC2     E7,1573  =  147     3  628  700 TERMASC   34,3560      855    2  854  855
TARGTDEX  31,2415      795    1  827      TDELTAV   E3,1520  =  115    13  115 1240 TERMATE   10,3400     1367    1 1366
TASKOVER     5263     1127   77  175 1375 TDESIRED  E5,1670  =  130     5  130 1194 TERMEXTV     5474  =  276    4  281  285
TAT          0014  = 1245   15  219 1221 TDISP     15,3332      973     1  973      TERMNVEC  12,3640     1197    1 1197
TAU.      E4,1473  =  118   13  119 1231 TDISPSET  31,3702      827     2  800  805 TERM1TMP     0157  =  100    3 1261
TAUHZ     E5,1474  =  126    2  126  815 TEMDELH   E7,1766  =  159     2  886  887 TERM40    36,3255      750    3  749  750
TAUROD    E5,1535  =  126    2  126  819 TEMK         1075      106    10 1100      TEROFF    43,2341      284    1  275
TBASE1       1052       105    4  731 1301 TEMP      E5,1441  =  132                TERRLAMB  E5,1757  =  130    2 1193 1194
TBASE2       1054       105    7  439 1217 TEMPADD   E5,1440  =  132                TERSKIP   33,3161      887    1  886
TBASE3       1056       105               TEMPBB       0064  = 1297     1 1296      TEST      01,2571     1092    1 1092
TBASE4       1060       105    4  244  739 TEMPBBCN     0073  = 1297     6 1296 1299 TESTBIT   40,3565      472    3  471  472
TBASE5       1062       105    1  862      TEMPFLSH     0373      102     3  240 1362 TESTLODX  31,3656      826    1  826
TBASE6       1064       105    1  739      TEMPG        0061  = 1297     8 1296 1299 TESTLOOP  13,3315     1215    6 1213 1242
TBUILDFX     4760      1094    1 1508      TEMPG2       0071  = 1297     3 1295 1298 TESTNN    41,2073      420    1  454
TBUP      E4,1661  =  123   15  123  855 TEMPNM       0063  = 1297     3 1296 1299 TESTOFUF  40,3223      443    4  446  456
TC        E3,1550  =  115   10  115 1238 TEMPNUM   E6,1741  =  136     2 1438      TESTV8    41,2066      420
TCALARM2  43,3267     1283                 TEMPOK    06,2525      181     2  181      TESTXACT  43,2076      276   19  281 1385
TCCSM     E3,1622      116                 TEMPOR2      0160  = 1370    10 1353 1364 TESTY     35,2750      670    1  670
TCDANZIG  27,3756  = 1279    6  583 1274 TEMPP        0062  = 1297     6 1296 1299 TET       E3,1516  =  115   33  115 1237
TCDH      E3,1774      117   11  205  650 TEMPPHS      0154  = 1305     9 1300 1305 TETCSM    E3,1570      116    5  116 1392
TCFINDVC     4345       476    2  463 1305 TEMPPR       0070  = 1297     2 1296 1299 TETLEM    E3,1642      116    4  116 1392
TCGETCAD  00,3762     1374    1 1375      TEMPP2       0072  = 1297     5 1295 1298 TETOTHER  E3,1570  =  116
TCGFAPPR  E5,1454  =  125    3  125  827 TEMPR60      1163      107     7  488  842 TETTHIS   E3,1642  =  116    1  713
TCGFBRAK  E5,1452  =  125    2  125  808 TEMPSW       0065  = 1297     8 1295 1298 TEVENT       1341      111    6  205  833
TCGIAPPR  E5,1455  =  125    1  125      TEMPSWCH     0157  = 1305     3 1300 1305 TFF       E4,1531  =  120   11  120  724
TCGIBRAK  E5,1453  =  125    1  125      TEMPSW2      0066  = 1297     4 1295 1298 TFF/RTMU     0036  = 1265    6  717 1276
TCLEM     E3,1674      116                 TEMPTIME  E5,1430  =  132     3  132  392 TFFALFA      0032  = 1265    6 1269 1276
TCNOVAC      4342       476    2  462 1305 TEMPVAR   E5,1667  =  131     3 1148 1149 TFFBANK   22,3322      717    1  716
TCP       E6,1445      135    3 1420 1433 TEMP2G       0155  = 1305     9 1300 1305 TFFCALLS  22,3567      723    1  723
TCPIN     43,3205      310    1  310      TEMP31    E6,1736  =  135     6 1442 1443 TFFCONIC  27,3363     1268
TCPINAD   43,3210      310    1  309      TEMX         1253  =  108     8  108  875 TFFCONMU  27,3364     1268    1  723
TCQ          6763  = 1291    4  277  541 TEMY         1254  =  108     5  108  875 TFFDELQ      0012  = 1265    2 1277 1278
TCQBNK00  30,3455     1078    1 1078      TEMZ         1255  =  108     7  108  875 TFFELL    27,3656     1277    1 1275
TCQCDUW   30,3461      915    1  921      TEM1         0141       99    35   99 1363 TFFEL1    27,3660     1277    1 1275
TCQR      E6,1457      135    3 1420 1446 TEM2         0142       99    36   99 1396 TFFNP        0034  = 1265    6 1268 1277
TCQSTAL   17,2050      578    2  577  578 TEM3         0143       99    19   99 1257 TFFQ1        0016  = 1265    5 1274 1277
TCSI      E7,1633      148   12  205  650 TEM4         0144       99    11   99  919 TFFRP/RA  27,3432     1271    1  723
TCSLEEP   00,3773     1375    1 1374      TEM5         0145       99    10   99  918 TFFRTALF     0030  = 1265    3 1269 1276
TCSUBTR   00,3734     1084    1 1082      TEN          4354  = 1097     8  220 1410 TFFSW        0167  =   80    3 1274
TCTSKOVR     4344       476    1  746      TENDAPPR  E7,1424      144                TFFSWBIT     4744  =   80
TCWAIT       4343       476    2  463 1305 TENDBRAK  E7,1423      144     2  145  807 TFFTEM       0044  = 1265   13 1274 1278
TDEC         1114       107    9  107 1241 TENSEC    24,3203      527     1  526      TFFTICK   22,3455      719

HEALTH KEY: NORMALLY DEFINED UNLESS FLAGGED AS FOLLOWS:

UN UNDEFINED          = DEFINED BY EQUALS            J DEFINED BY JOKER OR ERASE ANYWHERE      MD MULTIPLY DEFINED
BD BADLY DEFINED    CD DEFINITION ASSOCIATED WITH CONFLICT            XX MISCELLANEOUS TROUBLE
```

```
GAP:  ASSEMBLE REVISION 210 OF AGC PROGRAM LUMINARY BY NASA 2021112-161       17:11 MAR. 19,1971                PAGE 1553

SYMBOL TABLE LISTING, INCLUDING DEFINITION, HEALTH, PAGE OF DEF, # OF REFS, PAGE OF FIRST REF, PAGE OF LAST REF.

SYMBCL      DEF      H        REFERENCES       SYMBOL      DEF      H        REEERENCES       SYMBOL      DEF      H        REFERENCES

TEEVSQ      0024  = 1265    1 1268          TIG-0     36,2407       733    2  252  732 TJU       E6,1525  =   138   19  139 1507
TEEX        0042  = 1265    7 1274 1277 TIG-30    36,2300       731    2  252  730 TJV       E6,1526  =   138    3 1409 1453
TEEXTEST 27,3564    1275    1 1275          TIG-30.1 36,2270       730    1  730      TJZERO   21,3726     1508    2 1508
TEEZEROS 23,2504  = 1280    2 1274 1275 TIG-30A  36,2275       731    1  730      TLAND    E4,1426      118    6  212  929
TEE1/ALF    0026  = 1265    7 1269 1278 TIG-35   36,2242       730    3  252  729 TLIM     06,2514      181    1  172
TEE1/4   23,2474  = 1280    4 1268 1274 TIG-5    36,2354       732    4  252  738 TLOAD       6511     1017    3  369 1097
TGO      E7,1516  =  154   39  154  855 TIGNOW   36,3240       750    2  736  749 TM       E6,1732  =   140    4  376  379
TGOCALC  27,2470     766                TIGSAVE  E7,1762  =    149    4  756  760 TMANUCHK 22,3064      373
TGOCOMP  32,3626     837    2  835  836 TIGSAVEP E7,1764  =    149    2  756  757 TMARK    E5,1432  =   132    4  132  392
TGOFFNOW 21,3343    1478    3 1477 1478 TIGTASK  36,2566       736    1  727      TMEXITL  05,3720      992
TGO1     E7,1501  =  155    2  837      TIGTASK1 35,3657       736    1  736      TMEAIL2  04,3357     1337    2 1337
THDUMP   31,2333     792                TIMECHEK 10,3334      1366    1 1366      TMFI     E6,1702  =   140    9  364  365
THETA       0024  =  129   10  943 1248 TIMECHK  22,3075       378    1  378      TMIN     34,2111      638    2  647
THETACON 27,2411     762    1  761      TIMEDELT 04,3170      1222    4 1220 1221 TMINDEX     0336  =   102    4  991
THETAC      0321     101   26  101 1310 TIMEDIDL 04,3571      1389    2 1389 1392 TMIS     E6,1702  =   140   10  140  363
THETAN   E5,1452  =  133    1  133      TIMEDIDR 04,3603      1389    1  254      TMODE       6520     1017    1  536
THETCOMP 34,3650     856    2  835  855 TIMEGMBL 21,3260      1476    2 1448 1488 TMPDV       1235  =   108    2  681
THETCRIT E5,1555  =  126    2  126  835 TIMEHOLD    1104       106    4  569  588 TMPTOSPT 33,2367      876    1  865
THETEST  E7,1563  =  151    7  151  264 TIMEINC  13,3674      1221    1 1222      TMRESUME 05,3722      993
THETRET  15,2046     261    1  263      TIMEOVFL 12,2311      1176    1 1174      TNEWA    E7,1431      144    2  756
THIRD    35,3645     687    2  672  855 TIMEP       0030  =    985    3  983  984 TNONTEST 06,2227      173    1  171
THIRTEEN    4752  = 1071    2 1068 1359 TIMERAD  12,3557      1196    1  628      TNUV     E3,1526  =   115   12  115 1240
THISAXIS 23,2476  =   38    1   38      TIMESTEP 11,3307      1235    4 1216      TOBALL   26,2140      488    1  488
THISPREC 13,3115  =   38    3  704  718 TIMETEST 01,3576      1301    1 1304      TOBALLA  26,2146      488    2  489
THISSHIP 22,3360     718    1  717      TIMETHET 12,2732      1184    5  509  666 TOBALLC  26,2173      489    1  489
THISTPIP E7,1761  =  158    6  158  819 TIMEX    35,3207       673    2  671  673 TOCON2      5421     1296    1 1297
THISVINT 13,2066     248    1 1221      TIME1       0025  =     94   28  175 1366 TOE-FF   27,2000  =    34    1 1268
THRDCHK  34,2656     646    2  645      TIME2       0024  =     94   39  161 1394 TOE-FF1  27,2000  =    34    2   48 1280
THRDISP  E7,1750  =  152    2  329  789 TIME2SAV    0314       101    4  101 1334 TOFAR    25,3635      585    1  585
THREE       6266  = 1097   44  244 1456 TIME3       0026  =     94    4  230 1126 TOOBADF  22,2724      375    1  363
THREE/8  12,3757    1244    1 1230      TIME4       0027  =     94    4  167  230 TOOBADI  22,2742      375    1  364
THREEDEG 32,2563     590    1  590      TIME5       0030  =     94    5  230 1419 TOOBIG   24,2142      512    1  511
THRESH1  36,2022      41    1  748      TIME6       0031  =     94    7 1401 1455 TOOFEW      1354      112    2  797  814
THRESH2     6000      41    3  753  839 TIMQGMBL 21,3266      1477    1 1478      TOPSFUDD 17,2553     1446    1 1446
THRESH3  36,2023      41    1  748      TIMSUBM     0016  =   1146    3 1143      TORKJET1 20,2000       44    2 1488
THROTLAG 31,2004      41    1  792      TIMSUBO  E3,1706  =    117    1 1143      TORQCONS 20,3123     1493    1 1493
THROTTLE 31,2144     789    2  811  813 TITER    E7,1613  =    147    5  670  672 TORQNDX  E5,1440  =   132    3  385  400
THROTUP  32,3635     838    2  836      TIX      01,2421      1086    1 1010      TORQUE   37,2117      386    1  400
THROT66  31,3514     813    1  620      TJCALC   17,3402      1460    2 1460      TOTATTER 43,2167      279    2  275  279
THRTCALL 31,3407     811    2  811      TJETLAW  17,3304      1459    2 1436 1450 TPAGREE     7300     1034   19  287 1394
THRUST      0055  =   95    5  222  838 TJETU    E6,1525  =    139    2 1461 1462 TPASS4   E7,1630      148    9  205  774
TICKTEST 22,3432     719    2  716  719 TJLAW    17,2715      1450    1 1454      TPDVL       6631     1019    1 1019
TICKTEF  22,3422     718    1  718      TJLAWADR 17,3142      1454    1 1450      TPERTICK 22,3462      719    1  719
TICKIPER 22,3412     718                TJMIN    17,3774      1467    1 1465      TPIP     E7,1624  =   156    5  156  800
TIG      E7,1441     145   41  2 5  974 TJP      E6,1524       138   18  138 1468 TPIPOLD  E7,1573  =   156    2  799  800

HEALTH KEY: NORMALLY DEFINED UNLESS FLAGGED AS FOLLOWS:

UN UNDEFINED         = DEFINED BY EQUALS               J DEFINED BY JOKER OR ERASE ANYWHERE      MD MULTIPLY DEFINED
BO BADLY DEFINED    CD DEFINITION ASSOCIATED WITH CONFLICT              XX MISCELLANEOUS TROUBLE
```

```
SYMBOL TABLE LISTING, INCLUDING DEFINITION, HEALTH, PAGE OF DEF, # OF REFS, PAGE OF FIRST REF, PAGE OF LAST REF.

SYMBOL     DEF     H       REFERENCES      SYMBOL     DEF     H       REFERENCES      SYMBOL     DEF     H       REFERENCES

TPLEFTN  40,3202       448    3  433  448 TSIGHT   E7,1561 =   151   19  151  977 TURNON   17,3154      1454
TPMODE   10,3643      1395   11  596 1189 TSIGHT1  14,3172     940    1  938      TURNONBT    4744 =    88    1  542
TPREV    E5,1761 =     130    3 1193 1194 TSKOVCDR 01,3522    1130    1 1130      TURNONFL    0302 =    88
TPSL1       4375       477    6  437  448 TSL&TCQ  30,3603     918    1  918      TVEC        0032 =  1245    4 1233
TPUSH    0[illegible],3272      1075    1 1075      TSLC        7637    1042    1 1009      TWEEKIT     0050 =  1201    4 1180 1194
TR*GL**P 23,3543      1257    1 1257      TSLCLOOP 00,2201    1050    1 1050      TWELVE      5745 =  1482    2  898 1479
TRACEI   40,3265       456                TSLCTEST 00,2207    1050    1 1050      TWIDDLE     5175    1117   29  387 1321
TRACEIS  40,3276       456                TSLC2    00,2172    1050    1 1042      TWO         4743 =  1097  107   38 1503
TRACKPIT    4740 =      70   15  292 1312 TSNEXTP  16,3020    1428    4 1427 1428 TWOPI    35,3641       687    5  628  676
TRACKFLG    0031 =      70    6  510 1382 TSNEXTS  17,2226    1441                TWOPULSE 07,3536      1321    1 1321
TRANSM1  E4,1400 =     122    2  122  398 TSNUMBRT 17,2216    1441    1 1444      TXO      E7,1653 =   160    3  842  852
TRANSPOS 22,2326       368    1  363      TSSL     00,2101    1047    3 1045 1054 TX789    E7,1471 =   151    3  151 1155
TRANSIM  E7,1662 =     155    3  155  510 TSSR     00,2025    1045                TYPEP    16,3564      1438    1 1438
TRANS4   17,2352      1444    1 1441      TSTAB    40,3703     485    1  486      TYPEPOLY 17,3263      1456    2 1456
TRAPEDP  F6,1430       134   11  134 1423 TSTART82 E4,1575 =   120    7  351  718 T1TOT2   F4,1643       121    6  121  647
TRAPEDQ  E6,1431 =     134    6 1409 1424 TSTCON1  41,3730     483    1  482      T2A      30,3001 =   858    1  848
TRAPEDR  E6,1432 =     134    6 1409 1424 TSTCON2  41,3731     483    1  482      T2TEST   30,2447       848    2  848  854
TREDES   E7,1666 =     157    6  801  828 TSTCON3  41,3732     483    1  483      T2TOT3   E4,1645       121    5  328  647
TREDESCL 31,3763       829    1  827      TSTFBANK 27,2232     746    1  746      T3       30,3003       858    1  848
TRG*NPSM 23,3656      1259    5  261  966 TSTFORDP 41,2515     428    1  427      T3RPTBB     4057       164    1  163
TRG*SMNB 23,3643      1259    1  590      TSTLTS1  41,3703     482    1  482      T3RUPT   01,3412      1126    2  163  164
TRIG1    23,3316      1248    1 1248      TSTLTS2  40,3641     483    1  482      T3RUPT2  01,3417      1126    1 1127
TRIG2    23,3327      1248    1 1248      TSTLTS3  41,3734     483    1  483      T4JUMP   06,2116       169    2  168
TRIMACCL 31,2000        40    1  8[illegible]9      TSTLTS4  40,3527     465    1  484      T4RPTBB     4064       164    1  163
TRIMDONE 01,2330       308    1  778      TSTORF      6475    1015    1 1015      T4RUP    06,2000 =    30    2  165  166
TRIMGIMB 27,3221       777    1  3[illegible]8      TSTPOINT 23,3747    1261                T4RUPT   06,2000       165    2  163  164
TRIPA    E5,1664 =     131    5  131 1149 TSTRESRM 13,2632    1137    1 1137      T5ADR       1262       109    6  163 1488
TRKFLCDU 06,3117       196    2  196      TSTRT    E7,1611 =   147    3  295  706 T5TEMP      0061 =   142    1 1417
TRKFLCN     4572       541    2  540  618 TTEMP    E6,1706 =   140    8  377  380 T6ADR       4055       164    1  163
TRKMKCNT E7,1462       146   12  146 1219 TTF/8    E7,1642 =   156   18  156  892 T6EURTHA E6,1470       135   11 1401 1455
TRMTRACK 43,3020       299    2  275  613 TTF/8CL  31,3015     804    3  794      T6JOB    17,2061      1401
TRMTRAK1 42,2054       299    1  299      TTF/8TMP E7,1552 =   156    5  156  800 T6JOBCHK 17,2055      1401    1 1402
TRNSPSPD 22,2335       368    1  364      TTFDISP  E7,1475 =   154    4  154  827 T6NEXT   E6,1466       135   12  230 1455
TRUDELH  E7,1736 =     158    2  213  387 TTFINCR  31,2562     800    3  794  799 ========================================
TRUE360X 12,3172      1189    1 1188      TTFSCALE    4731 =   829                U=SCAXIS 27,2134       497    1  497
TRUNBG   26,3117       601                TTHROT   E7,1617 =   156    3  156  791 UAXDIST     0141 =  1503    2 1500 1501
TRUNNCMD    1351       112    3  550  566 TTO      E4,1657 =   123    4  123  847 UAXIS    20,3274      1496
TRUNVAR  E4,1411       118    1  602      TTOAXIS  E6,1741 =   138   10 1462 1465 UCSM     F7,1636 =   155    3  155  509
TRYGTS   17,2623      1447    1 1440      TTOGO    E7,1453     145   28  164  853 UDB1        0135 =  1503    2 1500 1501
TRYSWN   25,2514       559    1  559      TTOTIG      1271     109    2  328  573 UDB2        0136 =  1503
TRYSWS   25,2452       558    1  555      TTPI     E7,1635     148   19  205  673 UDB3        0140 =  1503
TRYUDRV  16,2757      1427    1 1428      TTPIO    E7,1637     148    3  629  634 UDB4        0137 =  1503    2 1500 1501
TSCALE   32,2170       221    1  220      TURNITON 35,3733     743    1  743      UERROR   F6,1750 =   136    3  136 1450
TSCALINV    4741 =     829    1  827      TURNOFFQ 16,2720    1426    1 1426      UJETCTR  E6,1767 =   142    4 1409 1507
TSENSF   17,2176      1441    1 1441      TURNOFFR 16,2730    1427    1 1426      ULC      E7,1723 =   152    8  152  605

HEALTH KEY: NORMALLY DEFINED UNLESS FLAGGED AS FOLLOWS:

UN UNDEFINED           = DEFINED BY EQUALS                 J DEFINED BY JOKER OR ERASE ANYWHERE      MD MULTIPLY DEFINED
BD BADLY DEFINED     CD DEFINITION ASSOCIATED WITH CONFLICT                 XX MISCELLANEOUS TROUBLE
```

```
GAP:  ASSEMBLE REVISION 210 OF AGC PROGRAM LUMINARY BY NASA 2021112-161        17:11 MAR. 19,1971                     PAGE 1555

SYMBOL TABLE LISTING, INCLUDING DEFINITION, HEALTH, PAGE OF DEF, # OF REFS, PAGE OF FIRST REF, PAGE OF LAST REF.

SYMBOL      DEF     H       REFERENCES       SYMBOL      DEF     H       REFERENCES       SYMBOL      DEF     H       REFERENCES

ULLAGER     4737  =    90    3  738 1441 UPDATIME  42,2016      287    1  287      UPTEMP      1166      107   11  107 1391
ULLAGFLG    0314  =    90    2  236  738 UPDATNN   41,2347      424    3  454  469 UPTEST   04,3363     1337    2 1336
ULLAGOFF 36,2561      735    1  252      UPDATOFF  43,3054      301    1  276      UPTHROT  32,3557      836
ULLGNCI  36,2327      731    5  726  731 UPDATOK   04,3376     1386    1 1386      UPTHROT1 32,3564      836    1  837
ULLGTASK 36,2350      732    4  239  741 UPDATRET     0117  =    98    3  424  425 UPTMFAST 06,2676      188    1  191
ULOS     E4,1701  =   121    6  670  678 UPDATVB   41,2367      424   10  416  469 UPVERB      1171  =   107    7  107 1389
UMPAC+   00,3170     1072    2 1072      UPDAT1    41,2374      425    2  424  458 UPVERBSV    1165      107    2 1385 1386
UMPAC-   00,3162     1072    2 1072      UPDNLIST  05,2414  =   204               UPVERIFY 04,3465     1387    3 1387 1388
UN       E5,1673  =   130    9  130 1197 UPDTCALL  22,3206      380    1  379      UPVRFYNV 04,3521     1388    1 1387
UNAJUMP  00,2000     1011    1 1008      UPDTMENO  42,2032      287               UPWAKE   04,3556     1389
UNFC/2   F6,1651  =   140   21  141  907 UPDTPHAS     4747  =  1388    1 1389      UP1      F4,1651      121   12  121  654
UNFV/2   E6,1665  =   141    5  141  907 UPEND70   04,3725     1392    1 1389      UP21        4353  =  1388    1 1387
UNFVLIM  30,3751      922    1  916      UPEND71   04,3634     1390    1 1389      UP70        4746  =  1385    1 1385
UNFVX/2  E6,1665  =   141                UPEND72   04,3666     1391    1 1339      UP71        4744  =  1385    1 1385
UNFVY/2  E6,1667  =   141    3  909  910 UPEND73   04,3540     1388               UP72        4743  =  1385    1 1385
UNFVZ/2  E6,1671  =   141    3  909  910 UPENT2    10,3554     1371    4 1360 1366 UP73        6266  =  1385    1 1385
UNIT     00,3023     1068    2 1011 1399 UPERROR   04,3375     1386               UR          0000  =   504    1  503
UNIT/R/  E7;1536  =   154   36  154  889 UPERROUT  04,3762     1393    4 1386 1392 URATEOIF F6,1426  =   135    5 1445 1447
UNITDV   00,3151     1072    3 1070      UPFLAG       5506     1372   78  279 1389 URP         0006  =   504    2  503
UNITGOBL E7,1520  =   154    2  776  882 UPFNOVAC  04,3546     1389    1 1388      URPV        0016  =  1245    8 1232 1245
UNITACRM 04,3155     1186    1 1186      UPJOB     04,3553     1389    1 1389      URRECT   F5,1646  =   130    4  130 1177
UNITX    23,2502     1098   11   38 1098 UPLIM     12,3277     1192    1 1191      UR1      F5,1721  =   130   11  130 1197
UNITY    23,2500     1098    4   38  782 UPLOADNV  04,3520     1388    2 1386 1387 USEADO   41,2132      420    1  420
UNITZ    23,2476     1098   10   38  882 UPLOCBIT     4741  =    80    3 1336 1337 USECOS   30,3640      919    1  919
UNKNOWN     0007  =   204                UPLOCKFL     0164  =    80               USFGTS   33,2260      866
UNP36    E4,1605  =   122    3  704      UPMNSVCD  04,3247     1223    1 1222      USEJETS  33,2317      867    4  866
UNRM     F4,1651  =   121    7  671  680 UPNEG        7602     1041    1 1041      USEMAXOT 13,3372     1215    1 1216
UNSUSPEN 40,3535      465    1  465      UPOK      04,3342     1336               USEPIOS  13,3037     1209    1 1209
UNVEC    E7,1543  =   147    5  653  654 UPOLDMOD     1170  =   107    5  107 1391 USEQRFLG    0304  =    89
UNWC/2   E6,1657  =   141   10  141  909 UPOUT     04,3713  =  1391    8 1223 1393 USFQRJTS    4727  =    89    6  756 1488
UNWCLOOP 31,3345      810    1  810      UPOUT4    04,3714  =  1388    3 1386 1387 USERPRIO    0163  =  1370    3 1356 1367
UNWCTEST 30,3507      916    2  910      UPPART2   04,3372  =  1386    1 1385      USEVF    33,3405      891    1  890
UNX/2       0000  =   141    7  909  916 UPPART3   04,3564  =  1389               USPRCADP    4704      998    6  825 1257
UNY/2       0006  =   141    1  910      UPPOS        7572     1041    1 1041      UT       E7,1672      149   10  149  764
UNZ/2       0014  =   141    8  909  910 UPPSV     24,2374      516    2  514  526 UTIME    21,3645     1507    1 1506
UNZ2     06,2313      175    1  176      UPPSV1    24,2414      516    1  516      UV          0154  =  1504    7 1496 1503
UPACTOFF 04,3767     1393    2 1391 1393 UPPSV3    24,2446      516    1  516      UXVECT   E7,1717  =   150    7  150  612
UPBUFF      1173  =   107   31  107 1392 UPPSV4    24,2427      516    1  517      UXVECTPR    0014  =   613    3  610
UPCOUNT     1172  =   107    7  107 1387 UPPSV5    24,2411      516    1  516      UYVECT   E7,1725  =   150    6  150  612
UPDATADR 13,2361      713    1  713      UPRPTB8      4060  =   164    1  163      UYVECTPR    0022  =   613    2  610
UPDATBIT    4736  =    70    1  522      UPRPT1    04,3320     1336    1 1336      UZ          0024  =  1245    4 1232 1234
UPDATCHK 33,3064      886    1  878      UPRUPT    04,3302     1336    1  163      U1POS    22,2250      366    1  366
UPDATEVG 36,3612      756    2  752  757 UPSTORE   04,3522  =  1388    1 1387      U2       E5,1711  =   130    5  130 1196
UPDATE2  04,2000  =    29    2 1222 1386 UPSUM        1245  =   108    3  109 1336 U2POS    22,2224      366    1  366
UPDATFLG    0027  =    70   10  300  684 UPSVFLAG  E3,1501  =   115    8    1 1223 U3POS    22,2274      367    1  367

HEALTH KEY: NORMALLY DEFINED UNLESS FLAGGED AS FOLLOWS:

UN UNDEFINED          = DEFINED BY EQUALS              J DEFINED BY JOKER OR ERASE ANYWHERE       MD MULTIPLY DEFINED
BD BADLY DEFINED     CD DEFINITION ASSOCIATED WITH CONFLICT             XX MISCELLANEOUS TROUBLE
```

```
SYMBOL TABLE LISTING, INCLUDING DEFINITION, HEALTH, PAGE OF DEF, # OF REFS, PAGE OF FIRST REF, PAGE OF LAST REF.

SYMBOL       DEF     H       REFERENCES        SYMBOL       DEF     H       REFERENCES        SYMBOL       DEF     H       REFERENCES

==================================== VBIAS     E5,1615  =  127     5  127  879 VECOFANG  22,2723     374     2  374
V          E7,1526  =  154    19  154  895 VBITS     25,3137     570     1  570      VECPNT1   27,2032     496     1  534
V(CSM)     E3,1723  =  116     5  709  384 VBPROC    40,3471     463     5  422  471 VECPNT2   27,2035     496     1  496
V-OTHER    E3,1723     116     6  116  333 VBRELOSP  40,3517     465     1  410      VECPOINT  27,2040     496     3  352  489
V/SC          7645    1043     1 1069      VBRESEQ   40,3514     464     1  422      VECPT     27,2000  =   34     1  495
V/SCDV     00,2750    1066     3 1065      VBRFG*    F5,1432  =  125     2  125  829 VECQTEMP  E6,1724  =  140     4  496  498
V/SC1         7653    1043     1 1043      VBRFGX    E5,1412  =  125     2  125  829 VECSGNAG  10,3770    1399     2  220  221
V/SC2      00,2654    1064     1 1043      VBRFGZ    E5,1416  =  125     1  125      VECSHIFT  23,2437     701     3  640  653
VACDSP     10,2671    1358     1 1358      VBRQEXEC  41,3526     462     1  422      VECTAB    F4,1522  =  119     8  119 1243
VACFOUND   01,2674    1104     5 1104      VBRQWAIT  41,3557     463     1  422      VEC1      E6,1645  =  141     8  141  980
VACRLEAS      5156    1103     5  811  851 VBSP1LD   41,3056     442     2  439  440 VEC2      E6,1653  =  141     6  968  980
VACSTOR    07,2467     271     2  270      VBSP2LD   41,3057     442     2  439  441 VEHUPBIT     4735  =   70
VACT1      E7,1471     147     4  150  648 VBSP2LD*  40,3516     464     1  463      VEHUPFLG     0026  =   70    13  301 1154
VACT2      E7,1513     147     3  642  654 VBSP3LD   41,3060     442     1  439      VELBIAS   F5,1400  =  125     2  125  889
VACT3      E7,1543     147    13  147  700 VBTERM    40,3477     463     2  422  470 VELCONV   21,2003      44     2  899  900
VACT4      E7,1565     147     6  148  642 VBTSTLTS  41,3662     482     1  422      VELDABIT     4736  =   86     2  576  889
VAC1          0401     102                 VBUF         0122      98    62   98 1503 VELDATA      0255  =   86
VAC1ADRC   05,3370     234     1  232      VBZERO    43,2126     278     1  275      VELDATA2  33,3271     889     1  889
VAC1USE       0400     102     4  232 1104 VB04N12   26,2121     352     1  351      VELLOS       0016  =  584     2  511  583
VAC2          0455     102                 VB05N06   15,3633     980     1  974      VELSC     37,3101     401     1  397
VAC2USE       0454     102     3  232 1104 VB05N09      4777  =  927     3  938  975 VELUPDAT  33,3275     889
VAC3          0531     102                 VB06N18   26,2122     352     1  352      VERB      40,2343     414     1  410
VAC3USE       0530     102     3  232 1104 VB06N98   37,2472     393     1  393      VERBFAN   41,2160     421     7  420  423
VAC4          0605     102                 VB56CADR     6046     613     1  613      VERBMASK     4144  = 1369     1 1354
VAC4USE       0604     102     3  233 1104 VB6N5     14,3315     943     1  943      VERBNOUN  E7,1615     147     4  636  686
VAC5          0661     103     1  103      VB64      43,2674     292     1  275      VERBREG      1000     104    22  233  473
VAC5USE       0660     103     3  233 1104 VB67      31,2000  =   35     1  614      VERBSAVE     1040     104     3  420  461
VAD           6772    1024     1 1009      VB67A     30,2000  =   35     1  616      VERBTAB   41,2176     421     1  421
VALIDCHK   07,2451     270     2  269  270 VB97DEX      4756  =  740     1  737      VERB37    04,2000  =   29     1  236
VALMIS     37,2263     389     1  400      VB99DEX      4751  =  740     1  733      VERB69    43,2037     275     1  275
VALTCHK    33,3433     891     3  889  891 VCV       E3,1542  =  115    21  115 1238 VERB85    43,3232     311     1  276
VAL67      05,2023      54     3  983  984 VCVCSM    E3,1614     116     1  598      VERB96    43,3211     310     1  276
VAPFG*     E5,1434  =  125     1  125      VCVLEM    E3,1666     116     2  516  598 VERIFBIT     4742  =   80     1 1388
VAPFGX     E5,1414  =  125     1  125      VDB       17,2533    1446     1 1446      VERIFLAG     0165  =   80
VAPFGZ     E5,1420  =  125     1  125      VDEF      00,3232    1075     1 1011      VERROR    E6,1751  =  136
VAPREC     E7,1505  =  147     2  670  673 VDG       E5,1412  =  829     1  806      VERTDISP  31,3502     812     1  795
VARADAR    25,2040     506     1  505      VDGVERT   E7,1644  =  157     4  797  819 VERTDRFT  37,2231     388
VARALARM      5740    1381     4  190 1329 VDG2TTF   F5,1432  =  829     1  804      VERTSKIP  37,2534     395     1  395
VARDELAY      5226    1117     9  174 1309 VD1          4351     476    15  234 1097 VEX       F7,1742     149     3  749  767
VARIANCE   E5,1706  =  131    12  131 1148 VE        E4,1655  =  123     6  123  847 VFAIL     33,3532     893     2  890
VAIT          0006  = 1245    23  583 1221 VEARTH    E5,1706  =  128     6  128  960 VFAILBIT     4727  =   85
VATT1         0024  = 1245    14  220  803 VECAGREE  00,3010    1067     4 1064 1399 VFAILFLG     0246  =   85     2  890  893
VBAD       25,3506     576     1  575      VECANG1   26,2415     498     1  497      VFLAG        0062  =   73     4  934  936
VBCDARK    43,2177     280     1  275      VECANG2   26,2417     499     1  497      VFLAGBIT     4733  =   73
VBFANDIR   41,2173     421     1  421      VECLEAR   27,2043     496     1  496      VFLSHBIT     4743  =   87     1  831

HEALTH KEY: NORMALLY DEFINED UNLESS FLAGGED AS FOLLOWS:

UN UNDEFINED          = DEFINED BY EQUALS              J DEFINED BY JOKER OR ERASE ANYWHERE      MD MULTIPLY DEFINED
BD BADLY DEFINED     CD DEFINITION ASSOCIATED WITH CONFLICT              XX MISCELLANEOUS TROUBLE
```

```
SYMBOL TABLE LISTING, INCLUDING DEFINITION, HEALTH, PAGE OF DEF, # OF REFS, PAGE OF FIRST REF, PAGE OF LAST REF.

SYMBOL      DEF     H         REFERENCES     SYMBOL      DEF     H         REFERENCES     SYMBOL      DEF     H         REFERENCES

VFLSHFLG      0262  =    87    2  890  893 VN2         E7,1656  =  157    3  157      VVEC        E5,1743  =  130   15  130 1198
VG         E7,1706      149    6  149  766 VOK         26,2674     598    1  598      VVECTX      E7,1720  =  157    8  158  901
VGAIN*     27,2455      766    1  776      VCK1        26,2735     599    1  599      VVECTY      E7,1722  =  158    9  158  902
VGBODY     E7,1501  =   154   12  154  847 VOK2        26,2737     599    1  599      VVECTZ      E7,1724  =  158    8  158  901
VGDISP     E7,1663  =   148    4  326  766 VONE        E4,1605  =  120   10  120 1268 VVXSC          7425    1038
VGPREV     E7,1700  =   149    9  251  772 VONE'       E4,1560  =  119    3 1268 1274 VXBEAMNB    33,2024      42
VGTIG      E7,1700  =   149   11  149  768 VUPENED     06,3260     203    1  202      VXINH          0250  =   85    2  890  893
VGU        E7,1626  =   156    8  156  806 VPASS1      E7,1505     147    6  147  643 VXINHBIT       4731  =   85    1  890
VGVECT     E7,1645  =   160    6  160  847 VPASS2      E7,1527     147    5  147  653 VXM            7360    1036    1 1009
VHY           0063  =   158    5  901  902 VPASS3      E7,1557     147    8  644  700 VXM/MXV        7363    1037    1 1036
VHZ           0065  =   158    7  901  902 VPASS4      E7,1505  =  150    2  666  676 VXRCM       E7,1703  =  150    3  150  612
VHZC       E7,1433  =   158    2  797  815 VPD            0000  =  937                VXSC           7422    1038    1 1009
VIGN       E5,1456  =   125    2  125  783 VPDVL          6614    1019                VXSCAL      33,2070      43
VINIT      E4,1721      122    9  677  762 VPPREC      E7,1527  =  147    2  670  673 VXV            7501    1040    2 1009 1264
VINJNCM    34,3371      842    1  840      VPROJ          7446    1039    1 1009      VYBEAMNB    33,2016      42
VINTFBIT      4742  =    73                VRATEDIF    E6,1427  =  135    3 1446      VYSCAL      33,2066      43
VINTFLAG      0071  =    73   27  247 1240 VRECT       E3,1510  =  115   11  115 1238 VZBEAMNB    33,2010      42    1  889
VIPRIME    E4,1727      123    7  666  774 VRECTCSM    E3,1562     116    2  842  981 VZSCAL      33,2064      43    1  889
VJETCTR    E6,1770  =   142    2 1409 1426 VRECTLEM    E3,1634     116                V0             0006  =  937
VLAUN      E5,1510  =   132    5  398  399 VRIGHT2     00,2242    1052    1 1052      V00N25         6010  =  221
VLAUNS     E5,1462  =   132                VROTATEX       7441    1038    3 1048 1070 V00N34         4233  =  221
VLIGHT     25,3705      618    1  618      VROUND         7161    1030    6 1038 1039 V01N14      32,2164     221
VLITE         4742  =   619    2  618  831 VSCALE      32,2175     221    1  220      V01N25      10,3504    1369    2 1358 1359
VLOAD         6526     1017    1 1009      VSELECT     E7,1462  =  146   10  213  893 V01N70      14,3713     954    1  952
VLOAD*        6130  =  1097    1 1016      VSELECT*       0131  =  126    3  890  891 V01N70*     15,2606     958    1  955
VLOADCOD      4726  =  1097    1 1016      VSHRRND     00,2073    1046    4 1048 1084 V01N71      07,2352     268    1  257
VMAX       E4,1405      118    1  606      VSHR2       00,2060    1046    1 1046      V04N06      10,3510    1369    1 1359
VMEAS      E7,1652  =   157    4  157  389 VSQ         00,3245    1075    1 1011      V04N12X     43,2646     291    1  289
VMEASCHK   33,3261      889    5  386  893 VSQSUB      00,3317    1076    3 1068 1075 V04N1272    23,2037     284    1  283
VMODE         6542     1017    2 1039 1075 VSSL        00,2145    1049    3 1048 1054 V04N46      20,2112     306    1  305
VMOON      E5,1722  =   128    8  128  984 VSSR        00,2127    1048    1 1052      V05N00M1    10,3523    1369    1 1363
VN            1225      108   10  206 1218 VSTILBAD    25,3507     576    1  576      V05N09         4777    1094    6  627 1379
VNCON      43,3127      303    1  302      VSTORE         6464    1015                V06N05      24,2746     523    1  521
VNDSPCCN   40,3345      458    1  458      VSU            6770    1024    1 1009      V06N07      10,3505    1369
VNLDRCDU   43,2266      282    1  282      VSUBC       E3,1756  =  117    3  509      V06N11      35,2415     637    1  627
VNLODCDU   43,2233      281    2  281  293 VSUN        E5,1714  =  128    7  128  984 V06N13      35,2416     637    1  633
VNLODDT    42,2034      287    1  287      VSURFACE    E7,1701  =  157    7  157  902 V06N16      32,2166     221    2  219
VNLODGYR   43,2373      285    1  285      VTARGET     E5,1702  =  130    4  130 1195 V06N16N     04,3012     705    1  704
VNPLANV    07,2676      960    1  959      VTARGTAG    E5,1701  =  130    5  130 1195 V06N18      26,2266     491    1  488
VNPOOH     35,3622      636   12  620  666 VTIG        E7,1647  =  148    7  148  764 V06N22         5001    1094    4  500  972
VN0611     35,2065      627    1  628      VTPRIME     E7,1565  =  148    4  666  693 V06N33      35,2032     621    1  620
VN0641     37,2473      393    1  385      VUPDAT      33,3354     890    1  890      V06N33*     24,2367     515    1  508
VN0655     35,2120      628    1  627      VUPDATED    33,3432     891                V06N33A     30,3014     858    1  839
VN1        E7,1552  =   154    7  154 1221 VV/SC          7650    1043                V06N3376    13,2356     713    1  711
VN1645     35,3516      683    6  621  696 VVARMIN     E3,1773     117    1  598      V06N34*     15,2325     927    2  925  973

HEALTH KEY: NORMALLY DEFINED UNLESS FLAGGED AS FOLLOWS:

UN UNDEFINED           = DEFINED BY EQUALS                J DEFINED BY JOKER OR ERASE ANYWHERE      MD MULTIPLY DEFINED
BD BADLY DEFINED     CD DEFINITION ASSOCIATED WITH CONFLICT                XX MISCELLANEOUS TROUBLE
```

```
SYMBOL TABLE LISTING, INCLUDING DEFINITION, HEALTH, PAGE OF DEF, # OF REFS, PAGE OF FIRST REF, PAGE OF LAST REF.

SYMBOL       DEF   H       REFERENCES    SYMBOL       DEF   H       REFERENCES    SYMBOL       DEF   H       REFERENCES

V06N37    35,3633    687   3  628  665 V16N85B   36,3753    758   4  731  752 V73UPDAT  43,3735   1385   4  275 1385
V06N42    35,2033    621   1  620      V16N85C   34,3570    855   1  855      V74       43,3040 =  300
V06N43    24,3630    660   1  660      V16N94    34,3547    854   1  854      V82CALL   22,3244    716   1  295
V06N43*   34,3345    788   1  737      V1683     36,3754    758   1  754      V82CON    43,2747    295   1  295
V06N48    01,2342    308   2  307  308 V2           0022 =  937               V82EMBIT     4743 =   80
V06N49NB  24,2747    523   1  523      V21N79    07,2564    273               V82EMFLG     0166 =   80   7  718  723
V06N51    42,3776    504   1  503      V22N79    07,2562    272               V82FLAGS  E4,1530 =  120   6  120  719
V06N55    35,3634    687   2  628  685 V3           0030 =  937               V82GOFF   22,3251    716   1  716
V06N58    35,3635    687   1  666      V34TON49  24,2671    522   1  523      V82GOFF1  22,3323    717   1  716
V06N59    35,3636    687               V37       04,2054    238   2  310  462 V82GOFLP  22,3271    716   1  717
V06N60    31,3772    830   1  812      V37BAD    04,2107    238   1  243      V82GON    22,3467    720   1  716
V06N61    36,3145    744   1  740      V37FLAG      0162 =   80   1  868      V82GON1   22,3505    720   2  720  721
V06N63    31,3770    830   2  811  812 V37FLBIT     4737 =   80   4  239 1380 V82GON2   22,3540    720   1  720
V06N64    31,3771    830   2  812      V37KLEAN  05,2654    225   2  241 1380 V82GON3   22,3543    721   1  721
V06N75    35,2417    637   2  629  634 V37NONO   04,2360    243   1  239      V82PERF   43,2741    295   1  276
V06N76    30,3013    858   1  840      V37N99    04,2053    236   1  236      V82REDSP  22,3477    720   1  720
V06N79    15,2607    958   1  957      V37QCAD   04,2422    244   1  242      V82STALL  22,3302    716   1  717
V06N79*   07,2563    273   2  272      V37RET    04,2144    239   1  868      V83CALL   37,3113    706   1  706
V06N81    35,3637    687   2  620  681 V37XEQ    04,2366    243   1  244      V83PERF   43,2751    295   1  276
V06N84    13,2354    713   1  711      V37XEQC   04,2415    244               V89CALL   26,2024    351   1  296
V06N87    14,3714    954   1  953      V41K      14,3541    949   1  947      V89CALL1  26,2074    352   1  352
V06N87*   07,2353    268   1  257      V43K      43,2740    294   1  293      V89PERF   43,2757    296   1  276
V06N89*   14,2514    930   1  930      V47TXACT  43,2403    286   1  275      V89RECL   26,2040    351   1  352
V06N90N   04,3013    705   1  705      V50N00    10,3506   1369   1 1364      V90PERF   43,2766    296   1  276
V06N93    14,3263    942   1  942      V50N00A   32,2165    221               V97N00    10,3547   1370   1 1364
V06N94    30,3012    858   1  651      V50N16    32,2167    221   1  220      V99RECYC  36,2776 =  740   1  727
V06N99    31,2143    616   1  614      V50N25    07,2351    268   1  267      ======================================
V06N99DS  31,2024    614   1  614      V50N25X   43,2647    291   1  289      W         E5,1400    125  34  125 1240
V06N9933  31,2051    614   1  614      V50N48    01,2342 =  308   1  308      W.IND        1256 =  111   3  604
V0647     01,2341    308   1  307      V50N72    24,3217    527   1  527      WAITABIT  36,2562    735   5  726  728
V1           0014 =  937               V50PASTE  10,3223   1364   1 1364      WAITADR      0063 =   97   3 1117 1121
V1S       E7,1600 =  154  14  155  891 V59GP63   25,3577    580   1  278      WAITBANK     0062 =   97   1 1120
V1STO2S   10,3630   1394   4  377 1251 V6N34     24,3631    660   1  658      WAITBB       5222   1117   2 1117 1127
V16N20    14,3233    941   1  941      V6N99PRO  31,2032    614   1  614      WAITEXIT     0061 =   97   7 1117 1374
V16N40    36,3752    758   1  749      V67       43,3216    310   1  275      WAITLIST     5205   1117  39  174 1321
V16N44    22,3321    717   2  717  720 V67CALL   31,2007    614   1  310      WAITMASK  10,2772   1360   1 1360
V16N45    35,3640    687   1  683      V67CLRF   31,2110    615   1  615      WAITPOOH  01,3525   1130   1 1120
V16N54    40,3760    706   1  706      V67FLAG      0160 =   79   3  614  615 WAITTEMP     0064 =   97   3 1125
V16N5420  24,2373    515   1  512      V67FLBIT     4735 =   79               WAIT2     01,3234   1120   2 1117
V16N56    41,2017    311   1  311      V67SURF   31,2102    615   1  615      WAKECAD   00,3774   1375   1 1374
V16N60    43,2644    291   1  290      V67WW     31,2120    615   1  614      WAKECADR  10,3516   1369   3 1360 1361
V16N67    43,2645    291   1  290      V67XXX    30,2042    616   1  616      WAKEPLAY  10,3036   1361   1 1366
V16N72    43,2642    291   1  290      V70UPDAT  43,3727   1385   1  275      WAKER     00,3766   1374   1 1375
V16N78    43,2643    291   1  290      V71UPDAT  43,3731   1385   1  275      WAKESTAL  13,3520   1217   2 1216 1217
V16N80    24,3336    532   1  530      V72UPDAT  43,3733   1385   1  275      WAKETEST  01,3050   1109   1 1109

HEALTH KEY: NORMALLY DEFINED UNLESS FLAGGED AS FOLLOWS:

UN UNDEFINED          = DEFINED BY EQUALS          J DEFINED BY JOKER OR ERASE ANYWHERE       MD MULTIPLY DEFINED
BD BADLY DEFINED     CD DEFINITION ASSOCIATED WITH CONFLICT               XX MISCELLANEOUS TROUBLE
```

```
SYMBOL TABLE LISTING, INCLUDING DEFINITION, HEALTH, PAGE OF DEF, # OF REFS, PAGE OF FIRST REF, PAGE OF LAST REF.

SYMBOL     DEF     H     REFERENCES        SYMBOL     DEF     H     REFERENCES        SYMBOL     DEF     H     REFERENCES

WANGI     E5,1436  =  132   1  386         WRENOPOS  E4,1400     118   3  122  615  XMKCNTR   E7,1762  =  151  13  265  274
WANGO     E5,1434  =  132   1  386         WRENDVEL  E4,1401     118   2  604  615  XMKRUPT   07,2425     270   2  269
WANGT     E5,1440  =  132   1  132         WRITEP       5750    1402   6 1401 1453  XN8       E5,1664  =  127  12  385 1394
WANTAPS   36,2324     731   1  727         WRITEU       5754    1402   1 1453       XN8ADR    37,2476     393   1  385
WBANK     26,2330     605   1  604         WRITEV       5765    1402   1 1453       XN8ECADR  10,2035    1262   1 1262
WCALC     22,2746     376                  WRTDESIR  15,3124     969   1  969       XN8PIP    E4,1536  =  119  12  119  910
WCENTRAL  E6,1742  =  137   2 1471 1472    WSHAFT    E4,1402     118   2  605  615  XN8PIPAD  33,2343     867   1  865
WCHPHASE     1346     111  13  734  808    WSIZE     26,3436     607   1  604       XORELBIT     4734  =   86   1  877
WCHPHOLD  E7,1621  =  156   8  156  811    WSTOR     33,3411     891   3  891       XORFLG       0253  =   86   1  877
WOAGAIN.  41,3443     458   1  458         WSUREPOS  E4,1406     118   2  604  615  XOVINFLG     0311  =   89   6  236  877
WOCNT        0137  =   99   4  456  458    WSURFVEL  E4,1407     118   2  604  615  XOVINHIB     4734  =   89   2  907 1428
WORET        0115  =   98   8  456  459    WTABORT   01,3366    1123   1 1121       XPLANE    E7,1524  =  151   4  151  266
WEARTH    26,2020      55   1 1144         WTLST2    01,3377    1125   8 1122 1123  XPREV     F3,1552  =  115   2 1174 1177
WEIGHT/G     1243  =  108   6  761  769    WTLST4    01,3263    1121   1 1125       XRANGE    E7,1642  =  160   5  160  840
WHATALM   31,2412     795   1  805         WTLST5    01,3313    1122   1 1120       XREG         1002     104  10  317  443
WHATDISP  31,2406     795   1  811         WTLTCADR     4343  = 1305   3 1301 1304  XREGLP       1005     104   3  413  443
WHATEXIT  31,2404     795   1  808         WTRUN     E4,1403     118   2  605  615  XROT      26,2400     498   1  498
WHATGUID  31,2376     794   1  804         WVFLSTOR  26,3312     604   1  604       XSCREF    F7,1606  =  155   3  764
WHATMARK  E7,1550  =  151   8  151  272    WWBIAS    F4,1575  =  120  11  330  616  XSM       E5,1642  =  127  24  127 1250
WHATOUT   31,2335     792                  WWPOS     E4,1571  =  120  16  120  616  XSMADR    37,2477     393
WHCHREAD     1353     112   6  112  601    WWVEL     F4,1573  =  120  10  120  616  XSMD      E7,1606  =  155  16    1  981
WHERETO   31,2210     790   1  790         ======================================  XSQC(XI)     0034  = 1199   5 1176 1182
WHICH     F7,1455     145  30  253  866    X            0024  = 1199  22 1173 1188  XSTORE    01,2352    1085   3 1085
WHICHADR  32,3653     838   1  834         XAD       01,2404    1086   1 1010       XSU       01,2415    1086   1 1010
WHICHRAD  25,3203     571   1  571         XAD2      01,2407    1086   2 1086       XTRANS    17,3112    1453   3 1443 1451
WHICHWAY  15,2120     262   2  262         XCHNYLOC  10,3243    1365   1 1361       XUNIT     12,2004    1099   9   38 1232
WHIMPER      5636    1379   4  869 1381    XCHQADD   10,3027    1361   1 1361       XXXALT    E7,1670     149   3  698
WHOCARES  F7,1471  =  146   5  235 1358    XCHSLEEP  10,2776    1360   1 1361       XYMARK    E7,1551  =  151  26  151  955
WHOLECON  42,3545     450   3  449         XCHTOENO  10,3242    1365   3 1356 1361  X1           0046  =   95  69  266 1397
WIDEDB    20,2152    1405   1 1404         XCHX      01,2376    1086   1 1010       X2           0047  =   95  29  502 1269
WITCHONE  10,3225    1364   3 1356 1361    XCOMMON   12,3066    1188   1 1190       X789      E3,1700     116   6  208 1155
WIXA         1315     110   6  110 1153    XCOUNT       1236  =  108   3  265       ======================================
WIXB         1316     110   3 1151 1153    XDC       E5,1664  =  127  12  127 1253  Y         E4,1725  =  124   6  124  856
WLINIT    26,3250     604   3  596  605    XDELVBIT     4735  =   71                YAW       E4,1753  =  124   3  124  841
WLOOP     12,3013    1187   1 1187         XDELVFLG     0045  =   71   6  620  766  YAWANG    F4,1573  =  122   2  502  503
WLSRFPOS  26,3273     604   1  604         XDIFF     12,2163    1174                YAWDUN    30,2222     841   1  841
WLSRFVEL  26,3310     604   1  604         XDSPBIT      4744  =   75   1 1351       YCO       E7,1632  =  160   6  160  849
WM        E4,1715  =  124   7  124  885    XDSPFLAG     0112  =   75   2  219  258  YCOMP     27,3315     856   3  835  846
WMATENO   11,3676    1241   1 1239         XI           0030  = 1199   7 1174 1193  YCONS     E4,1737  =  124   3  124  850
WMATRXNG  43,3072     302   1  276         XKEP      F3,1552  =  115   3  115 1238  YCOUNT       1237  =  108   1  265
WORKTIME  16,2630    1425   1 1425         XKEPCSM   E3,1624     116                YDC       E5,1672  =  127   5  127 1253
WOZERO    05,3614     991   2  990  995    XKEPLEM   F3,1676     116                YDOT      F4,1701  =  124   4  124  849
WPLATI    E5,1560  =  133                  XKEPNEW   F4,1520  =  119   3  119 1226  YDOTD     F4,1665  =  123   3  123  847
WPLATO    E5,1464  =  132                  XMAX         0012  = 1199   9 1173 1176  YDOTLEM   E4,1573  =  120   3  120  704
WPOSTCRF  26,3275     604   1  604         XMIN         0014  = 1199   6 1173 1176  YLEM      F4,1571     120   9  119  704

HEALTH KEY: NORMALLY DEFINED UNLESS FLAGGED AS FOLLOWS:

UN UNDEFINED           = DEFINED BY EQUALS                  J DEFINED BY JOKER OR ERASE ANYWHERE       MD MULTIPLY DEFINED
BD BADLY DEFINED    CD DEFINITION ASSOCIATED WITH CONFLICT                   XX MISCELLANEOUS TROUBLE
```

```
SYMBOL TABLE LISTING, INCLUDING DEFINITION, HEALTH, PAGE OF DEF, # OF REFS, PAGE OF FIRST REF, PAGE OF LAST REF.

SYMBOL      DEF    H      REFERENCES     SYMBOL      DEF    H      REFERENCES     SYMBOL      DEF    H      REFERENCES

YLIM      E5,1561  =  126   2  127  835 ZIXA         1317     110   4 1151 1153 1.5SPOT   01,2027     250
YMKCNTR   E7,1763  =  151   4  265  266 ZIXB         1320     110   4 1151 1153 1.75SEC   37,3536     863   1  861
YMKRUPT   E7,2427     270   2  269      ZNB       E5,1700  =  127   6  386 1250 1-CSTH    E5,1733  =  130   4  130 1192
YNB       E5,1677  =  127   6  386 1250 ZNBPIP    E4,1552  =  119   1  910      1-30KFT   33,3061     885   1  877
YNBPIP    E4,1544  =  119   3  119  802 ZNBSAV    E4,1635  =  121   4  215  979 1/.03        4724  = 1504   3 1496 1498
YNBSAV    E4,1627  =  121   5  121  979 ZONE1     17,3615    1464   2 1461 1464 1/ACCFIX  06,3273     203   1  202
YOK       32,3530     835   1  835      ZONE2     17,3606    1464             1/ACCJOB  21,3603    1484   2  203 1404
YPLANE    E7,1532  =  151   3  259  266 ZONE2,3   17,3602    1464   1 1461      1/ACCONT  20,3207    1495   2 1487 1489
YRATE     E4,1743  =  124   5  124  850 ZONE3     17,3610    1464   1 1464      1/ACCRET  20,3647    1501   2 1489 1501
YREG         1003     104   3  440  449 ZONE3LIM  E6,1555  =  139   1 1464      1/ACCS    20,2463    1484   2  867 1484
YREGLP       1006     104   2  104  449 ZONE3MAX  20,3740    1504   1 1495      1/ACCSET  21,3576    1484   1  234
YSCREF    E7,1614  =  155   1  764      ZONE4     17,3427    1461             1/ACOAST  E6,1572  =  139   1 1461
YSM       E5,1650  =  127   4  127 1250 ZONE4,5   17,3416    1460             1/ACOSTP  E6,1552  = 1503   2 1496
YSMD      E7,1614  =  155   6  155  981 ZONE5     17,3461    1461   1 1461      1/ACOSTT     0127  = 1503   5 1497 1502
YUNIT     12,2002    1099   2   38  966 ZON1,2,3  17,3575    1463   1 1460      1/ANET       0160  = 1504   7 1498 1502
YV           1125  =  107  11  107 1241 ZOOM      35,3670     736   4  251  737 1/ANET-   20,3670    1502   1 1499
======================================= ZOOMBIT      4735  =   76   1  796      1/ANETP   E6,1550  = 1503   5 1433 1496
Z            0005  =   94  24  316 1379 ZOOMFLAG     0122  =   76   2  732  736 1/ANET1   E6,1566  =  139  13  139 1501
ZAPTJ     21,3627    1507   1 1507      ZOOMTIME  E7,1422     144   5  251  809 1/ANET2   E6,1567  =  139   6 1447 1493
ZATTEROR  20,2154    1405  12  297 1445 ZPRIME       0026  =  129   7 1246 1247 1/ATEM1      0123  = 1503  22 1499 1503
ZAXIS1    E5,1605  =  127   5  846  853 ZREG         1004     104   3  420  449 1/ATEM2      0124  = 1503   4 1498 1499
ZDC       E5,1700  =  127   5  127 1253 ZREGLP       1007     104   2  104  449 1/0V0     E7,1570  =  160   2  844
ZDOT      E4,1703  =  124   3  124  846 ZRORCBIT  16,3145    1431   1 1428      1/0V1     E7,1634  =  160   5  160  844
ZDOTD     E4,1667  =  123   6  124  856 ZRUPT        0015  =   94   2 1426 1457 1/0V2     E7,1636  =  160   5  160  844
ZDOTDCMP  34,3620     855   1  846      ZSCREF    E7,1622  =  155   1  764      1/0V3     E7,1640  =  160   5  160  844
ZERLINA   E7,1646  =  156   5  156  822 ZSM       E5,1656  =  127   2  127 1250 1/GYRO    06,3557     345   3  340  347
ZERO         4746    1093 323  167 1508 ZSMD      E7,1622  =  155   5  155  981 1/MU         0016  = 1199   4 1172 1191
ZERO/SP   23,2504  =  613   1  585      ZSPCR     15,2552     957   1  956      1/NETMIN  20,3676    1502   2 1499 1502
ZEROANS   00,3376    1077   2 1077      ZUNIT     12,2000    1099   4   38 1235 1/PIPA    06,3333     338   3  397  964
ZEROOP    12,2006  = 1099               ZV           1133  =  107   8 1236 1241 1/PIPADT     1074     106  10  175  963
ZEROENBL  16,3176    1431   2 1431 1432 Z1TEM        0131  = 1503   4 1499 1500 1/PIPA1   06,3342     338   1  338
ZEROHIGH  21,3404    1479   1 1479      Z123      23,2526    1147   1 1148      1/ROOTMU     0022  = 1199   5 1172 1182
ZEROICDU     5461    1306   4  175 1308 Z123COMP  17,3561    1463   3 1461 1463 1/RTMU    27,2030      48
ZEROING   37,2367     391   2  385  395 Z3TEM        0152  = 1503   1 1495      1/RTMUF   22,2002      46   2  717  720
ZEROING1  37,2371     391   1  391      Z5TEM        0132  = 1503   4 1498 1499 1/RTMUM   22,2000      46   1  720
ZEROLOOP  21,3546    1481   2 1481      ======================================= 1/SQR3    07,2677     960   1  959
ZEROMID   31,3671     827   3  806      0.35356   20,3056    1492   2 1486 1487 1/WLOOP   12,3151    1189   1 1189
ZERONEX   E5,1571  =  133  11  385  395 0EBANK    43,3344    1285             1/10      01,2345     308   1  306
ZEROO     23,2504  = 1155               00314OCT     5770    1402   4 1402 1442 1/10S        4744  = 1444
ZEROOT    21,3401    1479   2 1479      06SEC     23,2317     536   1  535      1/10SEC      4744  = 1430
ZEROPLUS  20,2776    1490   1 1490      07400OCT  16,3614    1439   1 1427      1/20FG    31,3765     830   1  804
ZEROTJ    17,2620    1447               ======================================= 1/40      16,3621    1439   4 1421 1423
ZEROVEC   12,2006    1099  13   38 1244 1.2SPOT   01,2016     250   4  250  254 1/6TH     14,3712     954   1  952
ZEROVECS  23,2504    1098  19   38 1155 1.3SPOT   01,2024     250   1  250      1BITDP    26,2421     499
ZI        E5,1642  =  131  25  131 1156 1.5SECS   26,3714     613   1  609      1B1       12,2004  = 1146   1 1136

HEALTH KEY: NORMALLY DEFINED UNLESS FLAGGED AS FOLLOWS:

UN UNDEFINED         = DEFINED BY EQUALS             J DEFINED BY JOKER OR ERASE ANYWHERE     MD MULTIPLY DEFINED
BD BADLY DEFINED     CD DEFINITION ASSOCIATED WITH CONFLICT          XX MISCELLANEOUS TROUBLE
```

```
SYMBOL TABLE LISTING, INCLUDING DEFINITION, HEALTH, PAGE OF DEF, # OF REFS, PAGE OF FIRST REF, PAGE OF LAST REF.

SYMBOL      DEF     H        REFERENCES      SYMBOL     DEF     H        REFERENCES      SYMBOL     DEF     H        REFERENCES

1DEC70    21,2146      832    1  832        16OCT     30,3563     917    1  917        20J       33,2107      47    1  882
1DEC71    21,2147      832    1  831        17TO20    43,3646    1289                  20MRUPT      7752  =  169    3  167  170
1DEGDP    05,3506      834    1  833        180DEGS   31,3764     830    1  804        20SEC     32,2172     221    1  220
1DPB2     34,2067      638    2  639  641   180MESS   27,3125     774    1  774        200MS     16,3617    1439    2 1425
1DPB28    34,2071      638    2  639  644   180SETUP  36,3634     756    1  756        201R04    43,2650     291    1  289
1JACC     E6,1530      138   10  138 1495 ====================================== 21/22REG     0115  =   98    3  410  485
1JACCCON  20,3170     1493    1 1493        2.0SPT    04,2154     239                  25/32        7737  = 1439    1 1433
1JACCQ    E6,1531  =   138    6 1469 1493   2.11SPOT  01,2043     251                  25KFT     33,2117     858    1  852
1JACCR    E6,1532  =   138    6 1469 1493   2.11SPT   04,2155     239                  250DEC    24,2362     515    2  514
1JACCU    E6,1533  =   138   12 1487 1499   2.13SPOT  01,2046     251                  250MS+1      4757  =  291    1  290
1OVSQRT2  40,3737      504    2  502        2.15SPOT  01,2051     251                  27TO30    43,3654    1289
1REV      12,2073     1172    1 1172        2.17SPOT  01,2054     251                  ======================================
1SEC         4770     1094   16  283  949   2.2SPOT   01,2016  =  250    1  250        3.2SPOT   01,2016  =  251    1  250
1SEC+1    43,2651      291    2  288  290   2.21SPOT  01,2057     251                  3.3SPOT   01,2062     251    1  250
1SECX        4770  =   393                  2.3SPOT   01,2032     250    1  250        3.5SEC    27,2677     770    1  769
1SECXT    E5,1572  =   133    2  395  396   2.5SPOT   01,2035     251                  3.5SPOT   01,2065     251
1SEC2D    27,2675      770    1  769        2.7SPOT   01,2040     251                  3/32      12,3767    1244    1 1232
1STAR     15,3066      968    2  968  980   2.7SPT    04,2156     239    1  239        3/4       11,3772    1244    6  263 1243
1STOR2ND  10,3203     1364    1 1363        2/3       04,3253  = 1244    1 1232        3/4DP     22,3657     830    2  804  806
1STOTWOS  16,2262     1420    3 1419 1420   2BLANK    40,2570     417    6  414  473   3/5       12,3755    1244    1 1232
1STO2S    10,3624     1394    3  385  957   2DZERO    12,2006  = 1135                  3/64      12,3763    1244    1 1232
1TO2&TCQ  30,3636      919    2  919        2EBANK    43,3360    1285    1 1286        3/8DP     22,3655     830    1  804
1TO2SUB   10,3654     1395    6 1394 1395   2INTOUT   40,2761     434    1  430        3AXISBIT     4737  =   76    2  488  489
10,11     21,2076      831    1  831        2J        33,2111      47    1  882        3AXISFLG     0124  =   76    7  240  952
10SECS    32,3643      838    1  852        2J3RE/J2  13,2016      48    2 1233        3CSECS    04,3166    1222    1 1222
100CS     33,3052  =   858    2  850        2K           4732  = 1097    3 1004 1109   3J22R2MU  13,2024      48
100MRUPT     7750  =   165                  2K+3         4435     479    1  479        3SECONDS  26,3711     613    1  534
100PCTTO  36,2014       39    1  835        2LATE466  E5,1477  =  126    2  126  814   3SECS        4773    1094    1  790
11DSPIN   40,3433      460    4  415  457   2NDRETRN  22,3117     378    2  378        30DEG     24,3437     593    1  592
113ALRM   07,2422      269                  2PHSCHNG     5331    1295   11  507  868   30DEGCHK  24,3421     592
12DD      23,3231     1155    1 1153        2PI+3     27,3217     776    2  774        30KCHK    33,2421     377
120MRUPT  06,2041      167    1  170        2PI/8     26,3437     607    2  600  602   30RDMSK   06,2761     191    1  171
120MS        5745  =   191                  2PISC     04,3055    1183    2 1173 1190   33DEC        4245     471    1  471
13-11,1   41,3774      484    1  483        2RNDEND   40,3222     448                  33RDMSK      5017  =  191    2  177
13,14,15     7761     1096    5  294 1417   2ROUND    40,3212     448    3  446  447   34DEC        4233     470    2  221  470
13,7,2       4606      541    2  196  540   2SEC(17)  30,3001     858    1  858        35DEG     15,3017     965    1  961
130DEG    35,3655      637    1  664        2SEC(18)  33,3052     885    2  846  858   360-CDU   40,2614     431    2  431  446
14,11,9   06,2171      170    1  167        2SEC(28)  33,3054     885                  360-CDUE  40,2623     431    1  431
14MS      17,3136  =  1444    6 1443        2SEC(9)   30,3010     858    1  844        360-CDUO  40,2612     431    1  430
1406ALM   31,3733      828    2  795        2SECDELY  00,3735    1374    3  282  523   360CHECK  12,3122    1189    2 1187
1406POO   31,3731      828    1  795        2SECS        4771    1094    6  580 1374   360LAMB   12,3473    1194    1 1191
15/16     12,3771     1244    1 1232        2STARS    15,3064     968    1  980        360SW        0206  =   82    3 1187 1189
15ADRERS  01,2433     1037    7 1035 1089   2VEXHUST  E7,1742  =  767                  360SWBIT     4744  =   82
15BITADR     6273     1007    1 1013        2VISTO2S  10,3645    1395    2  335        3990DEC   37,2471     393    1  388
1500DEC   24,2750      523    2  515  523   20.5DEGS  25,2563     560    1  560        ======================================

HEALTH KEY: NORMALLY DEFINED UNLESS FLAGGED AS FOLLOWS:

UN UNDEFINED          = DEFINED BY EQUALS            J DEFINED BY JOKER OR ERASE ANYWHERE      MD MULTIPLY DEFINED
BD BADLY DEFINED     CD DEFINITION ASSOCIATED WITH CONFLICT             XX MISCELLANEOUS TROUBLE
```

```
SYMBOL TABLE LISTING, INCLUDING DEFINITION, HEALTH, PAGE OF DEF, # OF REFS, PAGE OF FIRST REF, PAGE OF LAST REF.

SYMBOL       DEF    H     REFERENCES      SYMBOL       DEF    H     REFERENCES      SYMBOL       DEF    H     REFERENCES

4.11SPOT   01,2107     252                5/128      04,3251    1244    1 1233      6DD        23,3230    1155    1 1153
4.13SPOT   01,2112     252                5/8        13,3761    1245    6 1209 1234 6FAILTAB   06,3307  =  203    2  202  203
4.15SPOT   01,2115     252                5BLANK     40,2525     417    6  416  472 6SEC       27,2703     770    2  769
4.17SPOT   01,2120     252                5BLANK1    40,2546     417                6SEC(18)   30,3005     858    1  844
4.2SPOT    01,2070     251    1  250      5B10       01,2502    1089                6SECONDS   26,3713     613    1  609
4.21SPOT   01,2123     252                5DEGREES   14,2616     933    2  933  969 6SECS      25,3565     580    1  579
4.23SPOT   01,2126     252                5DEGTEST   15,3164     969    2  969      60DEC      05,3065     229    1  224
4.25SPOT   01,2131     252                5FAILTAB   06,3277  =  203    2  202  203 60MIN      35,2426     637    6  629  634
4.27SPOT   01,2134     253                5SEC       36,3751     758    2  730  732 60MS          4767  = 1444    2 1443
4.3SPOT    01,2076     252    1  250      5SECDP     36,3750     758    1  729      60SCNDS    24,2526     519    1  519
4.31SPOT   01,2137     253                5SECS      27,2701     770    2  769      600MS      07,3766    1328    1 1311
4.33SPOT   01,2142     253                50SECS     32,2566     591    1  589      600SEC     24,3626     660    1  660
4.35SPOT   01,2145     253                500DEC     24,2370     515    1  512      600SECS    13,2666    1207    2  250 1207
4.37SPOT   01,2150     253                504AZ         0022  = 1146    3 1144      63/64+1       7747    1096
4.5SPOT    01,2101     252                504F          0006  = 1146    5 1142 1143 66DEC      33,3063     885
4.7SPOT    01,2104     252                504LM      E4,1412     118    3 1138 1235 =========================================
4.9SEC     36,3144     744    1  730      504LPL        0016  = 1146    4 1145      7/12       11,3774    1244    1 1232
4FMAXNOM   31,2365     793    1  789      504RM      C4,2002      47    1 1137      70DEC      32,3463     834
4SEC(17)   30,2777     858    1  848      504RPR        0000  = 1146    4 1138 1140 77DECML    37,3075     401    1  395
4SEC(28)   33,3056     885    1  818      511?       33,2462     878    1  877      79DISP     15,2556     957    1  957
4SECS         4774    1094    3  175  792 511CTR     F7,1622  =  156    5  156  878 =========================================
40CYC         4762  = 1430    1 1432      526ALARM   24,2104     511    1  583      8192AUG    07,3566    1321    1 1321
40CYCL        4762  = 1444    1 1446      526ALRM1   24,2120     511    1  512      82DEGS        4554     539    1  539
40FPS      23,2472     853    1  853      54DD       23,3227    1155    1 1151      89SECS     27,2705     770    1  770
42DEG      15,3016     964    1  961      59.99SEC   42,3553     450    1  449      89TEST     40,2141     411    2  410
49FPS      34,3367     842    1  840      59MIN      42,3552     450    1  449      =========================================
========================================= ========================================= 9/16       12,3773    1244    1 1232
5.2SPOT    01,2153     253    1  250      6.11SPOT   01,2211     254                9,6,4      05,3401     234    1  227
5.3SPOT    01,2167     253    1  250      6.2SPOT    01,2016  =  254    1  250      90MSCALP   17,2053     578    1  577
5.4SPOT    01,2161     253                6.3SPOT    01,2200     254    1  250      90SECS     06,3005     191    2  174
5.5DEGS       4553     539    2  539  560 6.5SECS    27,2707     770    1  768      999.99NM   24,2371     515    2  511  512
5.5SPOT    01,2172     253                6.5SPOT    01,2203     254                99999CON   32,3065     785    1  782
5.7SPOT    01,2175     254                6.7SPOT    01,2206     254

HEALTH KEY: NORMALLY DEFINED UNLESS FLAGGED AS FOLLOWS:

UN UNDEFINED          = DEFINED BY EQUALS           J DEFINED BY JOKER OR ERASE ANYWHERE      MD MULTIPLY DEFINED
BD BADLY DEFINED    CD DEFINITION ASSOCIATED WITH CONFLICT             XX MISCELLANEOUS TROUBLE
```

63
5
54
150
2700
54
8100

```
UNREFERENCED SYMBOL LISTING, INCLUDING DEFINITION, HEALTH, & PAGE OF DEFINITION.

SYMBOL        DEF    H PAGE      SYMBOL        DEF    H PAGE      SYMBOL        DEF    H PAGE      SYMBOL        DEF    H PAGE

+AZ       11,2364     823      ASENT3    05,2000  =   30      CHECKUP   16,2042    1409      DFRNT     40,3413     459
+EL       11,2376     823      ASENT4    14,2000  =   32      CHKBIT10  17,2237    1442      DGCHECK   25,3232     572
=========================      ASENT5    30,2000  =   35      CHKLIST   05,3541     990      DIDFLAG      0020  =   69
-AZ       11,2357     823      ASTNCLOK  32,3016     784      CKIMUSE      5246    1119      DIMOBIT      4744  =   73
-EL       11,2371     823      AUTOMANV  26,2200     489      CL1/NET+  20,3440    1498      DL101        1336  =  206
-LUKONFG  23,2040     284      AUTOMODE     0301  =   88      CMOONBIT     4731  =   81      DL102        0025  =  206
-MUDI1    33,2101      46      AUTRATE1     4744  =   90      CNGL      22,2400     369      DL103     E6,1516  =  206
=========================      AUTRATE2     4743  =   90      CNTRCHK   43,3471    1286      DL104     E6,1517  =  206
?            6001  =  744      AUTR1FLG     0321  =   90      COARFINE  14,3347     944      DL105     E6,1520  =  206
=========================      AUTR2FLG     0320  =   90      COFMAXGO  22,2176     365      DL106        1356  =  206
ABORT        5636  = 1381      AUXFLAG      0147  =   78      COGAFBIT     4741  =   82      DL107        1331  =  206
ABTTGBIT     4736  =   83      AVEMDBIT     4744  =   83      COMPMAT   13,2250     712      DL108        1334  =  206
ABVAL     00,3201    1073      AVERAGEG  33,2211     865      CONTDES2  26,3575     610      DL109        1335  =  207
ACCOKFLG     0317  =   90      AVFLBIT      4740  =   71      CONTRLFL     0243  =   85      DL110        1336  =  207
ACMODBIT     4730  =   71      =========================      CONV3     42,3634     502      DL111        1327  =  207
ACOSABRT  00,3723    1084      BADROOT   31,3650     826      CORFOUND  01,2642    1105      DL112        1300  =  207
ADDRESS      6124    1002      BDTOK     27,2461     766      CSMDKFLG     0305  =   89      DL113        0321  =  207
ADRS+1    43,3630    1289      BHIZ      01,2456    1088      CS359+    35,2422     637      DL114     E6,1422  =  207
AFCCALC1  31,3146     807      BIGADS    20,3317    1496      CULTBIT      4736  =   73      DL115     E6,1423  =  207
AFCCALC2  31,3156     807      BIN3         6266  =  581      CYCLSHFT  43,3500    1287      DL116     E6,1635  =  207
AFDUMP    31,2151     739      BIT14+7   26,2264     490      =========================      DL117     E6,1636  =  207
AGSBUFFE  14,1606  =  122      BIT4H     30,3007     858      DAPDATA3  01,2306     307      DL118        0033  =  207
AGSDISPK  32,2022     219      BIT8,9    17,3140    1454      DAPLRUPT  E6,1753  =  141      DL119        0034  =  207
AGSLIST   05,2414  =  204      BLANKCHK  10,3152    1363      DBSELFLG     0316  =   90      DL120        0035  =  207
AGSUPRAT     0001  =  247      BNKCHK    43,3721    1290      DBSL2FLG     0315  =   90      DL121     E6,1643  =  207
ALCGKK    37,2627     397      BNKUPTN   43,3320    1284      DCDU      E6,1634  =  140      DL122     E6,1644  =  207
ALGORTHM  21,3073    1471      BRSPOT1   31,2546     799      DEC-12    12,2016    1099      DL123        0375  =  207
ALINEX    26,2071     351      BRSPOT2   31,2641     801      DEC-6     12,2015    1099      DL124        0111  =  207
ALKCG     37,2632     397      BRSPOT3   31,3013     804      DEC27        4755  = 1094      DL125     E6,1422  =  207
ALMNCADR     5730    1331      BRSPOT4   31,3205     807      DEC29        4756  = 1094      DL126     E6,1423  =  207
ALPHATRY  21,3275    1477      BUSYMASK  10,3535    1370      DEC51     04,3256    1329      DL127     E6,1635  =  207
ALRM526   24,2363     515      BUTTONS   05,2705     226      DEGINSF2  40,3050     446      DL128     E6,1636  =  207
ALRM527   24,3064     526      B12-1        4347  =  476      DEG60     15,2614     958      DL129        0033  =  207
ALTRCUT   21,2377     898      B5T088    01,2471    1088      DELRSPL   22,3543  =   38      DL130        0034  =  207
ALTRRCUT  21,2346     898      =========================      DELVTEST  27,2252     760      DL131        0035  =  207
ALTSCALE     0272  =   88      CADRMARK     0372     102      DERCOF+1     0153  =  100      DL132     E6,1425  =  207
ALTSCBIT     4734  =   88      CALCTHET  27,2255     761      DERCOF-1     0151  =  100      DL133     E6,1514  =  207
ALTSTUFF  21,2267     897      CALC2BIT     4743  =   72      DERCOF-2     0150  =  100      DL201     E6,1516  =  209
ANTENFLG     0267  =   87      CALC3BIT     4742  =   72      DERCOF-3     0147  =  100      DL202     E6,1517  =  209
AORBSFLG     0125  =   76      CALSAM    07,2654     960      DERCOF-4     0146  =  100      DL203     E6,1520  =  209
AOSV      E6,1543  =  138      CDFLF/2      0016  = 1265      DERCOF-5     0145  =  100      DL204        1331  =  209
APSESBIT     4740  =   81      CDRVE     06,2012     166      DERCOF-6     0144  =  100      DL205        1334  =  209
ASCSPCT   32,3710     871      CDUINC    10,3670    1395      DERCOF-7     0143  =  100      DL206        1335  =  209
ASECXT    E5,1573  =  133      CHAN      E5,1443  =  132      DERCOF-8     0142  =  100      DL207        1336  =  209
ASENT2    07,2000  =   30      CHAN76       0076  =   95      DEX2         0144  =  100      DL208        0025  =  209

HEALTH KEY: NORMALLY DEFINED UNLESS FLAGGED AS FOLLOWS:

UN UNDEFINED           = DEFINED BY EQUALS              J DEFINED BY JOKER OR ERASE ANYWHERE      MD MULTIPLY DEFINED
BD BADLY DEFINED     CD DEFINITION ASSOCIATED WITH CONFLICT              XX MISCELLANEOUS TROUBLE
```

```
UNREFERENCED SYMBOL LISTING, INCLUDING DEFINITION, HEALTH, & PAGE OF DEFINITION.

SYMBOL       DEF    H PAGE      SYMBOL      DEF    H PAGE      SYMBOL      DEF    H PAGE      SYMBOL      DEF    H PAGE

DL209       1356    =  209      DL509    E6,1635   =  215      D6OR9BIT    4743   =   73      FIGTIME  35,2764       671
DL210       0037    =  209      DL510    E6,1636   =  215      =======================         FINALBIT    4737   =   71
DL211       0040    =  209      DL511       0033   =  215      E/BKCALL 04,2617       382      FINEK2   43,2363       285
DL212       0041    =  209      DL512       0034   =  215      E/CALL   04,2636       383      FIREQR   17,2257      1442
DL213       0113    =  209      DL513       0035   =  215      E/JOBWAK 04,2652       384      FIRSTTME 27,3173       775
DL214       1327    =  209      DL514    E6,1425   =  215      E/SWITCH 04,2634       382      FIXCLPAS 40,2371       414
DL215       1300    =  209      DL515       1241   =  215      EARTCNTR 14,2531       932      FLAGOFF  35,3512       682
DL216       0113    =  209      DL516    E7,1460   =  215      ENDALM      6026       461      FLAGORGY 32,2623       781
DL217    F5,1741    =  209      DL517    E7,1462   =  215      ENDBALL  26,2360       493      FLAGREF1    0010   = 1382
DL218    E5,1743    =  209      DL518       1331   =  215      ENDCHKG  37,2366       391      FLAGREF2    0006   = 1382
DL219    F5,1756    =  209      DL601       1170   =  217      ENDDAPT4    5272   =  200      FLAPBIT     4735   =   83
DL220       1260    =  209      DL602       1171   =  217      ENDHMSS  42,3617   =  451      FLASHH?  21,2061       831
DL301       1356    =  211      DL603       1172   =  217      ENDLLJOB 31,3420   =  811      FLPCBIT     4731   =   82
DL302       0025    =  211      DL604       1173   =  217      ENDMANUV 26,2206       489      FLPIBIT     4732   =   82
DL303    F6,1516    =  211      DL605       0025   =  217      ENDNV8SY 04,2676       479      FLT59BIT    4741   =   83
DL304    E6,1517    =  211      DL606    E6,1516   =  217      ENDPASTE    4143       454      FLVRBIT     4727   =   82
DL305    E6,1520    =  211      DL607    F6,1517   =  217      ENDPINBF    4503   =  480      FRSTMBIT    4741   =   70
DL306       0037    =  211      DL608    E6,1520   =  217      ENDPINS1 40,3737   =  486      FSPASBIT    4733   =   68
DL307       0040    =  211      DL609       1356   =  217      ENDPINS2 41,3777   =  484      FUNCT3   21,3202      1473
DL308       0041    =  211      DL610       1327   =  217      ENDRMODE    4607   =  541      =======================
DL309       0113    =  211      DL611       1300   =  217      ENDROLL  22,3226       381      GDUMP1   31,3407   =  811
DL310       1327    =  211      DMENFBIT    4734   =   76      ENDRQDAT 41,2345       424      GENMARK  10,3033      1361
DL311       1300    =  211      DOALARM     5146   = 1381      ENDSPOCT 40,3444       460      GEOIMUTT 37,2004       385
DL312    E7,1460    =  211      DOALIGN  15,3140       969      ENDSTEER 36,3647       757      GEOPGEK  37,3111       401
DL313    E7,1462    =  211      DODNADR  05,3533       990      ENDSTOR  07,2515       271      GEOSTRT4 37,3025       400
DL314       1331    =  211      DODNCHAN 05,3601       990      ENDS40.9 27,2727       772      GETAOSUV 20,3220      1495
DL401       0025    =  213      DORSAMP2 25,2007       505      ENDVPUSH    6561      1018      GETROOT  21,3233      1473
DL402    E6,1516    =  213      DOSHIFT  21,3467      1480      END2DEC  40,3334       457      GLOKFBIT    4727   =   72
DL403    F6,1517    =  213      DOTIXBR  01,2430      1086      ENGONFLG    0123   =   76      GMBLBITB 21,3565      1482
DL404    E6,1520    =  213      DPAGREE     7276      1034      ENTERDAT 07,2066       257      GN/CCODE    4772      1094
DL405       0113    =  213      DPMODE   14,3771      1398      ENTERQR  17,2445      1445      GOAGIN   10,3062   = 1369
DL406       1327    =  213      DP0         0036   =  937      ENTPASHI 41,2032       419      GOCLOSE  21,3555      1482
DL407       1300    =  213      DP1         0040   =  937      ERADFBIT    4730   =   69      GODSPR1  10,2445      1354
DL408    E7,1460    =  213      DSKYFLAG    0113   =   75      ERMINUS  40,3713       486      GODSP2   10,2437      1354
DL409    E7,1462    =  213      DSPDECNR 40,3311       457      ERRTEST  17,3361      1460      GOGOMARK 10,2400      1353
DL410    F7,1733    =  213      DTDECAY  36,2004        39      ETPIBIT     4736   =   71      GOMARS   10,2320      1352
DL411       1356    =  213      DUMPCNIC 27,3431      1269      =======================         GOODRAD  25,3246       572
DL501    F4,1635    =  215      DUMPRPRA 27,3467      1271      FALTOF      4361       476      GOPERFRS 10,2717      1359
DL502       0113    =  215      DUMPTFF1 27,3552      1275      FAZA1    23,2760      1152      GOPERFS  10,2637      1358
DL503       0025    =  215      DUMPTFF2 27,3647      1276      FAZB1    23,3056      1153      GOPERF1R 10,2715      1359
DL504       0113    =  215      DVCNTSET 33,2245       866      FDAIY    F4,1736       123      GOPERF2  10,2642      1358
DL505       1327    =  215      DVMON    33,2236       866      FDAIZ    F4,1737       123      GOSERV   33,2216       865
DL506       1300    =  215      DVMONCON 35,2547       735      FFTAG11     4000   =   29      GOXDSP   10,2317   = 1369
DL507    E6,1422    =  215      DVTRANS  13,2272       712      FFTAG12     4000   =   29      GOXDSPP  10,2342   = 1369
DL508    F6,1423    =  215      DXCRIT+1    0125   =  100      FFTAG13     4000   =   29      GRP4OFF  32,3574       836

HEALTH KEY: NORMALLY DEFINED UNLESS FLAGGED AS FOLLOWS:

UN UNDEFINED            = DEFINED BY EQUALS             J DEFINED BY JOKER OR ERASE ANYWHERE       MD MULTIPLY DEFINED
BD BADLY DEFINED      CD DEFINITION ASSOCIATED WITH CONFLICT              XX MISCELLANEOUS TROUBLE
```

```
UNREFERENCED SYMBOL LISTING, INCLUDING DEFINITION, HEALTH, & PAGE OF DEFINITION.

SYMBOL      DEF     H PAGE     SYMBOL      DEF     H PAGE     SYMBOL      DEF     H PAGE     SYMBOL      DEF     H PAGE

GTSGO+CN  21,3043     1470     KAOS      16,2627     1425     MOONBIT      4731   =   67     N71DISP   07,2061      257
GUESS     37,2020      385     KEYCOM    04,3256     1335     MRKIOBIT     4726   =   74     ========================
GUESSBIT     4743   =   70     KLEENEX   10,2322     1352     MRKIOFLG     0074   =   74     OCT00010     4741   =  243
GUESS1    37,2255      389     K3S1      22,2370      369     MRUPTBIT     4740   =   75     OCT02100  06,3166      198
GUILDEN   31,2436      797     K4        22,2372      369     MRUPTFLG     0106   =   75     OCT10000     4730   =  229
========================       K4SQ      22,2374      369     MU(P)        0032   = 1245     OCT11        4311   = 1093
HFAILBIT     4730   =   85     ========================       MULTEXIT     5622     1379     OCT20        4740   =  744
HIGATCHK  33,3434      891     LANDRAD   25,3207      571     MUM       13,2004       48     OCT203    26,2265      490
HLIGHT    25,3657      618     LASTTIME  01,3504     1130     MUNRVG    33,3000      884     OCT21103     5704     1380
========================       LATAZCHK  37,2021      385     MWAITBIT     4732   =   74     OCT217       5710     1380
ICURK2    43,2222      281     LEMONM       0056   =   95     MWAITFLG     0100   =   74     OCT30000     4346   =  229
IDAD3IEM     0152       99     LMOONBIT     4732   =   81     MXMYMZ    26,2771      599     OCT30002     6512   = 1097
IDLERET1  10,3314     1366     LOS1      E5,1444   =  132     ========================       OCT37774     7751     1096
IGNALG    32,2637      782     LOS2      E5,1452   =  132     NBD3      06,3656      346     OCT40200     7756     1096
IGNALGRT  32,3014      784     LOTEMIN      0124   =   98     NBPOSPL   37,2012      385     OCT40420  10,3544     1370
IMUBACK   37,2005      385     LOUNITX   12,2004   =   38     NB1NB2    23,2476   =   38     OCT67777  10,3543     1370
IMUFIN20  07,3175   = 1328     LOUNITY   12,2002   =   38     NOCMPTST  41,2465      428     OKUPDATE  25,3502      576
IMUGOOD   07,3640     1324     LOUNITZ   12,2000   =   38     NEEDLFIL  20,2350     1416     OMEGCALC  26,3607      611
IMUZER03  07,2753     1308     LRALTFLG     0276   =   88     NEG100       5174     1114     OPTION3      1145      107
INFINBIT     4736   =   31     LRPOSFLG     0275   =   88     NEG5      41,2142      421     ORBWFBIT     4737   =   73
INTFLAG      0227   =   84     LRSPEED   25,3217      572     NETZERO      6142     1003     ORDERBIT     4737   =   81
INTOTHIS  13,2320      713     LRS24.11  26,3470      609     NEWIBIT      4730   =   81     OTHSHIP   22,3335      717
INTVEC    E5,1462   =  133     LRUPT        0011   =   94     NJETSBIT     4726   =   69     OURRCFLG     0306   =   89
INTYPBIT     4741   =   73     LRVELBIT     4735   =   88     NO.VJETS  E6,1523   =  138     OUT       13,2347      713
INTZ      E5,1474   =  132     LRVELFLG     0273   =   88     NOBITS    E5,1442   =  132     OUTGUAVE  22,3710   =  868
IRIGCOMP  06,3400      340     LUNABIT      4731   =   72     NOOOP07      0061   =   72     OUTLINK      0057   =   95
ISSUP     06,2321      175     ========================       NOMDNLST  05,2153   =  204     ========================
ISSWOEF   06,2716      189     MANTHRT?  32,3177      816     NORESET   07,3415     1318     P-RATE    16,2514     1423
ISWCALL      4671      998     MANUFBIT     4727   =   79     NORFINAL  13,3336     1215     PARAM30   35,2021      620
ITRPNT1   32,3264      818     MANUFLAG     0152   =   79     NORMLIZ   23,2000   =   33     PERFCHEK  10,3155     1363
ITRPNT2   32,3421      820     MANUSTAL  22,3067      378     NORMSBIT     4733   =   79     PHI          0024   =  536
ITR0         6411     1012     MARKFORM  10,2332     1352     NORMSCL   16,3615     1439     PHSBB1    E3,1437      114
ITR1         6400     1012     MASSMON   33,2146      864     NORMTEST  00,3512     1079     PHSBB2    E3,1441      114
ITR10        6163     1003     MDOTAPS   36,2010       39     NPGNCSFL     0244   =   85     PHSBB3    E3,1443      114
ITR11        6223     1004     METHOD2   22,2216      366     NRMIDBIT     4730   =   74     PHSBB4    E3,1445      114
ITR12        6155     1003     MGLVFBIT     4743   =   77     NRMIDFLG     0076   =   74     PHSBB5    E3,1447      114
ITR14        6260     1006     MIDAVBIT     4743   =   83     NRMNVBIT     4735   =   74     PHSBB6    E3,1451      114
ITR15        6144     1003     MIDFLBIT     4730   =   67     NRUPTBIT     4741   =   75     PHSNAME4  E3,1444      114
ITR7         6302     1007     MID1FBIT     4742   =   83     NRUPTFLG     0107   =   75     PHSNAME6  E3,1450      114
ITSWBIT      4726   =   79     MKOVFLAG     0110   =   75     NSTEER    36,3673      757     PHSPROT5     1063      105
========================       MKVAC     07,2007      255     NTARGBIT     4742   =   78     PHSPROT6     1065      105
JAMPROC      4234      470     MKVB52    07,2567      273     NVSBWAIT     4436      479     PINBRBIT     4737   =   75
JETSCN    17,3435     1461     MKVB53    07,2565      273     NVSUBCOM     4161      467     PINTEST   43,2002   =  481
JSWCHBIT     4727   =   67     MODE71    05,3504      834     NWAITBIT     4733   =   74     PIPASCFY  E3,1455      114
========================       MONIT1    41,3304      452     NWAITFLG     0101   =   74     PIPASCFZ  E3,1457      114

HEALTH KEY: NORMALLY DEFINED UNLESS FLAGGED AS FOLLOWS:

UN UNDEFINED          = DEFINED BY EQUALS                  J DEFINED BY JOKER OR ERASE ANYWHERE      MD MULTIPLY DEFINED
BD BADLY DEFINED    CD DEFINITION ASSOCIATED WITH CONFLICT             XX MISCELLANEOUS TROUBLE
```

```
UNREFERENCED SYMBOL LISTING, INCLUDING DEFINITION, HEALTH, & PAGE OF DEFINITION.

SYMBOL       DEF   H PAGE      SYMBOL       DEF   H PAGE      SYMBOL       DEF   H PAGE      SYMBOL       DEF   H PAGE

PIPUSE    07,3260    1315      P7071BIT    4730  =   82      RVSWBIT     4734  =   79      SETCTR    21,3623    1506
PLUSX     27,2423     764      P71      21,2135     832      RWAITK   43,2143     278      SETINFL   05,2733     226
PMINM     34,2103     638      P71NOW?  21,2102     831      R12RDFLG    0261  =   86      SETMARK   10,2526    1356
PON2      37,2240     388      =======================      R12RDSET 25,3146     570      SETPRIO   10,2503    1355
POOH      04,2217     240      QUADGUID 31,3056     805      R12STUFF 34,2000  =   35      SETXFLAG  23,2453  =  852
POOHBIT      4726  =   72      QUARDUMP 21,2252     896      R21LEM1  24,3017     525      SETXTACT  43,2105     276
POSGMBL   37,2064     386      QUITBIT     4740  =   83      R21LEM12 24,3075     526      SFRET     41,3134     443
POSITF    15,3725     984      =======================      R21LEM3  24,3026     525      SFRET1    41,3116     443
POSTSI    23,2450     977      RCDUFAIL    0274  =   88      R22LEM12 24,2541     520      SHAFTBO   26,3023     600
POSUP     33,3222     888      RCDU0FLG    0266  =   87      R24LEM1  24,3275     530      SIM2CADR  05,2461     222
POSUPDAT  33,3070     886      RDIFF    E6,1452  =  137      R29/SERV 33,2000  =   35      SLOPEBIT     4742  =   70
POS1/4    12,3765  = 1244      RDM      13,3771    1245      R300K    27,3771    1280      SNAPAGN   05,3647     991
POWFLIT1  23,2000  =   33      RECAL3   40,3633     473      R51.2    14,3073     939      SNAPEND   05,3666     992
PREBJUMP     5320    1291      REDOMANN 26,2127     488      R51F     14,3060     938      SNGLCD    22,2376     369
PRECIBIT     4735  =   73      REFTAG1     4727  =  283      R51P63   14,3146     939      SOLNSBIT     4742  =   77
PRIODFLG     0075  =   74      REFTAG10    4732  =  282      R55.1    14,3240     942      SOMEAOS   20,3422    1498
PRIO1        4733  = 1097      REFTAG2     4732  =  283      R61C+L03 23,2156     534      SOMFFRRR  37,3040     400
PRIO11       5013    1095      REFTAG3     4733  =  531      R61C+L1  23,2305     536      SOPTION2  43,3326    1284
PRIO2        4732  = 1097      REFTAG4     4726  =  531      R61LEM1  23,2162     534      SOPTION3  43,3327    1284
PROCEEDE  06,2075     168      REFTAG5     4736  =  299      R61LEM2  23,2216     534      SOPTION4  43,3330    1284
PROCKEY1  40,3507     464      REFTAG6     4734  =  299      =======================      SOPTION5  43,3331    1284
PRODUCT   21,3455    1480      REFTAG7     4736  =  300      S+2         4743  = 1282      SOPTION6  43,3332    1284
PRONVBIT     4736  =   75      REFTAG8     4734  =  300      S+3         6266  = 1282      SOPTION7  43,3333    1284
PSKIPADR  16,3624    1439      REFTAG9     4727  =  282      S+4         4742  = 1282      SOPTON10  43,3334    1284
PSTHIGAT     0251  =   86      REGODSPR 10,2463    1355      S+5         4747  = 1282      SOUPLY    37,3071     401
PULSEM    14,3237     942      REMODFLG    0265  =   87      S+6         6263  = 1282      SPECSTS   37,2572     396
PUTXY     41,2764     441      REPOSMON    0270  =   87      S-2         7767  = 1283      SPSCODE      4734  = 1306
PUTXYZ    41,2663     439      REQEXLOC 41,2234     422      S-3         7766  = 1283      STARTDAP  16,2047    1409
P12A      23,2000  =   33      RERRCALC 17,2675    1449      S-4         6133  = 1283      STARTSIM  05,2457     222
P12LMB    30,2120     839      RHCSCFLG    0313  =   90      SBIT1       4744  = 1282      STARTSTO     6455    1015
P20LEMB7  24,2206     513      RLMUNIT     0014  =  613      SBIT10      4733  = 1282      STARTSW   05,2456     222
P20LEMF   24,2307     514      RMM      12,2017  =   38      SBIT13      4730  = 1282      STCLOK3   36,2664     738
P20LMWT1  24,2317     514      RNGEDATA    0260  =   86      SBIT14      4727  = 1282      STDESIG1  25,2607     562
P20S2     25,2000  =   33      RODTRAP  23,2000  =   33      SBIT2       4743  = 1282      STERN     31,2437     797
P30N33    35,2004     620      ROO      04,2167     240      SBIT3       4742  = 1282      STORHAPO  22,3602     723
P41FJET   36,3315     751      ROOTPS+1    0127  =  100      SBIT5       4740  = 1282      STORHPER  22,3614     724
P41MANU   36,3214     749      ROTFLBIT    4737  =   83      SBIT6       4737  = 1282      STRATGY   14,2722     936
P41NORM   36,3324     751      RPAD1    23,2335  = 1280      SBIT8       4735  = 1282      SUPER100     4736  = 1094
P52F      15,2233     925      RPQFLBIT    4726  =   80      SCLNORM  17,3141    1454      S32BIT1      4726  =   77
P52V      15,2265     926      RRCHECK     4567     540      SD       22,2366     369      S32BIT2      4727  =   77
P57A      15,3335     973      RPDATAFL    0277  =   88      SECAD    22,2027     363      S32BIT3A     4730  =   77
P63IGN1   36,2516     734      RRNBBIT     4737  =   68      SEC01       4770  =  758      S32BIT3B     4731  =   77
P63ZOOM   35,3673     736      RRRSFLAG    0300  =   88      SELFSUPR 40,2000  =   37      S3435.25  35,3245     676
P70INIT   32,3465     835      RSFLGBTS 05,3066     229      SENSEGET 17,2146    1440      S40.133   27,2647     770
P70NOW?   21,2121     832      RUPDATED 33,3260     889      SEPV4    34,2000  =   35      S40.137   27,2637     769

HEALTH KEY: NORMALLY DEFINED UNLESS FLAGGED AS FOLLOWS:

UN UNDEFINED          = DEFINED BY EQUALS              J DEFINED BY JOKER OR ERASE ANYWHERE      MD MULTIPLY DEFINED
BD BADLY DEFINED     CD DEFINITION ASSOCIATED WITH CONFLICT              XX MISCELLANEOUS TROUBLE
```

```
UNREFERENCED SYMBOL LISTING, INCLUDING DEFINITION, HEALTH, & PAGE OF DEFINITION.

SYMBOL     DEF     H PAGE    SYMBOL     DEF     H PAGE    SYMBOL     DEF     H PAGE    SYMBOL     DEF     H PAGE

S50       14,2515  =  932    UPOK      04,3342    1336    V37XEQC   04,2415     244    2.21SPOT  01,2057     251
S52.2.1   21,2727     950    UPPART3   04,3564  = 1389    V50N00A   32,2165     221    2.5SPOT   01,2035     251
=========================    UPTHRDT   32,3557     836    V67FLBIT     4735  =   79    2.7SPOT   01,2040     251
TBASE3       1056     105    UPWAKE    04,3556    1389    V74       43,3040  =  300    2DZERO    12,2006  = 1135
TCALARM2  43,3267    1283    USEGTS    33,2260     866    V82EMBIT     4743  =   80    2RNDEND   40,3222     448
TCCSM     E3,1622     116    USEQRFLG     0304  =   89    =========================    2SEC(28)  33,3054     885
TCLEM     E3,1674     116    =========================    WCALC     22,2746     376    2VEXHUST  E7,1742  =  767
TDECAYFX     4761    1094    VAC1         0401     102    WHATOUT   31,2335     792    27TO30    43,3654    1289
TEMP      E5,1441  =  132    VAC2         0455     102    WPLATI    E5,1560  =  133    =========================
TEMPADD   E5,1440  =  132    VAC3         0531     102    WPLATO    E5,1464  =  132    3.5SPOT   01,2065     251
TENDAPPR  E7,1424     144    VAC4         0605     102    =========================    3J22R2MU  13,2024      48
TESTVP    41,2066     420    VEHUPBIT     4735  =   70    XDELVBIT     4735  =   71    30DEGCHK  24,3421     592
TETOTHER  E3,1570  =  116    VELDATA      0255  =   86    XDIFF     12,2163    1174    30KCHK    33,2421     877
TFFCONIC  27,3363    1268    VELUPDAT  33,3275     889    XKEPCSM   E3,1624     116    360SWBIT     4744  =   82
TFFSWBIT     4744  =   80    VERIFLAG     0165  =   80    XKEPLEM   E3,1676     116    =========================
TFFTICK   22,3455     719    VERROR    E6,1751  =  136    XSMADR    37,2477     393    4.11SPOT  01,2107     252
TGOCALC   27,2470     766    VERTDRFT  37,2231     388    =========================    4.13SPOT  01,2112     252
THDUMP    31,2333     792    VFAILBIT     4727  =   35    ZERODP    12,2006  = 1099    4.15SPOT  01,2115     252
TICKIPER  22,3412     713    VFLAGBIT     4733  =   73    ZERO0     23,2504  = 1155    4.17SPOT  01,2120     252
TMANUCHK  22,3064     378    VINTFBIT     4742  =   73    ZERUTJ    17,2620    1447    4.21SPOT  01,2123     252
TMEXITL   05,3720     992    VLAUNS    E5,1462  =  132    ZONE2     17,3606    1464    4.23SPOT  01,2126     252
TMRESUME  05,3722     993    VPD          0000  =  937    ZONE4     17,3427    1461    4.25SPOT  01,2131     252
TRACE1    40,3265     456    VPDVL        6614    1019    ZONE4,5   17,3416    1460    4.27SPOT  01,2134     253
TRACE1S   40,3276     456    VRECTLEM  E3,1634     116    =========================    4.31SPOT  01,2137     253
TRUNBQ    26,3117     601    VSTORE       6464    1015    0EBANK    43,3344    1285    4.33SPOT  01,2142     253
TSNEXIS   17,2226    1441    VUPDATED  33,3432     891    =========================    4.35SPOT  01,2145     253
TSSR      00,2025    1045    VV/SC        7650    1043    1.5SPOT   01,2027     250    4.37SPOT  01,2150     253
TSTPOINT  23,3747    1261    VVXSC        7425    1038    1/RTMU    27,2030      48    4.5SPOT   01,2101     252
TTFSCALE     4731  =  829    VXBEAMNB  33,2024      42    1/10S        4744  = 1444    4.7SPOT   01,2104     252
TURNON    17,3154    1454    VXSCAL    33,2070      43    1/10SEC      4744  = 1430    =========================
TURNONFL     0302  =   38    VYBEAMNB  33,2015      42    1BITDP    26,2421     499    5.4SPOT   01,2161     253
T6JOB     17,2061    1401    VYSCAL    33,2066      43    1SECX        4770  =  393    5.5SPOT   01,2172     253
=========================    V0           0006  =  937    100MRUPT     7750  =  165    5.7SPOT   01,2175     254
UAXIS     20,3274    1496    V00N25       6010  =  221    113ALRM   07,2422     269    5BLANK1   40,2546     417
UDB2         0136  = 1503    V00N34       4233  =  221    120MS        5745  =  191    5B10      01,2502    1089
UDB3         0140  = 1503    V01N14    32,2164     221    17TO20    43,3646    1289    =========================
UNFVX/2   E6,1665  =  141    V06N07    10,3505    1369    =========================    6.11SPOT  01,2211     254
UNKNOWN      0007  =  204    V06N59    35,3636     687    2.0SPT    04,2154     239    6.5SPOT   01,2203     254
UPDNLIST  05,2414  =  204    V1           0014  =  937    2.11SPOT  01,2043     251    6.7SPOT   01,2206     254
UPDTMEND  42,2032     237    V2           0022  =  937    2.11SPT   04,2155     239    63/64+1      7747    1096
UPEND73   04,3540    1388    V21N79    07,2564     273    2.13SPOT  01,2046     251    66DEC     33,3063     885
UPERRCR   04,3375    1386    V22N79    07,2562     272    2.15SPOT  01,2051     251    =========================
UPLOCKFL     0164  =   80    V3           0030  =  937    2.17SPOT  01,2054     251    70DEC     32,3463     834

HEALTH KEY: NORMALLY DEFINED UNLESS FLAGGED AS FOLLOWS:

UN UNDEFINED           = DEFINED BY EQUALS              J DEFINED BY JOKER OR ERASE ANYWHERE      MD MULTIPLY DEFINED
BD BADLY DEFINED     CD DEFINITION ASSOCIATED WITH CONFLICT              XX MISCELLANEOUS TROUBLE
```

```
ERASABLE & EQUALS CROSS-REFERENCE TABLE SHOWING DEFINITION, PAGE OF DEFINITION, AND SYMBOL

   DEF  PAGE  SYMBOL          DEF  PAGE  SYMBOL          DEF  PAGE  SYMBOL          DEF  PAGE  SYMBOL          DEF  PAGE  SYMBOL

   0000   67  NEED2FLG        0010   95  OUT0            0016 1245  RATT1           0025  215  DL503           0035   95  DNTM2
   0000   94  A               0010 1136  GAMRP           0016 1245  URPV            0025  217  DL605           0035  207  DL120
   0000  141  UNX/2           0010 1146  CVECTR          0016 1265  CDELF/2         0026   70  VEHUPFLG        0035  207  DL131
   0000  247  COSTALIL        0010 1146  DVECTR          0016 1265  TFFQ1           0026   94  TIME3           0035  215  DL513
   0000  504  LR              0010 1146  SINNODI         0016 1271  RPER            0026  129  ZPRIME          0036   70  DRIFTFLG
   0000  937  VPD             0010 1199  ALPHA           0017   69  NJETSFLG        0026  985  GTMP            0036   94  CDUS
   0000 1146  504RPP          0010 1200  COGAMIN         0017   94  BRUPT           0026 1201  ITERCTR         0036  937  DP0
   0000 1245  RATT            0010 1201  MIN             0020   69  DIDFLAG         0026 1265  TFF1/ALF        0036 1199  T
   0001   67  JSWITCH         0010 1382  FLAGREF1        0020   94  CYR             0027   70  UPDATFLG        0036 1201  DEP
   0001   94  L               0011   68  RRNBSW          0020  129  COSTH           0027   94  TIME4           0036 1265  TFF/RTMU
   0001   95  LCHAN           0011   94  LRUPT           0020  933  CSUN            0030   70  NOUPFLAG        0037   71  SRCHOPTN
   0001  247  AGSUPDAT        0011   95  DSALMOUT        0020  985  STMP            0030   94  TIME5           0037   94  PIPAX
   0002   67  MIDFLAG         0012   68  LOKONSW         0020 1199  ROOTMU          0030   95  CHAN30          0037  209  DL210
   0002   94  Q               0012   94  QRUPT           0020 1265  NRTERM          0030  937  V3              0037  211  DL306
   0002   95  QCHAN           0012   95  CHAN12          0020 1271  RAPO            0030  985  TIMEP           0040   71  ACMODFLG
   0002  247  RENDEZVL        0012 1199  XMAX            0021   69  ERADFLAG        0030 1199  XI              0040   94  PIPAY
   0003   67  MCONFLAG        0012 1265  TFFDELQ         0021   94  SR              0030 1201  COSF            0040  209  DL211
   0003   94  EBANK           0013   68  NEEDLFLG        0022   69  RODFLAG         0030 1265  TFFRTALF        0040  211  DL307
   0003   95  HISCALAR        0013   94  SAMPTIME        0022   94  CYL             0031   70  TRACKFLG        0040  937  DP1
   0003  247  ORBMANUL        0013   95  CHAN13          0022  129  SINTH           0031   94  TIME6           0040 1146  COB
   0004   68  P21FLAG         0014   68  FREEFLAG        0022  613  UYVECTPR        0031   95  CHAN31          0040 1199  R1
   0004   94  FBANK           0014   95  CHAN14          0022  933  CMOUN           0032   70  FRSTIME         0040 1245  TDEC1
   0004   95  LOSCALAR        0014  141  UNZ/2           0022  937  V2              0032   94  CDUX            0040 1265  NRMAG
   0004  247  DESASCNT        0014  613  RLMUNIT         0022 1146  504AZ           0032   95  CHAN32          0041   71  LOSCMFLG
   0005   68  FSPASFLG        0014  613  UXVECTPR        0022 1199  1/ROOTMU        0032  665  DELELO          0041   94  PIPAZ
   0005   94  Z               0014  937  V1              0022 1245  COSPHI/2        0032 1146  BVECTR          0041  209  DL212
   0005   95  CHAN5           0014 1199  XMIN            0022 1265  RTERM           0032 1199  S(XI)           0041  211  DL308
   0005  247  LUNRSALN        0014 1200  DCOGA           0023   69  NOTERFLG        0032 1245  MU(P)           0042   71  STEERSW
   0006   68  P25FLAG         0014 1201  DELINDEP        0023   94  EDOP            0032 1245  TVEC            0042   94  Q-RHCCTR
   0006   94  BBANK           0014 1245  TAT             0024   69  R61FLAG         0032 1265  TFFALFA         0042   95  LVSQUARE
   0006   95  CHAN6           0014 1265  RMAG1           0024   94  TIME2           0033   70  SLOPESW         0042  130  RCNORM
   0006  141  UNY/2           0015   68  R10FLAG         0024  129  THETA           0033   94  CDUY            0042 1146  SOB
   0006  504  URP             0015   94  ZRUPT           0024  536  PHI             0033   95  CHAN33          0042 1199  KEPC1
   0006  937  VC              0015   95  MNKEYIN         0024  583  RRANGE          0033  207  DL118           0042 1265  TFFX
   0006 1146  504F            0016   69  P66PROFL        0024 1146  AVECTR          0033  207  DL129           0043   94  P-RHCCTR
   0006 1245  VATT            0016   94  BANKRUPT        0024 1146  MMATRIX         0033  215  DL511           0044   71  IMPULSW
   0006 1297  BB              0016   95  NAVKEYIN        0024 1199  X               0034   70  GUESSW          0044   94  R-RHCCTR
   0006 1382  FLAGREF2        0016  584  VELLOS          0024 1245  UZ              0034   94  CDUZ            0044   95  LV
   0007   68  IMUSE           0016  933  CEARTH          0024 1245  VATT1           0034   95  DNTM1           0044 1156  NORMZI
   0007   95  SUPERBNK        0016  936  CSS             0024 1265  TFFVSQ          0034  207  DL119           0044 1199  KEPC2
   0007  204  ERASZERO        0016 1146  TIMSUBM         0025   94  TIME1           0034  207  DL130           0044 1265  TFFTEM
   0007  204  SPARE           0016 1146  504LPL          0025  206  DL102           0034  215  DL512           0045   71  XDELVFLG
   0007  204  UNKNOWN         0016 1199  1/MU            0025  209  DL208           0034 1199  XSQC(XI)        0045   94  INLINK
   0010   68  RNDVZFLG        0016 1200  COGAMAX         0025  211  DL302           0034 1265  TFFNP           0046   71  ETPIFLAG
   0010   94  ARUPT           0016 1201  MAX             0025  213  DL401           0035   94  CDUT            0046   94  RNRAD
```

```
ERASABLE & EQUALS CROSS-REFERENCE TABLE SHOWING DEFINITION, PAGE OF DEFINITION, AND SYMBOL

  DEF  PAGE  SYMBOL        DEF  PAGE  SYMBOL        DEF  PAGE  SYMBOL        DEF  PAGE  SYMBOL        DEF  PAGE  SYMBOL

  0046   95  X1            0063  142  DINDX         0076   74  NRMIDFLG      0115   98  WDRFT         0130   77  MGLVFLAG
  0047   71  FINALFLG      0063  158  ALTRTEMP      0076   95  CHAN76        0115   98  21/22REG      0130   98  BUF
  0047   94  GYROCMD       0063  158  ALTTEMP       0077   72  FLAGWRD3      0115 1504  DBVAL3        0130   98  INDEXLOC
  0047   95  X2            0063  153  VHY           0077   95  CHAN77        0116   76  NOTHROTL      0130   98  SWWORD
  0050   71  AVFLAG        0063 1297  TEMPNM        0100   74  FLAGWRD4      0116   98  ADDRWD        0130  126  ABVEL*
  0050   94  CDUXCMD       0063 1476  NZACCDOT      0100   74  MWAITFLG      0116 1504  DRIFTER       0130  127  L*WCR*T
  0050   95  S1            0064   73  PRECIFLG      0101   74  NWAITFLG      0117   76  R77FLAG       0131   77  RENDWFLG
  0050 1146  FPREXIT       0064   97  ITEMP4        0101   75  FLAGWRD5      0117   98  CHAR          0131   98  SWBIT
  0050 1201  TWEEKIT       0064   97  LOCCTR        0102   74  MRKNVFLG      0117   98  DECOUNT       0131  126  VSFLECT*
  0051   72  PFRATFLG      0064   97  WAITTEMP      0102   77  FLAGWRD6      0117   98  EPCNT         0131  127  H*GHCR*T
  0051   94  CDUYCMD       0064 1297  TEMPBB        0103   74  NRMNVFLG      0117   98  POLISH        0131 1503  Z1TEM
  0051   95  S2            0065   73  CULTFLAG      0103   79  FLAGWRD7      0117   98  UPDATRET      0132   77  S32.1F1
  0051 1137  SETREX        0065   97  ITEMP5        0104   74  PRONVFLG      0117  100  PWRPTR        0132  100  RETROOT
  0051 1146  EARTHMXX      0065   97  NEWLOC        0104   80  FLAGWRD8      0117 1504  ACCRETRN      0132 1503  Z5TEM
  0052   72  CALCMAN3      0065  158  VHZ           0105   75  PINBRFLG      0120   76  RNGSCFLG      0133   77  S32.1F2
  0052   94  CDUZCMD       0065 1297  TEMPSW        0105   82  FLAGWRD9      0120   98  FIXLOC        0133   98  BUF2
  0052   95  GPRET         0066   73  ORBWFLAG      0106   75  MRUPTFLG      0121   76  DMENFLG       0134   77  S32.1F3A
  0053   72  CALCMAN2      0066   97  ITEMP6        0106   84  FLGWRD10      0121   98  OVFIND        0135   77  S32.1F3B
  0053   94  CDUTCMD       0066 1297  TEMPSW2       0106   84  RASFLAG       0122   76  ZOOMFLAG      0135   98  MPTEMP
  0054   72  NODOFLAG      0066 1474  CHNL12        0107   75  NRUPTFLG      0122   98  DFCTEM        0135   99  DMPNTEMP
  0054   94  CDUSCMD       0066 1476  QRNDXER       0107   85  FLGWRD11      0122   98  DISTEM        0135 1503  UDB1
  0055   72  PCOHFLAG      0067   73  STATEFLG      0110   75  MKOVFLAG      0122   98  NOUNTEM       0136   99  DOTINC
  0055   95  THRUST        0067   97  NEWJOB        0110   87  FLGWRD12      0122   98  SGNON         0136   99  DVSIGN
  0056   72  GLOKFAIL      0070   73  INTYPFLG      0110   87  RADMODES      0122   98  VBUF          0136   99  ENTRET
  0056   95  LEMONM        0070   97  RUPTREG1      0111   89  DAPBOOLS      0122 1503  ACCSW         0136   99  ESCAPE
  0057   72  REFSMFLG      0070  158  FORVTEMP      0111   89  FLGWRD13      0123   76  ENGONFLG      0136  420  ENTEXIT
  0057   95  OUTLINK       0070 1297  TEMPPR        0111  207  DL124         0123   98  HITEMIN       0136 1503  UDB2
  0060   72  LUNAFLAG      0071   73  VINTFLAG      0112   75  XDSPFLAG      0123   98  NVTEMP        0137   78  GMBORVSW
  0060   95  ALTM          0071   97  RUPTREG2      0112   98  LASTYCMD      0123   98  SFTEMP1       0137   99  DOTRET
  0061   72  NODOP07       0071 1297  TEMPG2        0113   75  DSKYFLAG      0123   98  SGNOFF        0137   99  DVNORMCT
  0061   97  EXECTEM1      0072   73  D6OR9FLG      0113   98  LASTXCMD      0123 1503  1/ATEM1       0137   99  ESCAPE2
  0061   97  ITEMP1        0072   97  RUPTREG3      0113  209  DL213         0124   76  3AXISFLG      0137   99  INREL
  0061   97  WAITEXIT      0072  158  LATVEL        0113  209  DL216         0124   98  CODE          0137   99  WDCNT
  0061  142  T5TEMP        0072 1297  TEMPP2        0113  211  DL309         0124   98  LOTEMIN       0137 1503  UDB4
  0061 1297  TEMPG         0073   73  DIMOFLAG      0113  213  DL405         0124   98  SFTEMP2       0140   99  DSPMMTEM
  0061 1411  COSMG         0073   97  DSRUPTEM      0113  215  DL502         0124  100  DXCRIT        0140   99  MATINC
  0062   73  VFLAG         0073   97  KEYTEMP1      0113  215  DL504         0124 1503  1/ATEM2       0140   99  MAXDVSW
  0062   97  EXECTEM2      0073   97  RUPTREG4      0114   75  PDSPFLAG      0125   76  AORBSFLG      0140   99  MIXBR
  0062   97  ITEMP2        0073 1297  TEMPBBCN      0114   98  DSEXIT        0125   98  MIXTEMP       0140   99  POLYCNT
  0062   97  WAITBANK      0074   67  FLAGWRD0      0114   98  EXITEM        0125  100  DXCRIT+1      0140  100  PWRCNT
  0062 1297  TEMPP         0074   74  MRKIDFLG      0114   98  INTB15+       0126   77  NORRMON       0140 1503  UDB3
  0063   73  R04FLAG       0074   97  STATE         0114 1504  DBVAL2        0126  100  ROOTPS        0141   78  MUNFLAG
  0063   97  ITEMP3        0075   69  FLAGWRD1      0115   76  SNUFFER       0127   77  SOLNSW        0141   99  DSREL
  0063   97  NEWPRIO       0075   74  PRIODFLG      0115   98  DECRET        0127  100  ROOTPS+1      0141   99  POLYRET
  0063   97  WAITADR       0076   70  FLAGWRD2      0115   98  INTBIT15      0127 1503  1/ACOSTT      0141   99  TEM1
```

```
ERASABLE & EQUALS CROSS-REFERENCE TABLE SHOWING DEFINITION, PAGE OF DEFINITION, AND SYMBOL

  DEF  PAGE  SYMBOL          DEF  PAGE  SYMBOL          DEF  PAGE  SYMBOL          DEF  PAGE  SYMBOL          DEF  PAGE  SYMBOL

  0141  100  DERPTR          0153   79  IGNFLAG         0164 1370  COPINDEX        0247   85  HFAILFLG        0321  101  CPHI
  0141 1503  UAXDIST         0153   99  RUTMXTEM        0164 1504  -SIGNAOS        0250   85  VXINH           0321  101  THETAD
  0142   99  DEXDEX          0153  100  DERCOF+1        0165   80  VERIFLAG        0251   86  PSTHIGAT        0321  207  DL113
  0142   99  CSMAG           0154   79  ASTNFLAG        0165  101  BANKSET         0252   86  NOLRREAD        0322  101  CTHETA
  0142   99  TEM2            0154  101  MPAC            0165 1369  MPAC2SAV        0253   86  XORFLG          0323  101  CPSI
  0142  100  DERCOF-8        0154 1305  TEMPPHS         0165 1504  HOLD            0254   86  LRINH           0324  101  DELV
  0143   78  REDFLAG         0154 1370  FACEREG         0166   80  V82EMFLG        0255   86  VELDATA         0324  101  DELVX
  0143   99  COUNT           0154 1504  UV              0166  101  PUSHLOC         0260   86  RNGEDATA        0326  101  DELVY
  0143   99  DEXI            0155   79  SWANDISP        0167   80  TFFSW           0261   86  RI2RDFLG        0330  101  DELVZ
  0143   99  TEM3            0155 1305  TEMP2G          0167  101  PRIORITY        0262   87  VELSHFLG        0332  101  KEYTEMP2
  0143  100  DERCOF-7        0155 1370  PLAYTEM1        0170   80  RPQFLAG         0263   87  HFLSHFLG        0332  101  RUPTAGN
  0143  100  DEXI            0155 1494  -EPSILON        0172   81  NEWIFLG         0264   87  CDESFLAG        0333  102  DNLSTCOD
  0143 1503  CBB1            0155 1494  EPSILON         0173   38  MOONOTH         0265   87  REMODFLG        0333  102  DNTMERAS
  0144   99  DSPWDRFT        0156   79  NORMSW          0173   81  CMOONFLG        0266   87  RCDU0FLG        0334  102  CTLIST
  0144   99  RELRET          0156 1305  PCINTER         0174   38  MOONTHIS        0267   87  ANTENFLG        0335  102  DNTMGOTO
  0144   99  SEPMNRFT        0157   79  RVSW            0174   81  LMOONFLG        0270   87  REPOSMON        0336  102  DNECADR
  0144   99  SEPSCRET        0157  100  TERM1TMP        0175   81  FLUNDISP        0271   87  DESIGFLG        0336  102  DUMPLOC
  0144   99  TEM4            0157 1305  TEMPSWCH        0177   81  SURFFLAG        0272   88  ALTSCALF        0336  102  TMINDEX
  0144  100  DERCOF-6        0157 1370  COFMPAC         0200   81  INFINFLG        0273   88  LRVELFLG        0337  102  SUBLIST
  0144  100  DEX2            0157 1370  PLAYTEM3        0201   81  ORDERSW         0274   88  RCDUFAIL        0340  102  DNTMBUFF
  0144 1503  DBB2            0157 1494  DOCKTEMP        0202   81  APSESW          0275   88  LRPOSFLG        0366  102  NVWORD
  0145   99  NOUNADD         0157 1504  ANET            0203   82  COGAFLAG        0276   88  LRALTFLG        0367  102  MARKNV
  0145   99  TEM5            0157 1504  FUNTEM          0205   82  INITALGN        0277   88  RRDATAFL        0370  102  NVSAVE
  0145  100  DERCOF-5        0160   79  V67FLAG         0206   82  360SW           0300   88  RPRSFLAG        0371  102  CADRFLSH
  0145  100  RTNSAVER        0160 1370  PLAYTEM4        0210   82  FLVR            0301   88  AUTOMODE        0372  102  CADRMARK
  0145 1503  CBB4            0160 1370  TEMPOR2         0211   82  P7071FLG        0302   88  TURNONFL        0373  102  TEMPFLSH
  0146   78  NTARGFLG        0160 1494  COEFCTR         0212   82  FLPC            0303   89  PULSEFLG        0374  102  CHANBKUP
  0146   99  NNADTEM         0160 1494  SCRATCHX        0213   82  FLPI            0304   89  USEQRFLG        0375  102  FAILREG
  0146  100  DERCOF-4        0160 1504  1/ANET          0214   82  FLRCS           0305   89  CSMDKFLG        0375  207  DL123
  0146 1503  DBB3            0161   80  IDLEFLAG        0215   83  LETABORT        0306   89  OURRCFLG        0400  102  VAC1USE
  0147   78  AUXFLAG         0161 1370  OUTHERE         0216   83  FLAP            0307   89  ACC4-2FL        0401  102  VAC1
  0147   99  NNTYPTEM        0161 1494  MASSCTR         0217   83  ABTTGFLG        0310   89  AORBTFLG        0454  102  VAC2USE
  0147  100  DERCOF-3        0161 1494  SCRATCHY        0220   83  ROTFLAG         0311   89  XOVINFLG        0455  102  VAC2
  0147 1503  AXDSTEM         0161 1504  ARET            0221   83  QUITFLAG        0312   89  DRIFTDFL        0530  102  VAC3USE
  0150   79  ATTFLAG         0162   80  V37FLAG         0222   83  FLT59FLG        0313   90  RHCSCFLG        0531  102  VAC3
  0150   99  IDAD1TEM        0162  433  MPAC+6          0223   83  MID1FLAG        0314   90  ULLAGFLG        0604  102  VAC4USE
  0150  100  DERCOF-2        0162 1370  GENMASK         0224   83  MIDAVFLG        0314  101  R22DISP         0605  102  VAC4
  0151   79  ITSWICH         0162 1494  SCRATCHZ        0225   83  AVEMIDSW        0314  101  TIME2SAV        0660  103  VAC5USE
  0151   99  IDAD2TEM        0162 1504  ABSAOS          0227   84  INTFLAG         0315   90  DBSL2FLG        0661  103  VAC5
  0151  100  DERCOF-1        0163   80  AVEGFLAG        0230   84  APSFLAG         0316   90  DBSELFLG        0705  103  GOLOC
  0151 1503  FLATEMP         0163  101  MODE            0236   84  REINTFLG        0316  101  SCALSAVE        0734  103  POSCODE
  0152   79  MANUFLAG        0163 1370  USERPRIO        0243   85  CONTRLFL        0317   90  ACCOKFLG        0735  103  SINCDU
  0152   99  IDAD3TEM        0163 1504  SIGNAOS         0244   85  NPGNCSFL        0320   90  AUTR2FLG        0735  103  SINCDUY
  0152  100  DERCOFN         0164   80  UPLOCKFL        0245   85  LRBYPASS        0320  101  REDOCTR         0735  103  STARALGN
  0152 1503  Z3TEM           0164  101  LOC             0246   85  VFAILFLG        0321   90  AUTR1FLG        0737  103  SINCDUZ
```

```
ERASABLE & EQUALS CROSS-REFERENCE TABLE SHOWING DEFINITION, PAGE OF DEFINITION, AND SYMBOL

 DEF  PAGE  SYMBOL        DEF  PAGE  SYMBOL        DEF  PAGE  SYMBOL        DEF  PAGE  SYMBOL        DEF  PAGE  SYMBOL

 0741  103  SINCDUX       1021  104  MONSAVE2      1106  106  TANG          1225  108  VN            1300  209  DL215
 0743  103  COSCDU        1022  104  DSPTAB        1110  106  MODEB         1233  108  PIPTIME       1300  211  DL311
 0743  103  COSCDUY       1036  104  NVQTEM        1110  106  NSAMP         1235  108  ADTCODE       1300  213  DL407
 0745  103  COSCDUZ       1037  104  NVBNKTEM      1112  106  DESRET        1235  108  GDT/2         1300  215  DL506
 0747  103  COSCDUX       1040  104  VERBSAVE      1112  106  OLDATAGD      1235  108  STARCODE      1300  217  DL611
 0751  103  -PHASE1       1041  104  CADRSTOR      1113  106  DESCOUNT      1235  108  TMPDV         1301  110  IMUCADR
 0752  103  PHASE1        1042  104  DSPLIST       1114  107  TDEC          1235  109  OPTFLAG       1301  110  MODECADR
 0753  103  -PHASE2       1043  104  EXTVBACT      1116  107  COLREG        1236  108  XCOUNT        1302  110  OPTCADR
 0754  103  PHASE2        1044  104  DSPTEM1       1117  107  LAT           1237  108  YCOUNT        1303  110  RADCADR
 0755  103  -PHASE3       1044  105  NORMTEM1      1121  107  LONG          1240  108  CURSOR        1304  110  ATTCADR
 0756  103  PHASE3        1047  105  DSPTEM2       1123  107  ALT           1241  108  SITIME        1306  110  ATTPRIO
 0757  103  -PHASE4       1050  105  DSPTEMX       1125  107  YV            1241  108  SPIRAL        1307  110  MAPKSTAT
 0760  103  PHASE4        1050  105  OPTIONX       1133  107  ZV            1241  215  DL515         1310  110  DSRUPTSW
 0761  103  -PHASE5       1052  105  TBASE1        1141  107  P40/RET       1243  108  MASS          1311  110  LGYRO
 0762  103  PHASE5        1053  105  PHSPRDT1      1142  107  GENRET        1243  108  WEIGHT/G      1312  110  RRRET
 0763  103  -PHASE6       1054  105  TBASE2        1143  107  OPTION1       1245  108  ABDELV        1313  110  RDES
 0764  103  PHASE6        1055  105  PHSPRDT2      1144  107  OPTION2       1245  108  UPSUM         1314  110  RRINDEX
 0765  103  CDUSPOT       1055  105  PIPCTR        1145  107  OPTION3       1246  108  PGUIDE        1315  110  LRWH1
 0765  103  CDUSPOTY      1056  105  TBASE3        1146  107  LONGCADR      1250  108  DVTHRUSH      1315  110  WIXA
 0767  103  CDUSPOTZ      1057  105  PHSPRDT3      1150  107  LONGBASE      1250  109  DELVOV        1316  110  WIXB
 0771  104  CDUSPOTX      1057  244  MMTEMP        1152  107  LONGTIME      1251  108  AVEGEXIT      1317  110  ZIXA
 0773  104  MINDEX        1060  105  TBASE4        1154  107  CDUTEMPX      1251  108  AVGEXIT       1320  110  ZIXB
 0774  104  MMNUMBER      1060  244  BASETEMP      1155  107  CDUTEMPY      1253  108  TEMX          1321  110  AGSWORD
 0775  104  DSPCNT        1061  105  PHSPRDT4      1156  107  CDUTEMPZ      1254  108  TEMY          1322  110  RATEINDX
 0776  104  DSPCOUNT      1062  105  TBASE5        1157  107  PIPATMPX      1255  108  TEMZ          1323  110  DELAYLOC
 0777  104  DECBRNCH      1063  105  PHSPRDT5      1160  107  PIPATMPY      1256  108  PIPAGE        1326  110  LEMMASS
 1000  104  VERBREG       1064  105  TBASE6        1161  107  PIPATMPZ      1256  111  W.IND         1327  110  CSMMASS
 1001  104  NOUNREG       1065  105  PHSPRDT6      1162  107  DISPDEX       1257  109  CH5MASK       1327  207  DL111
 1002  104  XREG          1066  105  NVWORD1       1162  155  P21ORIG       1260  109  CH6MASK       1327  209  DL214
 1003  104  YREG          1067  105  DSPFLG        1163  107  TEMPR60       1260  209  DL220         1327  211  DL310
 1004  104  ZREG          1067  105  EBANKSAV      1164  107  PRIOTIME      1261  109  SPNDX         1327  213  DL406
 1005  104  XREGLP        1070  105  MARKFLAG      1165  107  UPVERBSV      1262  109  T5ADP         1327  215  DL505
 1006  104  HITEMOUT      1071  105  EBANKTEM      1166  107  UPTEMP        1264  109  RESTREG       1327  217  DL610
 1006  104  YREGLP        1072  105  MARK2PAC      1166  108  EBUF2         1265  109  C13QSAV       1330  111  DNRRANGE
 1007  104  LOTEMOUT      1073  105  AGSCODE       1167  107  COMPNUMB      1266  109  C13FSAV       1331  111  DNRRDOT
 1007  104  ZREGLP        1074  106  1/PIPADT      1170  107  UPOLDMOD      1267  109  RADTIME       1331  206  DL107
 1010  104  MODREG        1075  106  TEMK          1170  217  DL601         1270  109  RADDEL        1331  209  DL204
 1011  104  DSPLOCK       1076  106  SQ            1171  107  UPVERB        1271  109  TTOTIG        1331  211  DL314
 1012  104  REQRET        1077  106  RADUSE        1171  217  DL602         1273  109  PVALVEST      1331  215  DL518
 1013  104  LOADSTAT      1077  106  SAMPLIM       1172  107  UPCOUNT       1274  109  DELPEROR      1332  111  DNINDEX
 1014  104  CLPASS        1100  106  RRTARGET      1172  217  DL603         1275  109  DELQEROR      1332  111  RADBITS
 1015  104  NOUT          1100  106  RSUBC         1173  107  DVTEMP        1276  109  DELREROR      1333  111  DNLRVELX
 1016  104  NOUNCADR      1100  106  SAMPLSUM      1173  107  UPBUFF        1277  110  IMODES30      1334  111  DNLRVELY
 1017  104  MONSAVE       1104  106  TIMEHOLD      1173  217  DL604         1300  110  IMODES33      1334  206  DL108
 1020  104  MONSAVE1      1106  106  MODEA         1217  108  RN            1300  207  DL112         1334  209  DL205
```

```
ERASABLE & EQUALS CROSS-REFERENCE TABLE SHOWING DEFINITION, PAGE OF DEFINITION, AND SYMBOL

   DEF  PAGE  SYMBOL        DEF   PAGE  SYMBOL        DEF   PAGE  SYMBOL        DEF   PAGE  SYMBOL        DEF   PAGE  SYMBOL

   1335  111  DNLRVELZ  E3,1410  114  LST2      E3,1550  115  TC        E3,1774  117  TCDH      E4,1544  119  YNBPIP
   1335  207  DL109     E3,1432  114  RSBBQ     E3,1552  115  XKEP      E3,1776  117  OLDAGS    E4,1552  119  ZNBPIP
   1335  209  DL206     E3,1434  114  LONGEXIT  E3,1552  115  XPREV     E4,1400  118  WRENDPOS  E4,1560  119  BASETHP
   1336  111  DNLRALT   E3,1436  114  PHSNAME1  E3,1554  116  RRECTCSM  E4,1400  122  TRANSM1   E4,1560  119  VONE'
   1336  206  DL101     E3,1437  114  PHSBB1    E3,1554  116  RRECTOTH  E4,1401  118  WRENDVEL  E4,1566  119  REAILCNT
   1336  207  DL110     E3,1440  114  PHSNAME2  E3,1562  116  VRECTCSM  E4,1402  118  WSHAFT    E4,1567  120  EPSILCNT
   1336  209  DL207     E3,1441  114  PHSBB2    E3,1570  116  T-OTHER   E4,1403  118  WTRUN     E4,1571  119  BASEOTV
   1337  111  BALLEXIT  E3,1442  114  PHSNAME3  E3,1570  116  TETCSM    E4,1404  118  RMAX      E4,1571  120  HPERMIN
   1340  111  DAPDATR1  E3,1443  114  PHSBB3    E3,1570  116  TETOTHER  E4,1405  118  VMAX      E4,1571  120  WWPOS
   1341  111  TEVENT    E3,1444  114  PHSNAME4  E3,1572  116  DELTACSM  E4,1406  118  WSURFPOS  E4,1571  120  YLFM
   1343  111  DB        E3,1445  114  PHSBB4    E3,1600  116  NUVCSM    E4,1407  118  WSURFVEL  E4,1571  122  AGSBUFF
   1343  111  DBVAL1    E3,1446  114  PHSNAME5  E3,1606  116  RCVCSM    E4,1410  118  SHAFTVAR  E4,1571  122  ALPHASB
   1344  111  AZ        E3,1447  114  PHSBB5    E3,1614  116  VCVCSM    E4,1411  118  TRUNVAR   E4,1571  122  PITCHANG
   1345  111  EL        E3,1450  114  PHSNAME6  E3,1622  116  TCCSM     E4,1412  118  504LM     E4,1571  122  RR-AZ
   1346  111  WCHPHASE  E3,1451  114  PHSBB6    E3,1624  116  XKEPCSM   E4,1420  118  RLS       E4,1571  122  RSTACK
   1347  112  E3J22R2M  E3,1452  114  PBIASX    E3,1626  116  RRECTHIS  E4,1422  122  ALFOK     E4,1573  120  RPADTEM
   1350  112  E32C31RM  E3,1452  114  PIPABIAS  E3,1626  116  RRECTLEM  E4,1426  118  TLAND     E4,1573  120  WWVEL
   1351  112  TRUNNCMD  E3,1453  114  PIPASCF   E3,1634  116  VRECTLEM  E4,1430  118  PBODY     E4,1573  120  YDOTLEM
   1352  112  SHAFTCMD  E3,1453  114  PIPASCFX  E3,1642  116  TETLEM    E4,1431  118  ALPHAV    E4,1573  122  BETASB
   1353  112  FLBIAS    E3,1454  114  PBIASY    E3,1642  116  TETTHIS   E4,1437  118  BETAV     E4,1573  122  RR-ELEV
   1353  112  WHCHREAD  E3,1455  114  PIPASCFY  E3,1644  116  DELTALEM  E4,1445  118  PHIV      E4,1573  122  YAWANG
   1354  112  TOOFEW    E3,1456  114  PBIASZ    E3,1652  116  NUVLEM    E4,1453  118  PSIV      E4,1575  120  PHILEM
   1355  112  SERVDURN  E3,1457  114  PIPASCFZ  E3,1660  116  RCVLEM    E4,1461  118  FV        E4,1575  120  TSTART82
   1356  112  DUMLOOPS  E3,1460  114  NBDX      E3,1666  116  VCVLEM    E4,1467  118  ALPHAM    E4,1575  120  WWBIAS
   1356  206  DL106     E3,1461  114  NBDY      E3,1674  116  TCLEM     E4,1471  118  BETAM     E4,1575  122  RLM
   1356  209  DL209     E3,1462  114  NBDZ      E3,1676  116  XKEPLEM   E4,1473  118  TAU.      E4,1577  120  RONE
   1356  211  DL301     E3,1463  115  ADIAX     E3,1700  116  X789      E4,1475  119  DT/2      E4,1577  122  RPASS36
   1356  213  DL411     E3,1464  115  ADIAY     E3,1706  116  TEPHEM    E4,1477  119  H         E4,1605  120  VONE
   1356  217  DL609     E3,1465  115  ADIAZ     E3,1706  117  TIMSUBO   E4,1501  119  1RETURN   E4,1605  122  UNP36
   1357  112  SELFERAS  E3,1466  115  ADSRAX    E3,1711  116  -AYO      E4,1502  119  NORMGAM   E4,1606  122  AGSBUFFE
   1357  112  SFAIL     E3,1467  115  ADSRAY    E3,1713  116  AXO       E4,1503  119  BASETHV   E4,1613  120  RANGE
   1360  112  ERESTORE  E3,1470  115  ADSRAZ    E3,1715  116  R(CSM)    E4,1503  119  RPQV      E4,1615  120  PRATE
   1361  112  SELFRET   E3,1471  115  COMMAND   E3,1715  116  R-OTHER   E4,1511  119  KEPRTN    E4,1617  120  RTHETA
   1362  112  SMODE     E3,1471  115  GCOMP     E3,1723  116  V(CSM)    E4,1511  119  ORIGFX    E4,1621  121  GSAV
   1363  112  ALMCADR   E3,1474  115  CDUIND    E3,1723  116  V-OTHER   E4,1512  119  BASETIME  E4,1621  121  KEL
   1365  112  ERCOUNT   E3,1477  115  GCOMPSW   E3,1731  117  REFSMMAT  E4,1512  119  HAPOX     E4,1621  121  MF1
   1366  112  SCOUNT    E3,1500  115  DIFEQCNT  E3,1753  117  ACTCENT   E4,1512  119  RPSV      E4,1621  121  MFS
   1371  112  SKEEP1    E3,1501  115  UPSVFLAG  E3,1755  117  LS21X     E4,1514  119  HPERX     E4,1621  123  ANGTERM
   1372  112  SKEEP2    E3,1502  115  RRECT     E3,1756  117  LOSVEL    E4,1520  119  XKEPNEW   E4,1627  121  YNBSAV
   1373  112  SKEEP3    E3,1510  115  VRECT     E3,1756  117  VSUBC     E4,1522  119  VECTAB    E4,1635  121  ZNBSAV
   1374  112  SKEEP4    E3,1516  115  TET       E3,1764  117  MLOSV     E4,1530  119  BASEOTP   E4,1635  215  DL501
   1375  113  SKEEP5    E3,1520  115  TDELTAV   E3,1766  117  RANGEVAR  E4,1530  120  V82FLAGS  E4,1643  121  +MGA
   1376  113  SKEEP6    E3,1526  115  TNUV      E3,1770  117  RATEVAR   E4,1531  120  TFF       E4,1643  121  T1TOT2
   1377  113  SKEEP7    E3,1534  115  RCV       E3,1772  117  RVARMIN   E4,1533  120  -TPER     E4,1645  121  T2TOT3
E3,1400  114  LST1      E3,1542  115  VCV       E3,1773  117  VVARMIN   E4,1536  119  XNBPIP    E4,1647  121  ELEV
```

```
ERASABLE & EQUALS CROSS-REFERENCE TABLE SHOWING DEFINITION, PAGE OF DEFINITION, AND SYMBOL

    DEF   PAGE  SYMBOL         DEF   PAGE  SYMBOL         DEF   PAGE  SYMBOL         DEF   PAGE  SYMBOL         DEF   PAGE  SYMBOL

E4,1651  121  UNRM       E4,1747  124  ATR        E5,1434  125  VAPFG*     E5,1474  126  TAUHZ      E5,1550  133  DELM
E4,1651  121  UP1        E4,1750  123  LMVEL      E5,1434  132  AINLA      E5,1474  132  INTZ       E5,1551  126  J2PARM
E4,1653  123  AT         E4,1751  124  ATP        E5,1434  132  GENPL      E5,1475  126  QHZ        E5,1553  126  K2PARM
E4,1655  123  VE         E4,1753  124  YAW        E5,1434  132  WANGO      E5,1476  126  AHZLIM     E5,1555  126  THETCRIT
E4,1657  121  DELVEET1   E4,1755  124  PITCH      E5,1436  125  ABRFG*     E5,1476  132  ANGY       E5,1557  126  RAMIN
E4,1657  123  TTO        E4,1756  123  DELVEET3   E5,1436  132  WANGI      E5,1477  126  2LATE466   E5,1560  133  WPLATI
E4,1661  123  TBUP       E4,1764  123  RTSTDEX    E5,1436  829  ADG2TTF    E5,1500  132  ANGX       E5,1561  126  YLIM
E4,1663  123  RDOTD      E4,1765  123  RTSTMAX    E5,1440  125  AAPFG*     E5,1502  132  DRIFTO     E5,1562  133  GEOCOMPS
E4,1665  121  DELVEET2   E4,1766  123  RTSTBASE   E5,1440  132  TEMPADD    E5,1503  126  DELQFIX    E5,1563  127  ABTRDOT
E4,1665  123  YDOTD      E4,1767  123  RTSTLOC    E5,1440  132  TORQNDX    E5,1504  132  DRIFTI     E5,1563  133  ERCOMP
E4,1667  123  ZDOTD      E4,1770  123  RSAMPDT    E5,1440  132  WANGT      E5,1510  132  VLAUN      E5,1565  127  COSTHET1
E4,1671  124  /R/MAG     E4,1771  124  N26/PRI    E5,1441  132  TEMP       E5,1511  126  LRVMAX     E5,1567  127  COSTHET2
E4,1673  121  DVLOS      E4,1772  124  N26/2CAD   E5,1442  125  JBRFG*     E5,1512  126  LRVF       E5,1571  127  CG
E4,1673  121  FACT1      E5,1400  125  VELBIAS    E5,1442  132  DRIFTT     E5,1512  132  ACCWD      E5,1571  127  JPARM
E4,1673  124  LAXIS      E5,1400  125  W          E5,1442  132  NOBITS     E5,1513  126  LRWVZ      E5,1571  133  ZERONDX
E4,1701  121  PACT2      E5,1400  132  AZIMUTH    E5,1442  829  JDG2TTF    E5,1514  126  LRWVY      E5,1572  133  1SECXT
E4,1701  121  ULOS       E5,1402  125  RBRFGX     E5,1443  132  CHAN       E5,1515  126  LRWVX      E5,1573  127  KPARM
E4,1701  124  YDOT       E5,1402  132  LATITUDE   E5,1444  125  JAPFG*     E5,1516  126  LRWVFZ     E5,1573  133  ASECXT
E4,1703  124  ZDOT       E5,1402  829  RDG        E5,1444  132  ALX1S      E5,1517  126  LRWVFY     E5,1574  133  PERFDLAY
E4,1705  124  CEEE       E5,1404  125  RAPFGX     E5,1444  132  LOS1       E5,1520  126  LRWVFX     E5,1575  127  RP
E4,1707  121  HAPO       E5,1404  132  ERVECTOR   E5,1445  132  CMPX1      E5,1520  133  POSNV      E5,1576  133  OVFLOWCK
E4,1707  121  NOMTPI     E5,1406  125  RBRFGZ     E5,1446  125  GAINBRAK   E5,1521  126  LRWVFF     E5,1577  127  QAXIS
E4,1707  121  RTSR1/MU   E5,1410  125  RAPFGZ     E5,1446  132  ALK        E5,1522  126  ABSC0      E5,1605  127  ZAXIS1
E4,1707  124  G(CSM)     E5,1412  125  VBRFGX     E5,1450  125  GAINAPPR   E5,1522  133  DPIPAY     E5,1613  127  OUTOFPLN
E4,1711  121  HPER       E5,1412  132  LENGTHOT   E5,1452  125  TCGFBRAK   E5,1523  126  ABSC1      E5,1613  127  RANGEDSP
E4,1711  121  RTMU       E5,1412  829  VDG        E5,1452  132  LOS2       E5,1524  126  ABSC2      E5,1615  127  VBIAS
E4,1713  122  RINIT      E5,1413  132  LOSVEC     E5,1452  133  THETAN     E5,1525  126  ABSC3      E5,1623  127  RGU
E4,1715  124  WM         E5,1414  125  VAPFGX     E5,1453  125  TCGIBRAK   E5,1526  126  ABSC4      E5,1631  127  DLAND
E4,1721  122  VINIT      E5,1414  132  NDXCTR     E5,1454  125  TCGFAPPR   E5,1526  133  DPIPAZ     E5,1631  127  DLANDX
E4,1723  124  /LAND/     E5,1415  132  PIPINDEX   E5,1455  125  TCGIAPPR   E5,1527  126  SLOPE0     E5,1633  127  DLANDY
E4,1725  124  Y          E5,1416  125  VBRFGZ     E5,1456  125  VIGN       E5,1530  126  SLOPE1     E5,1635  127  DLANDZ
E4,1727  123  VIPRIME    E5,1416  132  POSITON    E5,1460  125  RIGNX      E5,1530  133  ALTIM      E5,1637  127  ASCSAVE
E4,1727  124  ORDOT      E5,1417  132  QPLACE     E5,1460  133  FILDELV    E5,1531  126  SLOPE2     E5,1642  125  ENDW
E4,1731  124  CYDOT      E5,1420  125  VAPFGZ     E5,1462  125  RIGNZ      E5,1531  133  ALTIMS     E5,1642  127  XSM
E4,1733  124  CZDOT      E5,1420  132  QPLACES    E5,1462  132  VLAUNS     E5,1532  126  SLOPE3     E5,1642  130  DELX
E4,1735  123  FDAIX      E5,1421  132  SOUTHDR    E5,1462  133  INTVEC     E5,1532  133  ALDK       E5,1642  131  ZI
E4,1735  124  PCONS      E5,1422  125  ABRFGX     E5,1464  125  KIGNX/B4   E5,1533  126  SLOPE4     E5,1644  130  DELT
E4,1736  123  FDAIY      E5,1422  829  ADG        E5,1464  132  WPLATO     E5,1534  126  RODSCALE   E5,1646  130  URRECT
E4,1737  123  FDAIZ      E5,1424  125  AAPFGX     E5,1466  126  KIGNY/B8   E5,1535  126  TAUROD     E5,1650  127  YSM
E4,1737  124  YCONS      E5,1426  125  ABRFGZ     E5,1470  126  KIGNV/B4   E5,1537  126  LAG/TAU    E5,1654  130  RVEC
E4,1740  123  DELVTPF    E5,1430  125  AAPFGZ     E5,1470  132  INTY       E5,1537  132  RESULTCT   E5,1654  130  R1VEC
E4,1741  124  PRATE      E5,1430  132  TEMPTIME   E5,1472  126  LOWCRIT    E5,1541  126  MINFORCE   E5,1656  127  ZSM
E4,1742  123  LMPOS      E5,1432  125  VBRFG*     E5,1472  132  ANGZ       E5,1543  126  MAXFORCE   E5,1662  130  R2VEC
E4,1743  124  YRATE      E5,1432  132  TMARK      E5,1472  132  DATAPL     E5,1545  126  J1PARM     E5,1664  127  XDC
E4,1745  124  ATY        E5,1432  829  VDG2TTF    E5,1473  126  HIGHCRIT   E5,1547  126  K1PARM     E5,1664  127  XNB
```

```
ERASABLE & EQUALS CROSS-REFERENCE TABLE SHOWING DEFINITION, PAGE OF DEFINITION, AND SYMBOL

   DEF   PAGE  SYMBOL       DEF   PAGE  SYMBOL       DEF   PAGE  SYMBOL       DEF   PAGE  SYMBOL       DEF   PAGE  SYMBOL

E5,1664  131  DELTAX     E5,1741  128  IGC       E6,1416  134  M31       E6,1454  135  PLAST     E6,1517  213  DL403
E5,1664  131  TRIPA      E5,1741  130  RIA       E6,1417  134  M22       E6,1455  135  QLAST     E6,1517  217  DL607
E5,1667  131  TEMPVAR    E5,1741  209  DL217     E6,1420  134  M32       E6,1456  135  RLAST     E6,1520  138  NEGTORKV
E5,1670  130  TDESIRED   E5,1743  128  MGC       E6,1421  134  OMEGAP    E6,1457  135  TCQR      E6,1520  206  DL105
E5,1672  127  YDC        E5,1743  130  VVEC      E6,1422  134  OMEGAQ    E6,1460  135  OLDPMIN   E6,1520  209  DL203
E5,1672  127  YNB        E5,1743  209  DL218     E6,1422  207  DL114     E6,1461  135  OLDQRMIN  E6,1520  211  DL305
E5,1672  130  GEOMSGN    E5,1745  128  QMIN      E6,1422  207  DL125     E6,1462  135  SAVEHAND  E6,1520  213  DL404
E5,1673  130  UN         E5,1746  128  QMAJ      E6,1422  215  DL507     E6,1464  135  PERROR    E6,1520  217  DL608
E5,1700  127  ZDC        E5,1747  128  OGCT      E6,1423  134  OMEGAR    E6,1465  135  NXT6ADR   E6,1521  138  NO.PJETS
E5,1700  127  ZNB        E5,1751  130  ECC       E6,1423  207  DL115     E6,1466  135  T6NEXT    E6,1522  138  NO.UJETS
E5,1701  130  VTARGTAG   E5,1753  130  RTNPRM    E6,1423  207  DL126     E6,1470  135  T6FURTHA  E6,1523  138  NO.VJETS
E5,1702  130  VTARGET    E5,1754  130  SGNRDOT   E6,1423  215  DL508     E6,1472  135  NEXTP     E6,1524  138  TJP
E5,1706  128  CULTRIX    E5,1755  128  BESTI     E6,1424  134  ALPHAQ    E6,1473  135  NEXTU     E6,1525  138  TJU
E5,1706  128  GACC       E5,1755  130  RDESIRED  E6,1425  134  ALPHAR    E6,1474  135  NEXTV     E6,1525  139  TJETU
E5,1706  128  LANDLAT    E5,1756  128  BESTJ     E6,1425  207  DL132     E6,1475  135  -2JETLIM  E6,1526  138  TJV
E5,1706  128  STARAD     E5,1756  209  DL219     E6,1425  215  DL514     E6,1476  135  -RATEDB   E6,1527  138  L,PVT-CG
E5,1706  128  VEARTH     E5,1757  128  STARIND   E6,1426  134  OMEGAU    E6,1476  135  TARGETDB  E6,1530  138  1JACC
E5,1706  131  VARIANCE   E5,1757  130  DELDEP    E6,1426  135  URATEDIF  E6,1477  136  RETJADR   E6,1531  138  1JACCQ
E5,1710  128  LANDLONG   E5,1757  130  TERRLAMB  E6,1427  134  OMEGAV    E6,1500  136  SENSETYP  E6,1532  138  1JACCR
E5,1710  130  RTNAPSE    E5,1760  128  STARSAV1  E6,1427  135  EDOTP     E6,1501  137  NEGUQ     E6,1533  138  1JACCU
E5,1710  130  RTNLAMB    E5,1761  130  DEPREV    E6,1427  135  VRATEDIF  E6,1502  139  ALLOWGTS  E6,1534  138  SKIPU
E5,1710  130  RTNTR      E5,1761  130  TPREV     E6,1427  138  EDOT      E6,1503  137  NEGUR     E6,1535  138  SKIPV
E5,1710  130  RTNTT      E5,1763  130  EPSILONL  E6,1430  134  TRAPEDP   E6,1504  137  KQ        E6,1536  138  AOSQ
E5,1711  130  U2         E5,1765  130  COGA      E6,1431  134  TRAPEDQ   E6,1505  137  AXISCTR   E6,1540  138  AOSR
E5,1711  131  GRP2SVQ    E5,1765  130  INDEP     E6,1432  134  TRAPEDR   E6,1505  137  SAVESR    E6,1542  138  AOSU
E5,1712  128  LANDALT    E5,1766  128  STARSAV2  E6,1433  134  NPTRAPS   E6,1506  137  KRDAP     E6,1543  138  AOSV
E5,1712  131  OMEGAM1    E5,1767  131  EGRESS    E6,1434  135  NQTRAPS   E6,1507  137  ACCDOTQ   E6,1544  138  AOSQTERM
E5,1714  128  GOUT       E5,1774  128  TALIGN    E6,1435  135  NRTRAPS   E6,1510  137  QACCDOT   E6,1545  138  AOSRTERM
E5,1714  128  VSUN       E5,1776  129  RTX1      E6,1436  135  EDOTQ     E6,1511  137  ACCDOTR   E6,1546  139  ACCSWU
E5,1717  130  MAGVEC2    E5,1777  129  RTX2      E6,1436  135  QRATEDIF  E6,1512  137  RACCDOT   E6,1546  139  BLOCKTOP
E5,1717  130  R2         E5,1777  133  END-E5    E6,1437  135  EDOTR     E6,1513  137  DOWNTORK  E6,1547  139  ACCSWV
E5,1720  131  OMEGAM2    E6,1400  134  HIASCENT  E6,1437  135  RRATEDIF  E6,1513  137  POSTORKP  E6,1550 1503  1/ANETP
E5,1721  130  UR1        E6,1401  134  ROLLTIME  E6,1440  135  OLDXFORP  E6,1514  137  NEGTORKP  E6,1552 1503  1/ACOSTP
E5,1722  128  VMOON      E6,1402  134  PITTIME   E6,1441  135  OLDYFORP  E6,1514  207  DL133     E6,1554  139  FLAT
E5,1726  131  OMEGAM3    E6,1403  134  DKTRAP    E6,1442  135  OLDZFORQ  E6,1515  137  POSTORKU  E6,1555  139  ZONE3LIM
E5,1727  130  SNTH       E6,1404  134  DKOMEGAN  E6,1443  135  CH31TEMP  E6,1516  138  NEGTORKU  E6,1556 1503  PACCFUN
E5,1730  128  SAX        E6,1405  134  DKKAOSN   E6,1444  135  STIKSENS  E6,1516  206  DL103     E6,1560 1503  PDB1
E5,1730  128  STAR       E6,1406  134  LMTRAP    E6,1445  135  TCP       E6,1516  209  DL201     E6,1561 1503  PDB2
E5,1731  130  CSTH       E6,1407  134  LMOMEGAN  E6,1446  135  DXERROR   E6,1516  211  DL303     E6,1562 1503  PDB4
E5,1733  130  1-CSTH     E6,1410  134  LMKAOSN   E6,1450  135  DYERROR   E6,1516  213  DL402     E6,1563 1503  PDB3
E5,1734  131  HOLDW      E6,1411  134  DKDB      E6,1450  135  QERROR    E6,1516  217  DL606     E6,1564 1503  PAXDIST
E5,1735  130  CSTH-RHO   E6,1412  134  IGNAOSQ   E6,1450  137  QDIFF     E6,1517  138  POSTORKV  E6,1566  139  1/ANET1
E5,1736  128  GCTR       E6,1413  134  IGNAOSR   E6,1452  135  DZERROR   E6,1517  206  DL104     E6,1567  139  1/ANET2
E5,1737  128  OGC        E6,1414  134  M11       E6,1452  135  RERROR    E6,1517  209  DL202     E6,1572  139  1/ACOAST
E5,1737  130  P          E6,1415  134  M21       E6,1452  137  RDIFF     E6,1517  211  DL304     E6,1574  139  ACCFCTZ1
```

```
ERASABLE & EQUALS CROSS-REFERENCE TABLE SHOWING DEFINITION, PAGE OF DEFINITION, AND SYMBOL

    DEF    PAGE  SYMBOL         DEF    PAGE  SYMBOL         DEF    PAGE  SYMBOL         DEF    PAGE  SYMBOL         DEF    PAGE  SYMBOL

 E6,1575  139   ACCFCTZ5    E6,1671  141   UNFVZ/2     E6,1743  141   DAPTEMP6    E7,1421  144   LRWH        E7,1471  147   VACT1
 E6,1600  139   FIREDB      E6,1673  141   -DELGMB     E6,1744  137   OFL         E7,1422  144   ZOOMTIME    E7,1471  150   RTARG1
 E6,1602  139   COASTDB     E6,1675  140   BCDU        E6,1744  137   JETRATE     E7,1423  144   TENDBRAK    E7,1471  151   TX789
 E6,1604  139   AXISDIST    E6,1676  141   OGABIAS     E6,1744  138   HOLDQ       E7,1423  145   REPOSCNT    E7,1471  154   ABVEL
 E6,1626  139   COEFFQ      E6,1700  140   KSPNDX      E6,1744  141   DAPTREG1    E7,1424  144   TENDAPPR    E7,1473  154   HDOTDISP
 E6,1627  139   COEFFR      E6,1701  140   KDPNDX      E6,1744  141   OLDSENSE    E7,1424  145   REPOSTM     E7,1473  154   ROOT
 E6,1630  139   COTROLER    E6,1702  140   MFISYM      E6,1745  137   A2CNTRAL    E7,1425  144   DELTTFAP    E7,1475  154   TTFDISP
 E6,1631  139   QGIMTIMR    E6,1702  140   NCDU        E6,1745  137   JETRATEQ    E7,1426  144   LEADTIME    E7,1477  147   RAPREC
 E6,1632  139   INGTS       E6,1702  140   TMFI        E6,1745  137   SCRATCH     E7,1426  145   DELTATM     E7,1477  147   RPASS1
 E6,1633  139   RGIMTIMR    E6,1702  140   TMIS        E6,1745  138   ADRSDIF1    E7,1427  144   RPCRTIME    E7,1477  151   GAMMA
 E6,1634  139   CDUXD       E6,1705  140   NEXTIME     E6,1745  141   DAPTREG2    E7,1430  144   RPCRTQSW    E7,1477  154   SAVET-30
 E6,1634  140   DCDU        E6,1706  140   TTEMP       E6,1746  137   HALFARG     E7,1431  144   TNEWA       E7,1501  154   DELVCTL
 E6,1635  139   CDUYD       E6,1724  140   BRATE       E6,1746  137   JETRATER    E7,1433  145   DELVLVC     E7,1501  154   VGBODY
 E6,1635  207   DL116       E6,1724  140   COFSKEW     E6,1746  138   HH          E7,1433  145   DELVSLV     E7,1501  155   TGO1
 E6,1635  207   DL127       E6,1724  140   VECQTEMP    E6,1746  141   DAPTREG3    E7,1433  158   VHZC        E7,1502  151   OMEGA
 E6,1635  215   DL509       E6,1732  140   CAM         E6,1747  137   QRCNTR      E7,1441  145   TIG         E7,1505  147   VAPREC
 E6,1636  139   CDUZD       E6,1732  140   TM          E6,1747  141   DAPTREG4    E7,1443  145   RTARG       E7,1505  147   VPASS1
 E6,1636  207   DL117       E6,1734  140   AM          E6,1750  136   UERROR      E7,1451  145   DELLT4      E7,1505  150   VPASS4
 E6,1636  207   DL128       E6,1736  135   TEMP31      E6,1750  137   FUNCTION    E7,1451  145   HLROFF      E7,1507  154   DVTOTAL
 E6,1636  215   DL510       E6,1736  136   ABSEDOTP    E6,1750  141   DAPTREG5    E7,1453  145   TTOGO       E7,1511  154   GOBLTIME
 E6,1637  139   DELCDUX     E6,1736  136   ABSTJ       E6,1751  136   VERROR      E7,1455  145   WHICH       E7,1513  147   VACT2
 E6,1637  140   DELDCDU     E6,1736  136   ROTEMP1     E6,1751  138   E           E7,1456  145   LOSCOUNT    E7,1513  154   ABDVCONV
 E6,1640  139   DELCDUY     E6,1736  137   GTSTEMPS    E6,1751  141   DAPTREG6    E7,1456  157   OVFRET      E7,1515  154   DVCNTR
 E6,1640  140   DELDCDU1    E6,1736  137   K2THETA     E6,1752  141   DAPARUPT    E7,1457  146   AIG         E7,1516  154   TGO
 E6,1641  139   DELCDUZ     E6,1736  138   EDOTSQ      E6,1753  141   DAPLRUPT    E7,1460  146   AMG         E7,1520  154   R
 E6,1641  140   DELDCDU2    E6,1736  141   DAPTEMP1    E6,1754  142   DAPBQRPT    E7,1460  211   DL312       E7,1520  154   UNITGOBL
 E6,1642  139   OMEGAPD     E6,1737  136   ROTEMP2     E6,1756  142   DAPZRUPT    E7,1460  213   DL408       E7,1521  147   RPASS2
 E6,1643  139   OMEGAQD     E6,1737  138   ROTSENSE    E6,1760  142   AK          E7,1460  215   DL516       E7,1521  147   RPPREC
 E6,1643  207   DL121       E6,1737  141   DAPTEMP2    E6,1761  142   AK1         E7,1461  146   AOG         E7,1524  151   BVECTOR
 E6,1644  139   OMEGARD     E6,1740  136   POLYTEMP    E6,1762  142   AK2         E7,1462  146   MARKCTR     E7,1524  151   XPLANE
 E6,1644  207   DL122       E6,1740  137   KCENTRAL    E6,1763  142   EDRIVEX     E7,1462  146   TRKMKCNT    E7,1526  154   DELVREF
 E6,1645  140   ECDUW       E6,1740  137   SHFTFLAG    E6,1764  142   EDRIVEY     E7,1462  146   VSELECT     E7,1526  154   V
 E6,1645  140   ECDUWUSR    E6,1740  138   FIREFCT     E6,1765  142   EDRIVEZ     E7,1462  211   DL313       E7,1527  147   VPASS2
 E6,1645  140   MIS         E6,1740  141   DAPTEMP3    E6,1766  142   PJETCTR     E7,1462  213   DL409       E7,1527  147   VPPREC
 E6,1645  141   VEC1        E6,1741  136   TEMPNUM     E6,1767  142   UJETCTR     E7,1462  215   DL517       E7,1532  151   YPLANE
 E6,1646  140   QCDUWUSR    E6,1741  137   K2CNTRAL    E6,1770  142   VJETCTR     E7,1463  146   /AFC/       E7,1534  154   HCALC
 E6,1647  140   NDXCDUW     E6,1741  138   TTOAXIS     E6,1771  142   AGSK        E7,1463  146   NORMEX      E7,1535  147   RACT3
 E6,1650  140   FLAGOODW    E6,1741  141   DAPTEMP4    E6,1773  142   AZBIAS      E7,1464  146   QSAVED      E7,1536  154   UNIT/R/
 E6,1651  140   UNFC/2      E6,1742  136   NUMBERT     E6,1774  142   RCSFLAGS    E7,1465  146   FCODD       E7,1543  147   UNVEC
 E6,1653  141   VEC2        E6,1742  137   WCENTRAL    E6,1775  143   END-E6      E7,1465  146   RTRN        E7,1543  147   VACT3
 E6,1657  141   UNWC/2      E6,1742  141   DAPTEMP5    E7,1400  144   ATIGINC     E7,1466  146   NN          E7,1544  154   RN1
 E6,1665  141   UNFV/2      E6,1743  136   ROTINDEX    E7,1402  144   PTIGINC     E7,1467  146   FP          E7,1544  156   LANDTEMP
 E6,1665  141   UNFVX/2     E6,1743  137   ACENTRAL    E7,1404  144   AOTAZ       E7,1470  146   SUBEXIT     E7,1544  156   OURTEMPS
 E6,1667  141   COF         E6,1743  137   ININDEX     E7,1412  144   AOTEL       E7,1471  146   E7OVERLA    E7,1546  151   DELTAQ
 E6,1667  141   UNFVY/2     E6,1743  138   ADRSDIF2    E7,1420  144   LRHMAX      E7,1471  146   WHOCARES    E7,1550  151   WHATMARK
```

```
ERASABLE & EQUALS CROSS-REFERENCE TABLE SHOWING DEFINITION, PAGE OF DEFINITION, AND SYMBOL

   DEF     PAGE  SYMBOL       DEF     PAGE  SYMBOL       DEF     PAGE  SYMBOL       DEF     PAGE  SYMBOL       DEF     PAGE  SYMBOL

E7,1551   147   RPASS3     E7,1607   147   GAMPREV    E7,1642   156   TTF/8      E7,1675   150   RLMSRCH    E7,1731   152   SINTHETA
E7,1551   151   XYMARK     E7,1607   148   INTIME     E7,1642   160   XRANGE     E7,1675   151   IGRET      E7,1732   149   SS
E7,1552   151   MKDEX      E7,1607   156   RTNHOLD    E7,1644   155   NEWVEL     E7,1675   151   LGRET      E7,1732   158   LATVMETR
E7,1552   154   VN1        E7,1610   156   FWEIGHT    E7,1644   156   AZINCR1    E7,1675   151   RDRET      E7,1733   150   DATAGOOD
E7,1552   156   TTF/8TMP   E7,1611   147   DELDV      E7,1644   157   VDGVERT    E7,1675   155   P21BASER   E7,1733   152   RRTRUN
E7,1553   151   PLANVEC    E7,1611   147   TSTRT      E7,1644   160   ENGOFFDT   E7,1675   157   STILBADV   E7,1733   158   FORVMETR
E7,1554   156   ELINCR     E7,1612   156   PIF        E7,1645   156   ELINCR1    E7,1676   151   MX         E7,1733   213   DL410
E7,1556   156   AZINCR     E7,1613   147   CSIALRM    E7,1645   160   VGVECT     E7,1676   157   G-VBIASX   E7,1734   149   F
E7,1557   147   VPASS3     E7,1613   147   TITER      E7,1646   156   ZERLINA    E7,1677   157   G-VBIASY   E7,1734   150   OMEGAD
E7,1560   154   PIPTIME1   E7,1614   155   YSCREF     E7,1646   157   NIGNLOOP   E7,1700   149   VGPREV     E7,1734   150   OMEGDISP
E7,1560   156   KEEP-2     E7,1614   155   YSMD       E7,1647   148   VTIG       E7,1700   149   VGTIG      E7,1734   158   FORVEL
E7,1561   151   TSIGHT     E7,1614   156   PSEUDO55   E7,1647   156   ELVIRA     E7,1700   157   G-VBIASZ   E7,1735   152   RRSHAFT
E7,1562   154   CDF1/2     E7,1615   147   VERBNOUN   E7,1647   157   NGUIDSUB   E7,1701   157   VSURFACE   E7,1736   149   MDOT
E7,1562   156   TABLTTF    E7,1615   156   FC         E7,1650   156   LRPOS      E7,1703   150   VXRCM      E7,1736   150   NSRCHPNT
E7,1563   151   THETEST    E7,1616   147   RDOTV      E7,1652   155   NEWPOS     E7,1703   155   P21BASEV   E7,1736   158   TRUDELH
E7,1565   147   VACT4      E7,1616   148   ITCTR      E7,1652   157   VMEAS      E7,1704   151   MY         E7,1737   150   SAVLEMV
E7,1565   148   VTPRIME    E7,1617   156   TTHROT     E7,1653   160   TXO        E7,1706   149   VG         E7,1737   152   LRS22.1X
E7,1565   151   ESTER1     E7,1620   147   CENTANG    E7,1654   157   HMEAS      E7,1707   157   HCALCLAD   E7,1740   149   TDECAY
E7,1567   151   ESTER2     E7,1620   156   FCOLD      E7,1655   148   DELVSIN    E7,1711   150   LOSDESRD   E7,1740   152   RRBORSIT
E7,1570   154   DVCNTR1    E7,1621   156   E2DPS      E7,1655   149   IC         E7,1711   155   P21VEL     E7,1742   149   VEX
E7,1570   154   MASS1      E7,1621   156   OURPERMS   E7,1656   157   GNUR       E7,1711   157   HDOTLAD    E7,1742   767   2VEXHUST
E7,1570   160   1/DV0      E7,1621   156   WCHPHOLD   E7,1656   157   GNUV       E7,1712   151   MZ         E7,1744   149   IRETURN1
E7,1571   151   DELTHET    E7,1622   148   DELVIMU    E7,1656   157   VN2        E7,1713   155   P21GAM     E7,1745   152   R65CNTR
E7,1572   154   R1S        E7,1622   155   ZSCREF     E7,1660   155   LNCHTM     E7,1713   157   DALTRATE   E7,1746   152   N49FLAG
E7,1573   147   DELVCSI    E7,1622   155   ZSMD       E7,1662   155   TRANSTM    E7,1714   149   RMAG       E7,1746   152   RDOTMSAV
E7,1573   147   SECMAX     E7,1622   156   511CTR     E7,1663   148   DELVSAB    E7,1714   157   RUNITX     E7,1746   158   RODCOUNT
E7,1573   147   TDEC2      E7,1623   156   CNTTHROT   E7,1663   148   VGDISP     E7,1715   155   P21ALT     E7,1750   152   RDOTM
E7,1573   151   NCMKCNT    E7,1623   156   FLPASS0    E7,1664   155   NCSMVEL    E7,1715   157   RUNITY     E7,1750   152   THRDISP
E7,1573   156   TPIPOLD    E7,1624   156   TPIP       E7,1664   157   DELTAH     E7,1716   149   MUASTEER   E7,1752   152   GTCTIME
E7,1574   151   BODY       E7,1626   156   VGU        E7,1665   148   QTEMP1     E7,1716   157   RUNITZ     E7,1752   152   TANGNB
E7,1575   147   DELEL      E7,1630   148   TPASS4     E7,1665   148   SAVQR52    E7,1717   150   UXVECT     E7,1754   152   MKTIME
E7,1575   147   DELVTPI    E7,1630   155   END-ALIG   E7,1666   148   COZY4      E7,1717   157   DT         E7,1756   152   RM
E7,1575   147   DVPREV     E7,1630   155   RSUBL      E7,1666   157   FUNNYDSP   E7,1720   149   MU/A       E7,1756   158   RODSCAL1
E7,1575   147   KT         E7,1630   160   RCO        E7,1666   157   TREDES     E7,1720   151   SCALSHFT   E7,1757   158   LASTTPIP
E7,1577   147   DIFFALT    E7,1632   148   QTEMP      E7,1667   157   LOOKANGL   E7,1720   157   VVECTX     E7,1760   152   RANGRDOT
E7,1600   154   V1S        E7,1632   160   YCO        E7,1670   149   XXXALT     E7,1721   152   RXZ        E7,1761   158   THISTPIP
E7,1601   147   POSTCSI    E7,1633   148   TCSI       E7,1670   157   FOURPERM   E7,1722   149   RTMAG      E7,1762   149   TIGSAVE
E7,1603   147   HAFPA1     E7,1634   156   LAND       E7,1670   157   LRLCTR     E7,1722   158   PIPCTR1    E7,1762   151   XMKCNTR
E7,1603   147   POSTCDH    E7,1634   160   1/DV1      E7,1671   157   LRRCTR     E7,1722   158   VVECTY     E7,1762   153   P21TIME
E7,1605   147   DELTEEO    E7,1635   148   TTPI       E7,1672   149   UT         E7,1723   152   ULC        E7,1763   151   YMKCNTR
E7,1605   147   LOOPCT     E7,1636   155   UCSM       E7,1672   150   ERADM      E7,1724   149   R1C        E7,1763   158   OLDPIPAX
E7,1605   147   POSTTPI    E7,1636   160   1/DV2      E7,1672   157   LRMCTR     E7,1724   158   VVECTZ     E7,1764   149   TIGSAVEP
E7,1606   155   XSCREF     E7,1637   148   TTPI0      E7,1673   157   LRSCTR     E7,1725   150   UYVECT     E7,1764   153   SCAXIS
E7,1606   155   XSMD       E7,1640   160   1/DV3      E7,1674   150   INCORPEX   E7,1726   158   ALTRATE    E7,1764   158   OLDPIPAY
E7,1606   156   PIFPSET    E7,1641   148   RTIG       E7,1674   157   STILBADH   E7,1730   158   ALTITUDE   E7,1765   158   OLDPIPAZ
```

```
ERASABLE & EQUALS CROSS-REFERENCE TABLE SHOWING DEFINITION, PAGE OF DEFINITION, AND SYMBOL

   DEF   PAGE  SYMBOL          DEF  PAGE  SYMBOL         DEF  PAGE  SYMBOL         DEF  PAGE  SYMBOL         DEF  PAGE  SYMBOL

E7,1766   149  MUSCALE         4353 1388  UP21           4730   71  ACMODBIT       4732  136  QRBIT          4735   81  SURFFBIT
E7,1766   158  DELVROD         4354  515  OCT00012       4730   72  REFSMBIT       4732  282  REFTAG10       4735   83  FLAPBIT
E7,1766   159  TEMDELH         4354 1097  TEN            4730   74  NRMIDBIT       4732  283  REFTAG2        4735   86  LRINHBIT
E7,1772   153  POINTVSM        4503  480  ENDPINBF       4730   76  SNUFFBIT       4732 1097  EBANK4         4735   88  LRVELBIT
E7,1774   159  HCALC1          4607  541  ENDRMODF       4730   77  S32BIT3A       4732 1097  PRIO2          4735   89  DRIFTBIT
E7,1776   159  HMEASDL         4724 1504  1/.03          4730   79  IGNFLBIT       4732 1097  2K             4735 1282  SBIT8
E7,1777   160  END-E7          4725 1093  LIMITS         4730   81  NEWIBIT        4732 1282  SBIT11         4735 1328  IMUSEFLG
   4000    29  FFTAG1          4726   67  NEED2BIT       4730   82  P7071BIT       4733   68  FSPASBIT       4736   68  RNDVZBIT
   4000    29  FFTAG10         4726   69  NJETSBIT       4730   84  APSFLBIT       4733   69  R61FLBIT       4736   70  UPDATBIT
   4000    29  FFTAG11         4726   70  DRFTBIT        4730   85  HFAILBIT       4733   73  VFLAGBIT       4736   71  FTPIBIT
   4000    29  FFTAG12         4726   72  POOHBIT        4730   87  RCDUOBIT       4733   74  NWAITBIT       4736   73  CULTBIT
   4000    29  FFTAG13         4726   74  MRKIDBIT       4730   89  CSMDOCKD       4733   76  RNGSCBIT       4736   75  PRONVBIT
   4000    29  FFTAG2          4726   75  DSKYFBIT       4730  229  OCT10000       4733   78  GMBDRBIT       4736   76  ENGONBIT
   4000    29  FFTAG3          4726   77  S32BIT1        4730  793  FEXTRA         4733   79  NORMSBIT       4736   80  IDLEFBIT
   4000    29  FFTAG4          4726   79  ITSWBIT        4730 1097  PRIO10         4733   81  FLUNDBIT       4736   81  INFINBIT
   4000    29  FFTAG7          4726   80  RPQFLBIT       4730 1097  QUARTER        4733   83  FLRCSBIT       4736   83  ABTTGBIT
   4000    29  FFTAG8          4726   85  LRBYBIT        4730 1282  SBIT13         4733   86  NOLRRBIT       4736   84  REINTBIT
   4000    29  FFTAG9          4726   87  CDESBIT        4731   67  MOONBIT        4733   87  DESIGBIT       4736   86  VELDABIT
   4000    29  RADARFF         4726   89  PULSES         4731   69  RODFLBIT       4733   89  AORBTRAN       4736   88  RCDUFBIT
   4060   164  UPRPTB8         4726  531  REFTAG4        4731   71  LOSCMBIT       4733  136  PBIT           4736   90  RHCSCALE
   4101  1097  OCT60000        4726 1097  NEGMAX         4731   72  LUNABIT        4733  531  REFTAG3        4736  299  REFTAG5
   4144  1369  VERBMASK        4726 1097  VLOADCOD       4731   76  NOTHRBIT       4733 1097  PRIO1          4736  300  REFTAG7
   4172   467  PINSUPBT        4726 1282  SBIT15         4731   77  S32BIT3B       4733 1282  SBIT10         4736 1094  SUPER100
   4233   221  VOON34          4727   67  JSWCHBIT       4731   79  ASTNBIT        4734   68  P25FLBIT       4736 1282  SBIT7
   4274   471  ENDBLFF         4727   69  DIDFLBIT       4731   81  CMOONBIT       4734   71  IMPULBIT       4737   68  RRNBBIT
   4310  1071  FOURTEEN        4727   71  SRCHOBIT       4731   82  FLPCBIT        4734   73  RO4FLBIT       4737   70  NOUPFBIT
   4310  1071  OCT16           4727   72  GLOKFBIT       4731   85  VXINHBIT       4734   74  MRKNVBIT       4737   71  FINALBIT
   4311  1093  OCT11           4727   74  PRIODBIT       4731   87  ANTENBIT       4734   76  DMENFBIT       4737   73  ORBWFBIT
   4311  1097  NINE            4727   75  PDSPFBIT       4731   89  OURRCBIT       4734   79  RVSWBIT        4737   75  PINBRBIT
   4341  1008  FBANKMSK        4727   77  S32BIT2        4731  829  TTFSCALE       4734   83  LETABBIT       4737   76  3AXISBIT
   4341  1097  BANKMASK        4727   79  MANUFBIT       4731 1097  PRIO4          4734   86  XORFLBIT       4737   78  REDFLBIT
   4341  1283  -MAXADRS        4727   82  FLVRBIT        4731 1282  SBIT12         4734   88  ALTSCBIT       4737   80  V37FLBIT
   4342  1305  NOVACADR        4727   84  INTFLBIT       4732   45  MINCSM         4734   89  XOVINHIB       4737   81  ORDERBIT
   4343  1305  WILTCADR        4727   85  VFAILBIT       4732   68  P21FLBIT       4734  299  REFTAG6        4737   83  ROTFLBIT
   4345  1305  FVACCADR        4727   87  REMODBIT       4732   69  NOTERBIT       4734  300  REFTAG8        4737   88  LRPOSBIT
   4346   229  OCT30000        4727   89  USEQRJTS       4732   71  STEERBIT       4734 1282  SBIT9          4737   90  ULLAGER
   4346  1097  BIT13-14        4727  282  REFTAG9        4732   72  NOP07BIT       4734 1306  SPSCODE        4737  823  -AZBIT
   4346  1097  PRIO30          4727  283  REFTAG1        4732   74  MWAITBIT       4735   68  IMUSEBIT       4737 1282  SBIT6
   4347   476  B12-1           4727 1097  HALF           4732   76  R77FLBIT       4735   70  VEHUPBIT       4740   68  LOKONBIT
   4350  1283  S8BITS          4727 1097  POS1/2         4732   79  SWANDBIT       4735   71  XDELVBIT       4740   70  TRACKBIT
   4351  1097  OCT23           4727 1097  PRIO20         4732   81  LMOONBIT       4735   73  PRECIBIT       4740   71  AVFLBIT
   4352   393  DEC17           4727 1282  SBIT14         4732   82  FLPIBIT        4735   74  NRMNVBIT       4740   73  STATEBIT
   4352   442  OCT21           4730   41  HIRTHROT       4732   86  PSTHIBIT       4735   76  ZOOMBIT        4740   75  MRUPTBIT
   4353   785  ASTNDEX         4730   67  MIDFLBIT       4732   87  REPOSBIT       4735   78  MUNFLBIT       4740   76  AORBSYST
   4353  1097  OCT25           4730   69  ERADFBIT       4732   89  ACC4OR2X       4735   79  V67FLBIT       4740   80  AVEGFBIT
```

```
ERASABLE & EQUALS CROSS-REFERENCE TABLE SHOWING DEFINITION, PAGE OF DEFINITION, AND SYMBOL

 DEF  PAGE  SYMBOL       DEF  PAGE  SYMBOL       DEF  PAGE  SYMBOL       DEF  PAGE  SYMBOL          DEF  PAGE  SYMBOL

 4740   81  APSFSBIT     4743   70  GUESSBIT     4747 1388  UPDTPHAS     5272  200  ENDDAPT4        7770 1097  NEG1
 4740   83  QUITBIT      4743   72  CALC2BIT     4750  459  DSPMSK       5272  201  RCSMONEX        7770 1283  S-1
 4740   88  LRALTBIT     4743   73  D6OR9BIT     4750 1097  LOW3         5466 1370  LINUS        00,2000   29  DLAYJOB
 4740   90  D8SLECT2     4743   77  MGLVFBIT     4750 1283  S+7          5474  276  TERMEXTV     01,2000   29  LOADDAP1
 4740  619  HLITE        4743   78  AUXFLBIT     4750 1371  OCT7         5474  277  ENDEXTVB     01,2000   29  RESTART
 4740  744  OCT20        4743   80  V82EMBIT     4751  740  VB99DEX      5474 1369  ENDEXT       01,2000  250  PRDTTAB
 4740  745  LSTLIM       4743   82  INITABIT     4751 1097  NOUTCON      5636 1381  ABORT        01,2001  250  CADRTAB
 4740  823  +AZBIT       4743   83  MIDAVBIT     4752 1071  THIRTEEN     5652  244  NEG7         01,2016  250  2.2SPOT
 4740 1282  SBIT5        4743   85  CONTRLBT     4753  740  CNTDNDEX     5652 1283  S-7          01,2016  251  3.2SPOT
 4740 1409  CALLGMBL     4743   87  VFLSHBIT     4754  440  OCT30        5745  191  120MS        01,2016  254  6.2SPOT
 4741   63  NEEDLBIT     4743   88  AUTOMBIT     4755 1094  DEC27        5745 1328  BITS3&4      01,2342  308  V50N48
 4741   70  FRSTMBIT     4743   90  AUTRATE2     4756  740  VB97DEX      5745 1482  TWELVE       01,2522 1092  SW/
 4741   72  PFRATBIT     4743  740  BLANKDEX     4756 1094  DEC29        6000   29  FFTAG5       04,2000   29  CONICS1
 4741   73  INTYPBIT     4743  823  +ELBIT       4757  291  250MS+1      6000   29  FFTAG6       04,2000   29  E/PROG
 4741   75  NRUPTBIT     4743 1097  TWO          4757 1508  RATELIMI     6001  744  ?            04,2000   29  EPHEM2
 4741   77  NORRMBIT     4743 1282  S+2          4760 1508  RATEDB1      6010  221  V00N25       04,2000   29  KEYRUPT
 4741   80  LPLOCBIT     4743 1282  SBIT2        4762  316  MIXCON       6115 1305  OCT177       04,2000   29  ORBITAL3
 4741   82  COGAFBIT     4743 1385  UP72         4762 1283  CNTRCON      6130 1097  VLOAD*       04,2000   29  PINBALL4
 4741   83  FLT59BIT     4744   69  P66PROBT     4762 1328  BITS4&6      6133 1283  S-4          04,2000   29  R02
 4741   86  RNGEDBIT     4744   72  NODOBIT      4762 1430  40CYC        6263 1097  SIX          04,2000   29  R36LM
 4741   88  RRDATABT     4744   73  DIMOBIT      4762 1444  40CYCL       6263 1282  S+6          04,2000   29  UPDATE2
 4741   90  CBSELECT     4744   75  XDSPBIT      4765 1332  OCT62        6266  581  BIN3         04,2000   29  VERB37
 4741  243  OCT00010     4744   77  RENDWBIT     4766 1097  OCT120       6266 1097  LOW2         04,2000   30  AOTMARK2
 4741  829  TSCALINV     4744   79  ATTFLBIT     4767  885  BITS6+7      6266 1097  THREE        04,2054  462  MODROUTB
 4741 1097  EIGHT        4744   80  TFFSWBIT     4767 1097  OCT140       6266 1282  S+3          04,2440  245  FCADRMM1
 4741 1282  SBIT4        4744   82  360SWBIT     4767 1444  60MS         6266 1385  UP73         04,2472  246  PREMM1
 4741 1417  DSPLYALT     4744   83  AVEMDBIT     4770  393  1SECX        6512 1097  OCT30002     04,2525  246  DNLADMM1
 4742   68  FREEFBIT     4744   85  NPGNCSBT     4770  758  SEC01        6762 1023  Q+2          04,3037   38  LODP1/4
 4742   70  SLOPEBIT     4744   87  HFLSHBIT     4777  927  VB05N09      6763 1291  TCQ          04,3042 1183  BEE19
 4742   72  CALC3BIT     4744   88  TURNONBT     5000  234  STARTEB      7704 1097  OCT10001     04,3046 1183  BEE22
 4742   73  VINTFBIT     4744   90  AUTRATE1     5000 1097  EBANK3       7731  283  BIT14&11     04,3253 1244  2/3
 4742   75  MKOVBIT      4744  221  LAGSLIST     5000 1283  ERASCON6     7733  568  BIT12,14     04,3372 1386  UPPART2
 4742   77  SCLNSBIT     4744  823  -ELBIT       5000 1427  QGIMBITS     7737 1439  25/32        04,3522 1388  UPSTORE
 4742   78  NTARGBIT     4744 1097  ONE          5002   38  ERASID       7743 1097  B12T14       04,3564 1389  UPPART3
 4742   80  VERIFBIT     4744 1282  S+1          5003 1283  SLOBITS      7750  165  100MRUPT     04,3713 1391  UPOUT
 4742   83  MID1FBIT     4744 1282  SBIT1        5005 1431  BITS9,11     7750 1411  MS100        04,3714 1388  UPOUT4
 4742   86  R12RDBIT     4744 1385  UP71         5006 1097  EBANK6       7752  169  20MRUPT      05,2000   30  ABORTS1
 4742   88  RRRSBIT      4744 1430  1/10SEC      5011  904  BITSET       7761  548  -45DEGSP     05,2000   30  ASENT3
 4742   90  ACCSOKAY     4744 1444  1/10S        5011 1283  SBNK03       7761 1370  PINMASK      05,2000   30  DOWNTELM
 4742  619  VLITE        4745 1283  S-ZERO       5011 1427  RGIMBITS     7762  544  -BIT12       05,2000   30  EPHEM1
 4742 1097  FOUR         4746  247  DNLADP00     5015 1297  OCT14000     7762  993  MINB12       05,2000   30  FRANDRES
 4742 1282  S+4          4746 1282  S+ZERO       5016  191  OCT15000     7766 1283  S-3          05,2046  205  ORBMANUV
 4742 1282  SBIT3        4746 1385  UP70         5017  191  33RDMSK      7767 1283  S-2          05,2107  208  LMCSTA01
 4743   33  DELAYNUM     4747  234  NUMGRPS      5017  234  IM33INIT     7767 1305  MINUS2       05,2107  210  LMREND01
 4743   68  R10FLBIT     4747 1282  S+5          5146 1381  DOALARM      7770 1097  MINUS1       05,2107  214  LMLSAL01
```

```
ERASABLE & EQUALS CROSS-REFERENCE TABLE SHOWING DEFINITION, PAGE OF DEFINITION, AND SYMBOL

   DEF  PAGE  SYMBOL       DEF  PAGE  SYMBOL       DEF  PAGE  SYMBOL       DEF  PAGE  SYMBOL       DEF  PAGE  SYMBOL

05,2116  203  LMCSTA02  06,3277  203  5FAILTAB  13,2000   31  ORBITAL2  22,3543   38  DELRSPL   26,2000   34  BAWLANGS
05,2116  210  LMREND02  06,3307  203  6FAILTAB  13,2000   31  P50S2     22,3543  721  SPLRET    26,2000   34  MANUVER
05,2116  212  LMDSAS02  07,2000   30  AOTMARK1  13,2000   31  P76LOC    22,3710  868  OUTGOAVE  26,2000   34  MANUVER1
05,2116  214  LMLSAL02  07,2000   30  ASENT2    13,2717   38  ATOPOTH   23,2000   33  APOPERI   26,2000   34  PLANTIN1
05,2116  216  LMAGSI02  07,2000   30  MODESW    13,2772   38  ATOPTHIS  23,2000   33  ASENT7    26,2000   34  PLANTIN2
05,2125  203  LMCSTA03  07,3175 1328  IMUFIN20  13,3005   38  MOVATHIS  23,2000   33  EXTVB1    26,2000   34  P20S3
05,2125  210  LMREND03  07,3731 1327  OPTSTALL  13,3101   38  OTHPREC   23,2000   33  INFLIGHT  27,2000   34  ASENT1
05,2125  212  LMDSAS03  10,2000   30  DISPLAYS  13,3115   38  THISPREC  23,2000   33  INTPRET1  27,2000   34  P40S1
05,2125  214  LMLSAL03  10,2000   30  FLESHLOC  14,2000   32  ASENT4    23,2000   33  MEASINC   27,2000   34  SERV3
05,2125  216  LMAGSI03  10,2000   30  PHASETAB  14,2000   32  PHASTAB1  23,2000   33  MEASINC1  27,2000   34  TOF-FF
05,2134  208  LMCSTA04  10,2000   30  RTBCODES  14,2000   32  P50S1     23,2000   33  NORMLIZ   27,2000   34  TOF-FF1
05,2134  211  LMREND04  10,2000   30  SLCTMU    14,2000   32  RTBCODE1  23,2000   33  POWFLITE  27,2000   34  VECPT
05,2134  212  LMDSAS04  10,2317 1369  GCXDSP    14,2000   32  STARTAB   23,2000   33  POWFLIT1  27,3756 1279  TCDANZIG
05,2134  214  LMLSAL04  10,2323 1369  GOXDSPF   14,2515  932  S50       23,2000   33  P12A      30,2000   35  ASENT
05,2134  216  LMAGSI04  10,2342 1369  GCXDSPR   14,2620  934  R56       23,2000   33  RODTRAP   30,2000   35  ASENT5
05,2140  212  LMDSAS05  10,2345 1369  GOXDSPFR  14,3265  942  R54       23,2000   33  R61       30,2000   35  FCDUW
05,2140  216  LMAGSI05  10,3062 1369  GOAGIN    15,2000   32  EPHEM     23,2000   33  R62       30,2000   35  FLOGSUB
05,2144  209  LMCSTA10  10,3102 1370  GOPLAY    15,2000   32  P50S      23,2103  500  R62DISP   30,2000   35  LOWSUPER
05,2144  211  LMREND10  11,2000   30  F2DPS*11  15,2000   32  RRLEADIN  23,2335 1280  RPAD1     30,2000   35  P12
05,2145  215  LMLSAL09  11,2000   30  INTVEL    15,2000   32  R02BNK15  23,2453  852  SETXFLAG  30,2000   35  VB67A
05,2151  212  LMDSAS06  11,2000   30  ORBITAL   15,3646  983  LUNPOS    23,2474   38  HIDP1/4   30,3001  858  T2A
05,2151  214  LMLSAL06  11,2402  824  ELEACH    16,2000   32  DAPS1     23,2474  515  ONEB-2    30,3753  922  DAZMAX
05,2153  204  NOMDNLST  12,2000   31  CONICS    16,3573 1438  INDXYZ    23,2474 1280  TFF1/4    30,3755  922  DELFRLIM
05,2153  203  COSTALIN  12,2000   31  INTPRET2  17,2000   32  C13BANK   23,2476   38  HIUNITZ   31,2000   35  FTHROT
05,2207  211  LMREND05  12,2000   31  ORBITAL1  17,2000   32  DAPS2     23,2476   38  NB1NB2    31,2000   35  F2DPS*31
05,2207  214  LMSAL05   12,2000   38  LOUNITZ   17,2710 1450  ATTSTEER  23,2476   38  THISAXIS  31,2000   35  VB67
05,2213  211  LMREND06  12,2002   38  LOUNITY   17,3136 1444  14MS      23,2500   38  HIUNITY   31,3407  811  GDUMP1
05,2213  213  LMDSAS09  12,2004   38  LOOPHALF  20,2000   32  DAPS3     23,2502   38  HIOPHALF  31,3420  811  DISPEX66
05,2215  215  LMLSAL08  12,2004   38  LOUNITX   20,2000   32  LOADDAP   23,2502   38  HIUNITX   31,3420  811  ENDLLJOB
05,2221  210  RENDEZVU  12,2004 1099  HALFDP    21,2000   32  ABTFLGS   23,2502  613  COS60DEG  32,2000   35  A8DRTS
05,2277  212  DESC/ASC  12,2004 1134  DP1/2     21,2000   32  DAPS4     23,2502 1098  DPHALF    32,2000   35  F2DPS*32
05,2353  214  SURFALIN  12,2004 1146  181       21,2000   32  MANUR     23,2504   38  HI6ZEROS  32,2000   35  LRS22
05,2414  204  AGSLIST   12,2006   38  LO6ZEROS  21,2000   32  MIDOGIM1  23,2504  613  ZERO/SP   32,2000   35  P20S4
05,2414  204  UPDNLIST  12,2006 1099  ZEROOP    21,2000   32  ORBITAL5  23,2504 1155  ZEROO     32,2000   35  P40S4
05,2414  216  AGSI/UPD  12,2006 1135  2DZERO    21,2000   32  P50S3     23,2504 1280  TFFZEROS  32,2000   35  P66LOC
06,2000   30  AOTMARK3  12,2006 1183  KEPZERO   21,2000   32  R10       24,2000   33  ORBITAL4  32,2000   35  R47
06,2000   30  EARTHLOC  12,2006 1244  DPZERO    21,2000   32  R11       24,2000   33  PLANTIN   32,2000   35  SERV
06,2000   30  IMUCOMP   12,2017   38  RMM       22,2000   33  KALCMON1  24,2000   33  P20S      33,2000   35  ASENT6
06,2000   30  RCSMONT   12,2017 1199  LDPOSMAX  22,2000   33  KALCMON2  24,2000   33  S40BNK    33,2000   35  R29/SERV
06,2000   30  T4RUP     12,2021   38  RME       22,2000   33  LANDCNST  24,2000  507  PROG22    33,2000   35  SERVICES
06,2703  190  ICDUFAIL  12,3765 1244  DQUARTER  22,2000   33  MIDOGIM   25,2000   33  DRSAMP    33,3052  858  100CS
06,2703  190  IMUFAIL   12,3765 1244  POS1/4    22,2000   33  RENDEZ    25,2000   33  PLANTIN3  33,3433  891  ENDVDAT
06,3167  198  ENDRRMON  13,2000   31  INTINIT   22,2000   33  R30LOC    25,2000   33  P20S1     34,2000   35  ASCFILT
06,3167  199  CAPT4S    13,2000   31  LATLONG   22,2000   33  SERV2     25,2000   33  P20S2     34,2000   35  ASENT8
06,3213  202  RCSMONIT  13,2000   31  LEMGEOM   22,2744  376  LOCSKIRT  25,2000   33  RADARUPT  34,2000   35  CSI/CDH1
```

```
ERASABLE & EQUALS CROSS-REFFRENCE TABLE SHOWING DEFINITION, PAGE OF DEFINITION, AND SYMBOL

   DEF   PAGE  SYMBOL         DEF   PAGE  SYMBOL         DEF   PAGE  SYMBOL         DEF   PAGE  SYMBOL         DEF   PAGE  SYMBOL

34,2000   35   P30S1       36,2057  758   ACADN85     37,2000   37   P05P06      40,3351  458   ENDECVN     42,2000   37   PINBALL3
34,2000   35   R12STUEF    36,2107  744   SERVCADR    37,2000   37   R31         40,3543  465   ENDRELOS    42,2000   37   SBAND
34,2000   35   SERV4       36,2150  728   P12SPOT     37,2000   37   SERV1       40,3572  472   ENDBSUB1    42,3617  451   ENDHMSS
34,2000   36   F2DPS*34    36,2150  728   P42SPOT     37,3543  960   PIPSRINE    40,3572 1291   DSPMMJOB    43,2000   37   EXTVERBS
35,2000   36   CSI/CDH     36,2153  728   P63SPOT     40,2000   37   PINBALL1    40,3737  486   ENDPINS1    43,2000   37   SELFCHEC
35,2000   36   P30S        36,2776  740   V99RECYC    40,2000   37   PINSUPER    41,2000   37   PINBALL2    43,2002  481   PINTEST
35,2000   36   P40S2       37,2000   37   IMUSUPER    40,2000   37   R31LOC      41,2647  430   ENDRTOUT    43,2234  282   OPTCOARV
35,2000   36   P40S3       37,2000   37   IMU2        40,2000   37   SBAND40     41,3302  445   ENDRUTIN    43,3040  300   V74
36,2000   37   P40S        37,2000   37   IMU4        40,2000   37   SELFSUPR    41,3777  484   ENDPINS2    43,3077  302   GOSHOSUM
```

```
SUMMARY OF SYMBOL TABLE LISTINGS

           4930  DEFINED NORMALLY

           2281  DEFINED BY EQUALS
           ----

TOTAL:     7211
```

```
MEMORY TYPE & AVAILABILITY DISPLAY

   0000 TO    0057  SPECIAL OR NONEXISTENT MEMORY           32,3721 TO 32,3777  AVAILABLE SWITCHABLE FIXED MEMORY
                                                            33,2000 TO 33,3577  RESERVED SWITCHABLE FIXED MEMORY
              0060  AVAILABLE ERASABLE MEMORY               33,3600 TO 33,3777  AVAILABLE SWITCHABLE FIXED MEMORY
   0061 TO    1377  RESERVED ERASABLE MEMORY                34,2000 TO 34,3667  RESERVED SWITCHABLE FIXED MEMORY
                                                            34,3670 TO 34,3777  AVAILABLE SWITCHABLE FIXED MEMORY
E3,1400 TO E4,1770  RESERVED SWITCHABLE ERASABLE MEMORY     35,2000 TO 35,3745  RESERVED SWITCHABLE FIXED MEMORY
E4,1771 TO E4,1777  AVAILABLE SWITCHABLE ERASABLE MEMORY    35,3746 TO 35,3777  AVAILABLE SWITCHABLE FIXED MEMORY
E5,1400 TO E5,1641  RESERVED SWITCHABLE ERASABLE MEMORY     36,2000 TO 36,3761  RESERVED SWITCHABLE FIXED MEMORY
E5,1642 TO E5,1777  AVAILABLE SWITCHABLE ERASABLE MEMORY    36,3762 TO 36,3777  AVAILABLE SWITCHABLE FIXED MEMORY
E6,1400 TO E6,1774  RESERVED SWITCHABLE ERASABLE MEMORY     37,2000 TO 37,3775  RESERVED SWITCHABLE FIXED MEMORY
E6,1775 TO E6,1777  AVAILABLE SWITCHABLE ERASABLE MEMORY    37,3776 TO 37,3777  AVAILABLE SWITCHABLE FIXED MEMORY
E7,1400 TO E7,1744  RESERVED SWITCHABLE ERASABLE MEMORY     40,2000 TO 40,3771  RESERVED SWITCHABLE FIXED MEMORY
E7,1745 TO E7,1777  AVAILABLE SWITCHABLE ERASABLE MEMORY    40,3772 TO 40,3777  AVAILABLE SWITCHABLE FIXED MEMORY
                                                            41,2000 TO 43,3744  RESERVED SWITCHABLE FIXED MEMORY
   4000 TO    5773  RESERVED FIXED MEMORY                   43,3745 TO 43,3777  AVAILABLE SWITCHABLE FIXED MEMORY
   5774 TO    5777  AVAILABLE FIXED MEMORY
   6000 TO    7777  RESERVED FIXED MEMORY                   44,2000 TO 57,3777  SPECIAL OR NONEXISTENT MEMORY

00,2000 TO 01,3777  RESERVED SWITCHABLE FIXED MEMORY        60,2000 TO 67,3777  AVAILABLE SWITCHABLE FIXED MEMORY

02,2000 TO 03,3777  SPECIAL OR NONEXISTENT MEMORY           70,2000 TO 73,3777  SPECIAL OR NONEXISTENT MEMORY

04,2000 TO 04,3775  RESERVED SWITCHABLE FIXED MEMORY
04,3776 TO 04,3777  AVAILABLE SWITCHABLE FIXED MEMORY
05,2000 TO 07,3771  RESERVED SWITCHABLE FIXED MEMORY
07,3772 TO 07,3777  AVAILABLE SWITCHABLE FIXED MEMORY
10,2000 TO 10,3775  RESERVED SWITCHABLE FIXED MEMORY
10,3776 TO 10,3777  AVAILABLE SWITCHABLE FIXED MEMORY
11,2000 TO 16,3775  RESERVED SWITCHABLE FIXED MEMORY
16,3776 TO 16,3777  AVAILABLE SWITCHABLE FIXED MEMORY
17,2000 TO 20,3753  RESERVED SWITCHABLE FIXED MEMORY
20,3754 TO 20,3777  AVAILABLE SWITCHABLE FIXED MEMORY
21,2000 TO 21,3732  RESERVED SWITCHABLE FIXED MEMORY
21,3733 TO 21,3777  AVAILABLE SWITCHABLE FIXED MEMORY
22,2000 TO 22,3776  RESERVED SWITCHABLE FIXED MEMORY
           22,3777  AVAILABLE SWITCHABLE FIXED MEMORY
23,2000 TO 23,3763  RESERVED SWITCHABLE FIXED MEMORY
23,3764 TO 23,3777  AVAILABLE SWITCHABLE FIXED MEMORY
24,2000 TO 25,3773  RESERVED SWITCHABLE FIXED MEMORY
25,3774 TO 25,3777  AVAILABLE SWITCHABLE FIXED MEMORY
26,2000 TO 30,3763  RESERVED SWITCHABLE FIXED MEMORY
30,3764 TO 30,3777  AVAILABLE SWITCHABLE FIXED MEMORY
31,2000 TO 31,3775  RESERVED SWITCHABLE FIXED MEMORY
31,3776 TO 31,3777  AVAILABLE SWITCHABLE FIXED MEMORY
32,2000 TO 32,3720  RESERVED SWITCHABLE FIXED MEMORY
```

```
ROUTINE: COUNT DATA FOR ROUTINE'S LAST REACH:TOTAL:CUMUL        ROUTINE: COUNT DATA FOR ROUTINE'S LAST REACH:TOTAL:CUMUL

             REF   0 LAST      TO   29:     5     5     5      04/CONIC   REF   3 LAST 1184 TO 1187:    65   110  4244
 $$/P41      REF   1 LAST  752 TO  753:    10    10    15      04/INTIN   REF   2 LAST 1222 TO 1223:    47    51  4295
 BANKSUM     REF   1 LAST   29 TO   39:    55    55    70      04/KEYUP   REF   1 LAST 1335 TO 1351:    75    75  4370
 00/DELAY    REF   1 LAST 1374 TO 1376:    32    32   102      04/LT-LG   REF   1 LAST   47 TO   47:     4     4  4374

 00/INTER    REF   1 LAST 1045 TO 1085:   974   974  1076      04/MARK    REF   1 LAST  260 TO  261:    32    32  4406
 01/EXEC     REF   1 LAST 1104 TO 1114:   279   279  1355      04/PIN     REF   2 LAST  479 TO  479:     7    16  4422
 01/INTFP    REF   1 LAST 1085 TO 1093:   157   157  1512      04/P00     REF   1 LAST  236 TO  247:   335   335  4757
 01/RSROU    REF   3 LAST 1304 TO 1306:    52   165  1677      04/P07     REF   2 LAST  384 TO  385:     5    32  4789

 01/RSTAB    REF   1 LAST  250 TO  255:   138   138  1815      04/P27     REF   1 LAST 1386 TO 1394:   257   257  5046
 01/P03      REF   2 LAST  306 TO  309:    92    94  1909      04/P57     REF   1 LAST  981 TO  983:    12    12  5058
 01/WAIT     REF   2 LAST 1129 TO 1131:    43   188  2097      04/R02     REF   1 LAST 1329 TO 1332:    17    17  5075
 02/ALARM    REF   2 LAST 1379 TO 1381:    81   110  2207      04/R36     REF   1 LAST  704 TO  706:    77    77  5152

 02/BANK     REF   1 LAST  996 TO 1000:    76    76  2283      05/DLIST   REF   1 LAST  204 TO  218:   263   263  5415
 02/DAPT6    REF   1 LAST 1401 TO 1402:    13    18  2301      05/DPROG   REF   1 LAST  989 TO  996:   183   183  5598
 02/DSPLA    REF   1 LAST 1351 TO 1351:    16    16  2317      05/FPHFM   REF   2 LAST  985 TO  989:     0    52  5650
 02/EXEC     REF   2 LAST 1114 TO 1117:     6    74  2391      05/P70     REF   1 LAST  832 TO  834:    56    56  5706

 02/EXIVB    REF   1 LAST 1377 TO 1378:     4     4  2395      05/START   REF   2 LAST  222 TO  235:   483   484  6190
 02/FCONS    REF   1 LAST 1093 TO 1095:    64    64  2459      06/ICOMP   REF   1 LAST  338 TO  351:   282   282  6472
 02/FLAG     REF   1 LAST 1372 TO 1374:    32    32  2491      06/LUROT   REF   1 LAST 1145 TO 1147:     9     9  6481
 02/IMODE    REF   1 LAST 1306 TO 1307:     5     5  2496      06/T4RCS   REF   1 LAST  202 TO  204:    69    69  6550

 02/INTER    REF   1 LAST 1100 TO 1101:    32    32  2528      06/T4RPT   REF   2 LAST  166 TO  202:   641   651  7201
 02/PHASE    REF   1 LAST 1295 TO 1297:    71    71  2599      07/IMODE   REF   1 LAST 1307 TO 1329:   585   585  7786
 02/PIN      REF   5 LAST  479 TO  482:    37   239  2838      07/MARK    REF   2 LAST  265 TO  275:   295   427  8213
 02/P07      REF   1 LAST  393 TO  395:    18    18  2856      07/R58     REF   1 LAST  959 TO  961:    58    58  8271

 02/RRSUB    REF   1 LAST  536 TO  542:    68    68  2924      10/DSPLA   REF   3 LAST 1379 TO 1379:     9   694  8965
 02/RSROU    REF   2 LAST 1303 TO 1304:    10    17  2941      10/MIDG    REF   1 LAST  696 TO  698:    24    24  8989
 02/RUPTS    REF   1 LAST  163 TO  165:    54    54  2995      10/PHASE   REF   1 LAST 1297 TO 1299:    66    66  9055
 02/TRAN     REF   1 LAST 1376 TO 1377:    15    15  3010      10/POWFL   REF   1 LAST 1262 TO 1268:   115   115  9170

 02/T4PPT    REF   1 LAST  165 TO  166:    12    12  3022      10/PTB     REF   1 LAST 1394 TO 1401:   130   130  9300
 02/WAIT     REF   2 LAST 1127 TO 1129:    24    78  3100      11/F2DPS   REF   1 LAST  822 TO  824:    65    65  9365
 03/DAP      REF   1 LAST 1457 TO 1459:     2     2  3102      11/INITV   REF   1 LAST  689 TO  695:   194   194  9559
 03/FCONS    REF   1 LAST 1095 TO 1098:    32    32  3134      11/ORBIT   REF   1 LAST 1225 TO 1246:   829   829 10388

 03/INTER    REF   3 LAST 1012 TO 1045:   732   952  4086      12/CONIC   REF   3 LAST 1187 TO 1206:   502   986 11374
 03/KILL     REF   1 LAST  745 TO  745:     8     8  4094      12/ICONS   REF   1 LAST 1099 TO 1100:    19    19 11393
 03/PHASE    REF   1 LAST 1299 TO 1300:     4     4  4098      13/GEOM    REF   1 LAST  332 TO  336:    79    79 11472
 03/PIN      REF   1 LAST  461 TO  461:     7     7  4105      13/INTIN   REF   5 LAST 1220 TO 1222:    74   595 12067

 03/P00      REF   1 LAST  235 TO  236:    14    14  4119      13/LT-LG   REF   1 LAST 1131 TO 1138:   155   155 12222
 03/P20      REF   1 LAST  613 TO  614:     5     5  4124      13/ORBIT   REF   1 LAST   48 TO   48:    20    20 12242
 03/P40      REF   1 LAST   41 TO   41:     1     1  4125      13/P76     REF   1 LAST  711 TO  716:   117   117 12359
 03/R2[illegible]      REF   1 LAST  531 TO  531:     9     9  4134      14/INFLT   REF   1 LAST  945 TO  946:     0     0 12359
```

```
ROUTINE: COUNT DATA FOR ROUTINE'S LAST REACH:TOTAL:CUMUL         ROUTINE: COUNT DATA FOR ROUTINE'S LAST REACH:TOTAL:CUMUL

14/LOSAM     REF   2 LAST  932 TO  934:    67     75 12434       22/MIDG      REF   1 LAST  695 TO  695:     2      2 19095
14/PHASE     REF   1 LAST 1291 TO 1295:     9      9 12443       22/R30       REF   2 LAST  716 TO  723:   199    203 19298
14/P51       REF   1 LAST  946 TO  950:   127    127 12570       22/SERV      REF   1 LAST  867 TO  869:    23     23 19321
14/P57       REF   1 LAST  972 TO  972:    31     31 12601       22/SR30S     REF   1 LAST  723 TO  726:    62     62 19383

14/R50       REF   1 LAST  944 TO  945:    54     54 12655       23/ASENT     REF   1 LAST  852 TO  853:    17     17 19400
14/R51       REF   1 LAST  938 TO  942:   137    137 12792       23/EXTVB     REF   1 LAST  283 TO  284:    33     33 19433
14/R52       REF   1 LAST  952 TO  955:    74     74 12866       23/GEOM      REF   1 LAST  336 TO  338:    34     34 19467
14/R54       REF   1 LAST  943 TO  944:    25     25 12891       23/ICONS     REF   1 LAST 1098 TO 1099:    16     16 19483

14/R55       REF   1 LAST  942 TO  943:    25     25 12916       23/INCOR     REF   2 LAST 1151 TO 1155:   196    334 19817
14/R56       REF   1 LAST  934 TO  938:   131    131 13047       23/INFLT     REF   1 LAST 1246 TO 1256:   184    184 20001
14/STARS     REF   1 LAST   49 TO   53:   223    223 13270       23/PERAP     REF   1 LAST  698 TO  704:    78     78 20079
15/EPHEM     REF   1 LAST  983 TO  985:    73     73 13343       23/POWFL     REF   1 LAST 1256 TO 1262:   159    159 20238

15/P52       REF   1 LAST  924 TO  932:   171    171 13514       23/R61       REF   1 LAST  533 TO  536:   143    143 20381
15/P57       REF   4 LAST  972 TO  981:   235    537 14051       23/R62       REF   1 LAST  500 TO  501:    11     11 20392
15/RLEAD     REF   1 LAST  505 TO  507:    55     55 14106       24/INTIN     REF   1 LAST 1223 TO 1225:     7      7 20399
15/R59       REF   2 LAST  955 TO  959:   139    294 14400       24/LPS20     REF   1 LAST  583 TO  585:    47     47 20446

16/DAP       REF   1 LAST 1468 TO 1470:    60     60 14460       24/LUROT     REF   1 LAST 1139 TO 1142:    63     63 20509
16/DAPID     REF   1 LAST 1407 TO 1412:   143    143 14603       24/P20       REF   2 LAST  510 TO  517:   276    306 20815
16/DAPP      REF   1 LAST 1419 TO 1440:   737    787 15390       24/P21       REF   1 LAST  658 TO  664:   123    123 20938
17/DAPQR     REF   1 LAST 1440 TO 1457:   624    624 16014       24/P22       REF   2 LAST  523 TO  524:     5      5 20943

17/DAPTJ     REF   1 LAST 1459 TO 1468:   315    315 16329       24/P25       REF   1 LAST  518 TO  520:    37     37 20980
17/DAPT6     REF   2 LAST 1402 TO 1403:     5     39 16368       24/R21       REF   1 LAST  524 TO  528:   162    162 21142
20/DAPAO     REF   4 LAST 1495 TO 1506:   355    698 17066       24/R22       REF   1 LAST  520 TO  523:   146    146 21288
20/DAPIF     REF   1 LAST 1403 TO 1407:    74     74 17140       24/R23       REF   1 LAST  528 TO  530:    41     41 21329

20/NEEDL     REF   1 LAST 1412 TO 1419:   156    156 17296       24/R24       REF   2 LAST  531 TO  533:    16     38 21367
20/R03       REF   1 LAST  304 TO  306:    73     73 17369       25/LPS20     REF   1 LAST  585 TO  588:    12     12 21379
21/ALARM     REF   1 LAST 1381 TO 1385:    16     16 17385       25/LUROT     REF   1 LAST 1142 TO 1144:    68     68 21447
21/DAPAO     REF   1 LAST 1484 TO 1484:     8      8 17393       25/RRUPT     REF   3 LAST  618 TO  620:    33    302 21749

21/DAPBU     REF   1 LAST 1506 TO 1506:    32     32 17475       25/RSUB      REF   2 LAST  579 TO  583:    77    657 22406
21/DAPGT     REF   1 LAST 1470 TO 1484:   388    388 17863       26/BALL      REF   1 LAST  492 TO  496:    50     50 22456
21/INTIN     REF   1 LAST 1220 TO 1220:     4      4 17867       26/LRS24     REF   1 LAST  608 TO  613:   173    173 22629
21/MIDG      REF   1 LAST  695 TO  696:    28     28 17895       26/LSR22     REF   1 LAST  595 TO  608:   532    532 23161

21/P70       REF   2 LAST  837 TO  837:    16     30 17925       26/LUROT     REF   3 LAST 1144 TO 1145:    26     67 23228
21/R10       REF   2 LAST  895 TO  907:   335    341 18266       26/R06       REF   1 LAST  488 TO  492:   107    107 23335
21/R11       REF   1 LAST  831 TO  832:    56     56 18322       26/R63       REF   1 LAST  351 TO  363:    65     65 23400
21/S52.1     REF   1 LAST  950 TO  951:    25     25 18347       27/ASENT     REF   2 LAST  856 TO  858:    21     37 23437

21/S52.3     REF   1 LAST  951 TO  952:    16     16 18363       27/KILL      REF   1 LAST  745 TO  748:    38     38 23475
22/F2DPS     REF   1 LAST  830 TO  831:    10     10 18373       27/P12       REF   1 LAST   46 TO   46:     4      4 23479
22/INCOR     REF   1 LAST 1155 TO 1172:    50     50 18423       27/P40       REF   2 LAST  748 TO  750:    83     93 23572
22/KALC      REF   1 LAST  363 TO  332:   670    670 19093       27/P70       REF   1 LAST   40 TO   40:     8      8 23580
```

```
ROUTINE: COUNT DATA FOR ROUTINE'S LAST REACH:TOTAL:CUMUL        ROUTINE: COUNT DATA FOR ROUTINE'S LAST REACH:TOTAL:CUMUL

27/SERV        REF    1 LAST  869 TO  870:    31     31 23611      34/P6567       REF    1 LAST  787 TO  789:    45     45 29352
27/S40.1       REF    1 LAST  760 TO  764:   101    101 23712      34/S30S        REF    1 LAST  622 TO  627:    47     47 29399
27/S40.2       REF    1 LAST  764 TO  765:    28     28 23740      35/P30         REF    1 LAST  620 TO  622:    28     28 29427
27/S40.6       REF    1 LAST  777 TO  780:    40     40 23780      35/P3272       REF    1 LAST  627 TO  633:   119    119 29546

27/S40.8       REF    1 LAST  765 TO  768:    63     63 23843      35/P3373       REF    1 LAST  633 TO  638:   140    140 29686
27/S40.9       REF    2 LAST  772 TO  777:   200    202 24045      35/P3474       REF    1 LAST  664 TO  669:   118    118 29804
27/S41.1       REF    1 LAST  780 TO  781:     4      4 24049      35/P3575       REF    2 LAST  669 TO  689:   524    538 30342
27/TFF         REF    2 LAST 1268 TO 1282:   266    268 24317      35/P40         REF    2 LAST  743 TO  744:    27     52 30394

27/VECPT       REF    1 LAST  496 TO  500:   136    136 24453      36/P40         REF    6 LAST  755 TO  760:   156    770 31164
27/40.13       REF    1 LAST  768 TO  772:   107    107 24560      36/P41         REF    1 LAST  750 TO  752:    80     80 31244
30/ASENT       REF    2 LAST  846 TO  852:   312    314 24874      36/P42         REF    1 LAST  753 TO  753:    22     22 31266
30/EXTVB       REF    1 LAST  616 TO  618:    47     47 24921      36/P47         REF    1 LAST  753 TO  755:    52     52 31318

30/FCDUW       REF    1 LAST  907 TO  924:   446    446 25367      37/P05         REF    1 LAST 1333 TO 1335:    32     32 31350
30/P12         REF    1 LAST  839 TO  842:   150    150 25517      37/P06         REF    1 LAST 1332 TO 1333:    47     47 31397
31/EXTVB       REF    1 LAST  614 TO  616:    93     93 25610      37/P07         REF    3 LAST  395 TO  410:   267    587 31984
31/F2DPS       REF    4 LAST  824 TO  830:   150    717 26327      37/SERV        REF    2 LAST  873 TO  876:    76    171 32155

31/R13         REF    1 LAST  797 TO  799:    58     58 26385      40/PIN         REF   10 LAST  485 TO  488:    57    939 33094
31/THROT       REF    2 LAST  789 TO  794:   146    151 26536      40/R31         REF    1 LAST  706 TO  711:   204    204 33298
32/F2DPS       REF    2 LAST  815 TO  822:   231    232 26768      41/EXTVB       REF    1 LAST  311 TO  316:    63     63 33361
32/LRS22       REF    2 LAST  588 TO  595:   153    157 26925      41/PIN         REF    8 LAST  482 TO  485:    82   1012 34373

32/P20         REF    1 LAST  508 TO  510:   103    103 27028      42/EXTVB       REF    2 LAST  299 TO  300:    28     43 34416
32/P63         REF    1 LAST  781 TO  787:   186    186 27214      42/NOUNS       REF    1 LAST  316 TO  332:   601    601 35017
32/P70         REF    2 LAST  837 TO  839:    24    139 27353      42/PIN         REF    2 LAST  449 TO  452:    92    238 35255
32/R47         REF    1 LAST  218 TO  222:   134    134 27487      42/R05         REF    2 LAST  501 TO  505:   114    116 35371

32/SERV        REF    1 LAST  870 TO  871:    32     32 27519      42/R33         REF    1 LAST  287 TO  288:    27     27 35398
33/ASENT       REF    1 LAST  858 TO  860:    44     44 27563      43/EXTVB       REF    6 LAST  309 TO  311:    60    498 35896
33/SERV        REF    8 LAST  894 TO  895:    16    887 28450      43/PHASE       REF    1 LAST 1291 TO 1291:    14     14 35910
34/ASENT       REF    2 LAST  853 TO  856:   140    184 28634      43/P27         REF    1 LAST 1385 TO 1386:    11     11 35921

34/CSI         REF    1 LAST  638 TO  656:   650    650 29284      43/R0477       REF    1 LAST  288 TO  292:   172    172 36093
34/P12         REF    1 LAST  842 TO  844:    23     23 29307      43/SELF        REF    1 LAST 1282 TO 1291:   314    314 36407
```

```
PARAGRAPHS GENERATED FOR THIS ASSEMBLY; ADDRESS LIMITS AND THE MANUFACTURING LOCATION CODE ARE SHOWN FOR EACH

    4000  TO     4377      PARAGRAPH # 010          ROPE MODULE 1, SIDE A, SENSE LINE SET  5 (WIRES  65- 80)
    4400  TO     4777      PARAGRAPH # 011          ROPE MODULE 1, SIDE B, SENSE LINE SET  5 (WIRES  65- 80)
    5000  TO     5377      PARAGRAPH # 012          ROPE MODULE 1, SIDE A, SENSE LINE SET  6 (WIRES  81- 96)
    5400  TO     5777      PARAGRAPH # 013          ROPE MODULE 1, SIDE B, SENSE LINE SET  6 (WIRES  81- 96)
    6000  TO     6377      PARAGRAPH # 014          ROPE MODULE 1, SIDE A, SENSE LINE SET  7 (WIRES  97-112)
    6400  TO     6777      PARAGRAPH # 015          ROPE MODULE 1, SIDE B, SENSE LINE SET  7 (WIRES  97-112)
    7000  TO     7377      PARAGRAPH # 016          ROPE MODULE 1, SIDE A, SENSE LINE SET  8 (WIRES 113-128)
    7400  TO     7777      PARAGRAPH # 017          ROPE MODULE 1, SIDE B, SENSE LINE SET  8 (WIRES 113-128)
 00,2000  TO  00,2377      PARAGRAPH # 020          ROPE MODULE 1, SIDE A, SENSE LINE SET  1 (WIRES   1- 16)
 00,2400  TO  00,2777      PARAGRAPH # 021          ROPE MODULE 1, SIDE B, SENSE LINE SET  1 (WIRES   1- 16)
 00,3000  TO  00,3377      PARAGRAPH # 022          ROPE MODULE 1, SIDE A, SENSE LINE SET  2 (WIRES  17- 32)
 00,3400  TO  00,3777      PARAGRAPH # 023          ROPE MODULE 1, SIDE B, SENSE LINE SET  2 (WIRES  17- 32)
 01,2000  TO  01,2377      PARAGRAPH # 024          ROPE MODULE 1, SIDE A, SENSE LINE SET  3 (WIRES  33- 48)
 01,2400  TO  01,2777      PARAGRAPH # 025          ROPE MODULE 1, SIDE B, SENSE LINE SET  3 (WIRES  33- 48)
 01,3000  TO  01,3377      PARAGRAPH # 026          ROPE MODULE 1, SIDE A, SENSE LINE SET  4 (WIRES  49- 64)
 01,3400  TO  01,3777      PARAGRAPH # 027          ROPE MODULE 1, SIDE B, SENSE LINE SET  4 (WIRES  49- 64)

 04,2000  TO  04,2377      PARAGRAPH # 040          ROPE MODULE 1, SIDE A, SENSE LINE SET  9 (WIRES 129-144)
 04,2400  TO  04,2777      PARAGRAPH # 041          ROPE MODULE 1, SIDE B, SENSE LINE SET  9 (WIRES 129-144)
 04,3000  TO  04,3377      PARAGRAPH # 042          ROPE MODULE 1, SIDE A, SENSE LINE SET 10 (WIRES 145-160)
 04,3400  TO  04,3777      PARAGRAPH # 043          ROPE MODULE 1, SIDE B, SENSE LINE SET 10 (WIRES 145-160)
 05,2000  TO  05,2377      PARAGRAPH # 044          ROPE MODULE 1, SIDE A, SENSE LINE SET 11 (WIRES 161-176)
 05,2400  TO  05,2777      PARAGRAPH # 045          ROPE MODULE 1, SIDE B, SENSE LINE SET 11 (WIRES 161-176)
 05,3000  TO  05,3377      PARAGRAPH # 046          ROPE MODULE 1, SIDE A, SENSE LINE SET 12 (WIRES 177-192)
 05,3400  TO  05,3777      PARAGRAPH # 047          ROPE MODULE 1, SIDE B, SENSE LINE SET 12 (WIRES 177-192)
 06,2000  TO  06,2377      PARAGRAPH # 050          ROPE MODULE 2, SIDE A, SENSE LINE SET  1 (WIRES   1- 16)
 06,2400  TO  06,2777      PARAGRAPH # 051          ROPE MODULE 2, SIDE B, SENSE LINE SET  1 (WIRES   1- 16)
 06,3000  TO  06,3377      PARAGRAPH # 052          ROPE MODULE 2, SIDE A, SENSE LINE SET  2 (WIRES  17- 32)
 06,3400  TO  06,3777      PARAGRAPH # 053          ROPE MODULE 2, SIDE B, SENSE LINE SET  2 (WIRES  17- 32)
 07,2000  TO  07,2377      PARAGRAPH # 054          ROPE MODULE 2, SIDE A, SENSE LINE SET  3 (WIRES  33- 48)
 07,2400  TO  07,2777      PARAGRAPH # 055          ROPE MODULE 2, SIDE B, SENSE LINE SET  3 (WIRES  33- 48)
 07,3000  TO  07,3377      PARAGRAPH # 056          ROPE MODULE 2, SIDE A, SENSE LINE SET  4 (WIRES  49- 64)
 07,3400  TO  07,3777      PARAGRAPH # 057          ROPE MODULE 2, SIDE B, SENSE LINE SET  4 (WIRES  49- 64)
 10,2000  TO  10,2377      PARAGRAPH # 060          ROPE MODULE 2, SIDE A, SENSE LINE SET  5 (WIRES  65- 80)
 10,2400  TO  10,2777      PARAGRAPH # 061          ROPE MODULE 2, SIDE B, SENSE LINE SET  5 (WIRES  65- 80)
 10,3000  TO  10,3377      PARAGRAPH # 062          ROPE MODULE 2, SIDE A, SENSE LINE SET  6 (WIRES  81- 96)
 10,3400  TO  10,3777      PARAGRAPH # 063          ROPE MODULE 2, SIDE B, SENSE LINE SET  6 (WIRES  81- 96)
 11,2000  TO  11,2377      PARAGRAPH # 064          ROPE MODULE 2, SIDE A, SENSE LINE SET  7 (WIRES  97-112)
 11,2400  TO  11,2777      PARAGRAPH # 065          ROPE MODULE 2, SIDE B, SENSE LINE SET  7 (WIRES  97-112)
 11,3000  TO  11,3377      PARAGRAPH # 066          ROPE MODULE 2, SIDE A, SENSE LINE SET  8 (WIRES 113-128)
 11,3400  TO  11,3777      PARAGRAPH # 067          ROPE MODULE 2, SIDE B, SENSE LINE SET  8 (WIRES 113-128)
 12,2000  TO  12,2377      PARAGRAPH # 070          ROPE MODULE 2, SIDE A, SENSE LINE SET  9 (WIRES 129-144)
 12,2400  TO  12,2777      PARAGRAPH # 071          ROPE MODULE 2, SIDE B, SENSE LINE SET  9 (WIRES 129-144)
 12,3000  TO  12,3377      PARAGRAPH # 072          ROPE MODULE 2, SIDE A, SENSE LINE SET 10 (WIRES 145-160)
```

```
PARAGRAPHS GENERATED FOR THIS ASSEMBLY; ADDRESS LIMITS AND THE MANUFACTURING LOCATION CODE ARE SHOWN FOR EACH

12,3400  TO 12,3777      PARAGRAPH # 073          ROPE MODULE 2, SIDE B, SENSE LINE SET 10 (WIRES 145-160)
13,2000  TO 13,2377      PARAGRAPH # 074          ROPE MODULE 2, SIDE A, SENSE LINE SET 11 (WIRES 161-176)
13,2400  TO 13,2777      PARAGRAPH # 075          ROPE MODULE 2, SIDE B, SENSE LINE SET 11 (WIRES 161-176)
13,3000  TO 13,3377      PARAGRAPH # 076          ROPE MODULE 2, SIDE A, SENSE LINE SET 12 (WIRES 177-192)
13,3400  TO 13,3777      PARAGRAPH # 077          ROPE MODULE 2, SIDE B, SENSE LINE SET 12 (WIRES 177-192)
14,2000  TO 14,2377      PARAGRAPH # 100          ROPE MODULE 3, SIDE A, SENSE LINE SET  1 (WIRES   1- 16)
14,2400  TO 14,2777      PARAGRAPH # 101          ROPE MODULE 3, SIDE B, SENSE LINE SET  1 (WIRES   1- 16)
14,3000  TO 14,3377      PARAGRAPH # 102          ROPE MODULE 3, SIDE A, SENSE LINE SET  2 (WIRES  17- 32)
14,3400  TO 14,3777      PARAGRAPH # 103          ROPE MODULE 3, SIDE B, SENSE LINE SET  2 (WIRES  17- 32)
15,2000  TO 15,2377      PARAGRAPH # 104          ROPE MODULE 3, SIDE A, SENSE LINE SET  3 (WIRES  33- 48)
15,2400  TO 15,2777      PARAGRAPH # 105          ROPE MODULE 3, SIDE B, SENSE LINE SET  3 (WIRES  33- 48)
15,3000  TO 15,3377      PARAGRAPH # 106          ROPE MODULE 3, SIDE A, SENSE LINE SET  4 (WIRES  49- 64)
15,3400  TO 15,3777      PARAGRAPH # 107          ROPE MODULE 3, SIDE B, SENSE LINE SET  4 (WIRES  49- 64)
16,2000  TO 16,2377      PARAGRAPH # 110          ROPE MODULE 3, SIDE A, SENSE LINE SET  5 (WIRES  65- 80)
16,2400  TO 16,2777      PARAGRAPH # 111          ROPE MODULE 3, SIDE B, SENSE LINE SET  5 (WIRES  65- 80)
16,3000  TO 16,3377      PARAGRAPH # 112          ROPE MODULE 3, SIDE A, SENSE LINE SET  6 (WIRES  81- 96)
16,3400  TO 16,3777      PARAGRAPH # 113          ROPE MODULE 3, SIDE B, SENSE LINE SET  6 (WIRES  81- 96)
17,2000  TO 17,2377      PARAGRAPH # 114          ROPE MODULE 3, SIDE A, SENSE LINE SET  7 (WIRES  97-112)
17,2400  TO 17,2777      PARAGRAPH # 115          ROPE MODULE 3, SIDE B, SENSE LINE SET  7 (WIRES  97-112)
17,3000  TO 17,3377      PARAGRAPH # 116          ROPE MODULE 3, SIDE A, SENSE LINE SET  8 (WIRES 113-128)
17,3400  TO 17,3777      PARAGRAPH # 117          ROPE MODULE 3, SIDE B, SENSE LINE SET  8 (WIRES 113-128)
20,2000  TO 20,2377      PARAGRAPH # 120          ROPE MODULE 3, SIDE A, SENSE LINE SET  9 (WIRES 129-144)
20,2400  TO 20,2777      PARAGRAPH # 121          ROPE MODULE 3, SIDE B, SENSE LINE SET  9 (WIRES 129-144)
20,3000  TO 20,3377      PARAGRAPH # 122          ROPE MODULE 3, SIDE A, SENSE LINE SET 10 (WIRES 145-160)
20,3400  TO 20,3777      PARAGRAPH # 123          ROPE MODULE 3, SIDE B, SENSE LINE SET 10 (WIRES 145-160)
21,2000  TO 21,2377      PARAGRAPH # 124          ROPE MODULE 3, SIDE A, SENSE LINE SET 11 (WIRES 161-176)
21,2400  TO 21,2777      PARAGRAPH # 125          ROPE MODULE 3, SIDE B, SENSE LINE SET 11 (WIRES 161-176)
21,3000  TO 21,3377      PARAGRAPH # 126          ROPE MODULE 3, SIDE A, SENSE LINE SET 12 (WIRES 177-192)
21,3400  TO 21,3777      PARAGRAPH # 127          ROPE MODULE 3, SIDE B, SENSE LINE SET 12 (WIRES 177-192)
22,2000  TO 22,2377      PARAGRAPH # 130          ROPE MODULE 4, SIDE A, SENSE LINE SET  1 (WIRES   1- 16)
22,2400  TO 22,2777      PARAGRAPH # 131          ROPE MODULE 4, SIDE B, SENSE LINE SET  1 (WIRES   1- 16)
22,3000  TO 22,3377      PARAGRAPH # 132          ROPE MODULE 4, SIDE A, SENSE LINE SET  2 (WIRES  17- 32)
22,3400  TO 22,3777      PARAGRAPH # 133          ROPE MODULE 4, SIDE B, SENSE LINE SET  2 (WIRES  17- 32)
23,2000  TO 23,2377      PARAGRAPH # 134          ROPE MODULE 4, SIDE A, SENSE LINE SET  3 (WIRES  33- 48)
23,2400  TO 23,2777      PARAGRAPH # 135          ROPE MODULE 4, SIDE B, SENSE LINE SET  3 (WIRES  33- 48)
23,3000  TO 23,3377      PARAGRAPH # 136          ROPE MODULE 4, SIDE A, SENSE LINE SET  4 (WIRES  49- 64)
23,3400  TO 23,3777      PARAGRAPH # 137          ROPE MODULE 4, SIDE B, SENSE LINE SET  4 (WIRES  49- 64)
24,2000  TO 24,2377      PARAGRAPH # 140          ROPE MODULE 4, SIDE A, SENSE LINE SET  5 (WIRES  65- 80)
24,2400  TO 24,2777      PARAGRAPH # 141          ROPE MODULE 4, SIDE B, SENSE LINE SET  5 (WIRES  65- 80)
24,3000  TO 24,3377      PARAGRAPH # 142          ROPE MODULE 4, SIDE A, SENSE LINE SET  6 (WIRES  81- 96)
24,3400  TO 24,3777      PARAGRAPH # 143          ROPE MODULE 4, SIDE B, SENSE LINE SET  6 (WIRES  81- 96)
25,2000  TO 25,2377      PARAGRAPH # 144          ROPE MODULE 4, SIDE A, SENSE LINE SET  7 (WIRES  97-112)
25,2400  TO 25,2777      PARAGRAPH # 145          ROPE MODULE 4, SIDE B, SENSE LINE SET  7 (WIRES  97-112)
25,3000  TO 25,3377      PARAGRAPH # 146          ROPE MODULE 4, SIDE A, SENSE LINE SET  8 (WIRES 113-128)
25,3400  TO 25,3777      PARAGRAPH # 147          ROPE MODULE 4, SIDE B, SENSE LINE SET  8 (WIRES 113-128)
```

```
PARAGRAPHS GENERATED FOR THIS ASSEMBLY; ADDRESS LIMITS AND THE MANUFACTURING LOCATION CODE ARE SHOWN FOR EACH

26,2000  TO 26,2377      PARAGRAPH # 150          ROPE MODULE 4, SIDE A, SENSE LINE SET  9 (WIRES 129-144)
26,2400  TO 26,2777      PARAGRAPH # 151          ROPE MODULE 4, SIDE B, SENSE LINE SET  9 (WIRES 129-144)
26,3000  TO 26,3377      PARAGRAPH # 152          ROPE MODULE 4, SIDE A, SENSE LINE SET 10 (WIRES 145-160)
26,3400  TO 26,3777      PARAGRAPH # 153          ROPE MODULE 4, SIDE B, SENSE LINE SET 10 (WIRES 145-160)
27,2000  TO 27,2377      PARAGRAPH # 154          ROPE MODULE 4, SIDE A, SENSE LINE SET 11 (WIRES 161-176)
27,2400  TO 27,2777      PARAGRAPH # 155          ROPE MODULE 4, SIDE B, SENSE LINE SET 11 (WIRES 161-176)
27,3000  TO 27,3377      PARAGRAPH # 156          ROPE MODULE 4, SIDE A, SENSE LINE SET 12 (WIRES 177-192)
27,3400  TO 27,3777      PARAGRAPH # 157          ROPE MODULE 4, SIDE B, SENSE LINE SET 12 (WIRES 177-192)
30,2000  TO 30,2377      PARAGRAPH # 160          ROPE MODULE 5, SIDE A, SENSE LINE SET  1 (WIRES   1- 16)
30,2400  TO 30,2777      PARAGRAPH # 161          ROPE MODULE 5, SIDE B, SENSE LINE SET  1 (WIRES   1- 16)
30,3000  TO 30,3377      PARAGRAPH # 162          ROPE MODULE 5, SIDE A, SENSE LINE SET  2 (WIRES  17- 32)
30,3400  TO 30,3777      PARAGRAPH # 163          ROPE MODULE 5, SIDE B, SENSE LINE SET  2 (WIRES  17- 32)
31,2000  TO 31,2377      PARAGRAPH # 164          ROPE MODULE 5, SIDE A, SENSE LINE SET  3 (WIRES  33- 48)
31,2400  TO 31,2777      PARAGRAPH # 165          ROPE MODULE 5, SIDE B, SENSE LINE SET  3 (WIRES  33- 48)
31,3000  TO 31,3377      PARAGRAPH # 166          ROPE MODULE 5, SIDE A, SENSE LINE SET  4 (WIRES  49- 64)
31,3400  TO 31,3777      PARAGRAPH # 167          ROPE MODULE 5, SIDE B, SENSE LINE SET  4 (WIRES  49- 64)
32,2000  TO 32,2377      PARAGRAPH # 170          ROPE MODULE 5, SIDE A, SENSE LINE SET  5 (WIRES  65- 80)
32,2400  TO 32,2777      PARAGRAPH # 171          ROPE MODULE 5, SIDE B, SENSE LINE SET  5 (WIRES  65- 80)
32,3000  TO 32,3377      PARAGRAPH # 172          ROPE MODULE 5, SIDE A, SENSE LINE SET  6 (WIRES  81- 96)
32,3400  TO 32,3777      PARAGRAPH # 173          ROPE MODULE 5, SIDE B, SENSE LINE SET  6 (WIRES  81- 96)
33,2000  TO 33,2377      PARAGRAPH # 174          ROPE MODULE 5, SIDE A, SENSE LINE SET  7 (WIRES  97-112)
33,2400  TO 33,2777      PARAGRAPH # 175          ROPE MODULE 5, SIDE B, SENSE LINE SET  7 (WIRES  97-112)
33,3000  TO 33,3377      PARAGRAPH # 176          ROPE MODULE 5, SIDE A, SENSE LINE SET  8 (WIRES 113-128)
33,3400  TO 33,3777      PARAGRAPH # 177          ROPE MODULE 5, SIDE B, SENSE LINE SET  8 (WIRES 113-128)
34,2000  TO 34,2377      PARAGRAPH # 200          ROPE MODULE 5, SIDE A, SENSE LINE SET  9 (WIRES 129-144)
34,2400  TO 34,2777      PARAGRAPH # 201          ROPE MODULE 5, SIDE B, SENSE LINE SET  9 (WIRES 129-144)
34,3000  TO 34,3377      PARAGRAPH # 202          ROPE MODULE 5, SIDE A, SENSE LINE SET 10 (WIRES 145-160)
34,3400  TO 34,3777      PARAGRAPH # 203          ROPE MODULE 5, SIDE B, SENSE LINE SET 10 (WIRES 145-160)
35,2000  TO 35,2377      PARAGRAPH # 204          ROPE MODULE 5, SIDE A, SENSE LINE SET 11 (WIRES 161-176)
35,2400  TO 35,2777      PARAGRAPH # 205          ROPE MODULE 5, SIDE B, SENSE LINE SET 11 (WIRES 161-176)
35,3000  TO 35,3377      PARAGRAPH # 206          ROPE MODULE 5, SIDE A, SENSE LINE SET 12 (WIRES 177-192)
35,3400  TO 35,3777      PARAGRAPH # 207          ROPE MODULE 5, SIDE B, SENSE LINE SET 12 (WIRES 177-192)
36,2000  TO 36,2377      PARAGRAPH # 210          ROPE MODULE 6, SIDE A, SENSE LINE SET  1 (WIRES   1- 16)
36,2400  TO 36,2777      PARAGRAPH # 211          ROPE MODULE 6, SIDE B, SENSE LINE SET  1 (WIRES   1- 16)
36,3000  TO 36,3377      PARAGRAPH # 212          ROPE MODULE 6, SIDE A, SENSE LINE SET  2 (WIRES  17- 32)
36,3400  TO 36,3777      PARAGRAPH # 213          ROPE MODULE 6, SIDE B, SENSE LINE SET  2 (WIRES  17- 32)
37,2000  TO 37,2377      PARAGRAPH # 214          ROPE MODULE 6, SIDE A, SENSE LINE SET  3 (WIRES  33- 48)
37,2400  TO 37,2777      PARAGRAPH # 215          ROPE MODULE 6, SIDE B, SENSE LINE SET  3 (WIRES  33- 48)
37,3000  TO 37,3377      PARAGRAPH # 216          ROPE MODULE 6, SIDE A, SENSE LINE SET  4 (WIRES  49- 64)
37,3400  TO 37,3777      PARAGRAPH # 217          ROPE MODULE 6, SIDE B, SENSE LINE SET  4 (WIRES  49- 64)
40,2000  TO 40,2377      PARAGRAPH # 220          ROPE MODULE 6, SIDE A, SENSE LINE SET  5 (WIRES  65- 80)
40,2400  TO 40,2777      PARAGRAPH # 221          ROPE MODULE 6, SIDE B, SENSE LINE SET  5 (WIRES  65- 80)
40,3000  TO 40,3377      PARAGRAPH # 222          ROPE MODULE 6, SIDE A, SENSE LINE SET  6 (WIRES  81- 96)
40,3400  TO 40,3777      PARAGRAPH # 223          ROPE MODULE 6, SIDE B, SENSE LINE SET  6 (WIRES  81- 96)
41,2000  TO 41,2377      PARAGRAPH # 224          ROPE MODULE 6, SIDE A, SENSE LINE SET  7 (WIRES  97-112)
```

```
PARAGRAPHS GENERATED FOR THIS ASSEMBLY; ADDRESS LIMITS AND THE MANUFACTURING LOCATION CODE ARE SHOWN FOR EACH

41,2400  TO 41,2777     PARAGRAPH # 225         ROPE MODULE 6, SIDE B, SENSE LINE SET  7 (WIRES  97-112)
41,3000  TO 41,3377     PARAGRAPH # 226         ROPE MODULE 6, SIDE A, SENSE LINE SET  8 (WIRES 113-128)
41,3400  TO 41,3777     PARAGRAPH # 227         ROPE MODULE 6, SIDE B, SENSE LINE SET  8 (WIRES 113-128)
42,2000  TO 42,2377     PARAGRAPH # 230         ROPE MODULE 6, SIDE A, SENSE LINE SET  9 (WIRES 129-144)
42,2400  TO 42,2777     PARAGRAPH # 231         ROPE MODULE 6, SIDE B, SENSE LINE SET  9 (WIRES 129-144)
42,3000  TO 42,3377     PARAGRAPH # 232         ROPE MODULE 6, SIDE A, SENSE LINE SET 10 (WIRES 145-160)
42,3400  TO 42,3777     PARAGRAPH # 233         ROPE MODULE 6, SIDE B, SENSE LINE SET 10 (WIRES 145-160)
43,2000  TO 43,2377     PARAGRAPH # 234         ROPE MODULE 6, SIDE A, SENSE LINE SET 11 (WIRES 161-176)
43,2400  TO 43,2777     PARAGRAPH # 235         ROPE MODULE 6, SIDE B, SENSE LINE SET 11 (WIRES 161-176)
43,3000  TO 43,3377     PARAGRAPH # 236         ROPE MODULE 6, SIDE A, SENSE LINE SET 12 (WIRES 177-192)
43,3400  TO 43,3777     PARAGRAPH # 237         ROPE MODULE 6, SIDE B, SENSE LINE SET 12 (WIRES 177-192)
```

```
OCTAL LISTING FOR PARAGRAPH # 010,  WITH PARITY BIT IN BINARY AT THE RIGHT OF EACH WORD, "@" DENOTES UNUSED FIXED MEMORY

ALL VALID WORDS ARE BASIC INSTRUCTIONS EXCEPT THOSE MARKED "I" (INTERPRETIVE OPERATOR WORDS) OR "C" (CONSTANTS)

  4000        00004 0      34054 1      56006 1      12671 1      52011 0      00006 1      34056 0      52006 0
  4010        52011 0      00006 1      31263 1      52006 0      52011 0      34057 1      56006 1      13412 1
  4020        52011 0      34064 1      56006 1      12000 1      52011 0      34060 0      56006 1      13257 0
  4030        52011 0      34061 1      56006 1      12354 0      52011 0      34060 0      56006 1      13302 1

  4040        52011 0      34062 1      56006 1      13507 1      52011 0      34063 0      56006 1      13157 0
  4050        52011 0      34065 0      56006 1      12302 0   C: 12103 0   C: 02117 1   C: 36106 0   C: 02103 1
  4060     C: 10100 1   C: 16107 0   C: 12100 0   C: 52107 0   C: 14106 0   C: 22107 1   C: 04025 1   C: 10003 0
  4070     C: 14031 0   C: 20033 0   C: 24017 1   C: 30036 1   C: 34034 1   C: 40023 1   C: 44035 1   C: 50037 0

  4100     C: 54000 0   C: 60000 1      00004 0      00006 1      00004 0      54001 1      00006 1      06004 0
  4110        00006 1      14115 1      00006 1      00004 0      54001 1      44724 0      60001 0      00006 1
  4120        14103 0      00006 1      00003 1      00002 0      34144 1      71021 1      00006 1      14131 1
  4130        04132 0      31017 0      54023 1      30023 0      04607 1   C: 62366 0      34746 0      55012 1

  4140        31021 0      04246 0      04143 0      05146 1   C: 37600 0      22007 0      54123 0      34727 1
  4150        71020 0      61011 0      10000 0      00002 0      34744 1      60002 0      55036 1      23021 0
  4160        04175 0      34172 1      56006 1      00006 1      04007 1      55037 0      34172 1      00006 1
  4170        01007 1      02020 1   C: 62101 0      53037 0      05167 1      34726 0      55020 0      00002 0

  4200        22002 0      04211 1      04215 0      30001 0      75003 0      60004 0      55041 1      05124 0
  4210        05146 1      11041 1      04220 0      00002 0      04220 0      11042 1      04220 0      00002 0
  4220        05626 0   C: 31206 1      34172 1      00006 1      01007 1      34233 1      55012 1      44351 0
  4230        54776 0      04626 1   C: 61477 1   C: 00042 1      34172 1      00006 1      01007 1      34245 0

  4240        55012 1      44351 0      54776 0      04626 1   C: 61471 1   C: 00041 1      74750 0      54123 0
  4250        34727 1      71020 0      61011 0      10000 0      00002 0      24002 0      10123 0      14261 1
  4260        00002 0      22002 0      34273 0      56006 1      00006 1      04007 1      52131 0      34172 1
  4270        00006 1      01007 1      03543 0   C: 60101 1      55016 0      54003 0      74350 1      65000 1

  4300        54145 0      00002 0      31016 1      14275 1      54003 0      74350 1      65000 1      00002 0
  4310     C: 00016 0   C: 00011 1   C: 00004 0      54020 1      40020 1      40020 1      40020 1      40020 1
  4320        56020 0      00002 0      54022 0      40022 0      40022 0      40022 0      40022 0      56022 1
  4330        00002 0      60000 1      60000 1      60000 1      60000 1      60000 1      00002 0   C: 00037 0

  4340     C: 01740 0   C: 76000 0      05063 1      05205 0      05263 0      05076 0   C: 30000 1   C: 03777 0
  4350     C: 00377 1   C: 00023 0   C: 00021 1   C: 00025 0   C: 00012 1      34736 1      00006 1      05011 1
  4360        00002 0      44736 0      00006 1      03011 1      00002 0      34740 0      00006 1      05011 1
  4370        00002 0      00006 1      30025 0      52014 0      00002 0      00006 1      30156 0      20156 1
```

```
OCTAL LISTING FOR PARAGRAPH # 011,  WITH PARITY BIT IN BINARY AT THE RIGHT OF EACH WORD, "@" DENOTES UNUSED FIXED MEMORY

ALL VALID WORDS ARE BASIC INSTRUCTIONS EXCEPT THOSE MARKED "I" (INTERPRETIVE OPERATOR WORDS) OR "C" (CONSTANTS)

  4400        60154 1     26154 0     54007 1     00002 0     54162 0     00002 0     54135 1     10000 0
  4410        30135 0     17331 0     14410 1     44746 1     54154 0     54155 1     54156 1     00002 0
  4420        34737 0     00006 1     05011 1     00002 0     44737 1     00006 1     03011 1     00002 0
  4430        44435 0     60002 0     60004 0     04626 1  C: 10670 1  C: 02003 0     22007 0     54123 0

  4440        34727 1     71020 0     61011 0     10000 0     14446 1     14155 0     24002 0     14430 0
  4450        56002 0     54144 1     44727 0     00004 0     71020 0     55020 0     11042 1     04461 0
  4460        04464 0     34746 0     57042 0     05130 0     00003 1     44740 1     00006 1     03011 1
  4470        34746 0     55011 1     00144 0     56002 0     54144 1     11042 1     04500 0     04464 0

  4500        34746 0     55011 1     00144 0     00006 1     64506 0     14507 0     40000 0     50002 0
  4510        60000 1     00006 1     66762 1     16760 1     00006 1     50002 0     50000 1     30001 0
  4520        24002 0     52062 1     22002 0     34731 0     70110 0     10000 0     14541 1     30061 0
  4530        04503 0  C: 66161 1     00001 0     34553 0     60062 0     04503 0  C: 64420 0     00001 0

  4540        04551 1     34554 1     60062 0     04503 0  C: 65673 0     00001 0     30061 0     04503 0
  4550     C: 51615 1     50001 0     00001 0  C: 00765 0  C: 16450 1     34744 1     71300 1     10000 0
  4560        00002 0     34735 1     54001 1     34606 0     70110 0     00006 1     14572 1     34741 1
  4570        70110 0     10000 0     30001 0     61035 0     70001 1     00006 1     16763 1     31035 0

  4600        00006 1     06001 0     74724 0     64726 0     55035 1     00002 0  C: 10102 0     52134 0
  4610        50002 0     30000 1     24002 0     54001 1     22004 0     75003 0     56002 0     52134 0
  4620        50002 0     02000 0     56134 1     56004 0     56134 1     00133 0     56002 0     50000 1
  4630        30000 1     54004 1     75003 0     56002 0     50002 0     12000 1     35003 1     70133 1

  4640        60134 1     00002 0     54135 1     56004 0     00006 1     04007 1     56135 0     75003 0
  4650        56001 0     00004 0     00006 1     01007 1     50001 0     32000 0     56135 0     00006 1
  4660        01007 1     00003 1     54004 1     30135 0     00002 0     52073 1     50002 0     30000 1
  4670        24002 0     54001 1     22004 0     75003 0     56002 0     52073 1     50002 0     02000 0

  4700        56073 0     56004 0     56073 0     00072 1     54164 0     34735 1     54023 1     30006 1
  4710        54165 1     50002 0     30000 1     54004 1     75003 0     56002 0     56164 1     14634 0
  4720        00006 1     01007 1     00002 0  C: 37777 1  C: 37777 1  C: 57777 1  C: 40000 0  C: 20000 0
  4730     C: 10000 0  C: 04000 0  C: 02000 0  C: 01000 0  C: 00400 0  C: 00200 0  C: 00100 0  C: 00040 0

  4740     C: 00020 0  C: 00010 0  C: 00004 0  C: 00002 0  C: 00001 0  C: 77777 0  C: 00000 1  C: 00005 1
  4750     C: 00007 0  C: 00013 0  C: 00015 0  C: 00017 1  C: 00030 1  C: 00033 1  C: 00035 1  C: 00032 0
  4760     C: 00045 0  C: 00046 0  C: 00050 1  C: 00055 1  C: 00060 1  C: 00062 0  C: 00120 1  C: 00140 1
  4770     C: 00144 0  C: 00310 0  C: 00401 1  C: 00454 1  C: 00620 0  C: 00777 0  C: 01124 1  C: 01211 1
```

```
OCTAL LISTING FOR PARAGRAPH # 012,  WITH PARITY BIT IN BINARY AT THE RIGHT OF EACH WORD, "@" DENOTES UNUSED FIXED MEMORY

ALL VALID WORDS ARE BASIC INSTRUCTIONS EXCEPT THOSE MARKED "1" (INTERPRETIVE OPERATOR WORDS) OR "C" (CONSTANTS)

   5000      C: 01400 1   C: 01426 0   C: 01776 0   C: 01777 1   C: 02177 1   C: 02400 1   C: 03000 1   C: 03400 0
   5010      C: 05000 1   C: 06000 1   C: 07000 0   C: 11000 1   C: 13000 0   C: 14000 1   C: 15000 0   C: 16000 0
   5020      C: 17000 1   C: 17770 1   C: 21000 1      64727 1      55075 0      15027 0      41075 0      60000 1
   5030         55075 0      15042 0      57075 1      51075 1      64725 0      40000 0      61075 1      55075 0

   5040         15042 0      15060 0      00006 1      71075 0      55076 0      00006 1      74776 1      67760 1
   5050         00006 1      71076 0      67740 0      00006 1      71075 0      20001 1      55075 0      00002 0
   5060         50000 1      44725 1      00002 0      00004 0      65155 0      54063 0      00006 1      50002 0
   5070         30001 0      52066 0      35154 1      56004 0      54061 1      12631 0      00004 0      54063 0

   5100         00006 1      50002 0      30001 0      52066 0      35154 1      56004 0      12605 1      56002 0
   5110         67767 0      56002 0      15103 1      22002 0      35154 1      56006 1      12712 0      40164 0
   5120         54001 1      35154 1      54006 0      12711 0      54164 0      35154 1      54004 1      13002 1
   5130         00004 0      54065 0      44743 1      26002 1      35154 1      56004 0      13027 0      00004 0

   5140         54063 0      35154 1      56006 1      54165 1      30002 0      13076 1      35154 1      54004 1
   5150         13107 0      30061 0      54004 1      16762 0   C: 02605 0   C: 00110 1      30167 1      77746 1
   5160         65155 0      56167 1      74775 1      10000 0      50000 1      54000 0      00002 0      56001 0
   5170         00006 1      01007 1      54006 0      00001 0   C: 77677 1      00004 0      54001 1      34724 1

   5200         26002 1      30006 1      00006 1      04007 1      56001 0      00004 0      56002 0      54061 1
   5210         00006 1      50061 0      30001 0      54063 0      35222 0      56006 1      13234 0      52062 1
   5220         64743 0      52006 0   C: 02063 0      50002 0      30000 1      24002 0      56002 0      54063 0
   5230         30006 1      00006 1      04007 1      54001 1      35237 1      54061 1      15214 1      15261 0

   5240      C: 72535 1   C: 73714 1      10076 1      15263 1      15263 1      15246 0      11301 0      15260 1
   5250         15253 1      15260 1      15260 1      37744 1      05063 1   C: 03625 0   C: 14063 1      15263 1
   5260         05223 1   C: 00764 1      05242 0      10332 1      35222 0      54006 0      13417 1      30016 0
   5270         00006 1      01007 1      00006 1      22012 1      30016 0      56006 1      52011 0      00003 1

   5300         50017 1      53153 0      00006 1      50002 0      30001 0      53147 0      00006 1      35312 1
   5310         52006 0   C: 03455 0   C: 02063 0      50002 0      30000 1      24002 0      55010 0      35322 1
   5320         22006 1      14631 0   C: 31754 0      50002 0      40000 0      61010 1      00006 1      16762 0
   5330         16760 1      00004 0      50002 0      30000 1      24002 0      54072 0      74750 0      60000 1

   5340         54071 0      30072 1      75021 0      00006 1      74731 1      56072 1      74726 1      54066 0
   5350         50002 0      30000 1      24002 0      54065 0      15365 0      00004 0      50002 0      30000 1
   5360         24002 0      00004 0      54065 0      34744 1      54066 0      00006 1      35371 1      52006 0
   5370      C: 02213 0   C: 20103 1      22073 0      22006 1      22073 0      75015 1      10000 0      17771 0
```

```
OCTAL LISTING FOR PARAGRAPH # 013,  WITH PARITY BIT IN BINARY AT THE RIGHT OF EACH WORD, "@" DENOTES UNUSED FIXED MEMORY
ALL VALID WORDS ARE BASIC INSTRUCTIONS EXCEPT THOSE MARKED "I" (INTERPRETIVE OPERATOR WORDS) OR "C" (CONSTANTS)

 5400        30062 0      74736 0      10000 0      15425 0      50061 0      31051 1      54070 1      30062 0
 5410        74735 0      10000 0      15431 0      30002 0      54063 0      30006 1      00006 1      04007 1
 5420        54064 1      35424 0      22073 0      52006 0   C: 02301 1      50002 0      30000 1      24002 0
 5430        15406 1      00006 1      50002 0      30001 0      52064 1      34743 0      26002 1      15421 1

 5440        22706 0      22006 1      50000 1      30001 0      22006 1      22706 0      13603 0      22706 0
 5450        22006 1      22706 0      00006 1      50000 1      30001 0      22706 0      22006 1      22706 0
 5460        13711 1      34746 0      54032 1      54033 0      54034 1      00002 0      54162 0      40160 1
 5470        70162 0      50161 1      26160 1      00002 0      04626 1   C: 20315 1      34746 0      55043 0

 5500        00004 0      44744 0      70100 1      54100 1      00003 1      00002 0      30002 0      05524 1
 5510        40000 0      00006 1      04001 1      50061 0      54074 0      22063 1      00003 1      00001 0
 5520        30002 0      05524 1      70001 1      15513 1      64744 1      00004 0      54063 0      34753 1
 5530        54061 1      50063 1      27777 0      54001 1      34746 0      00006 1      10061 1      52062 1

 5540        50061 0      30074 1      54001 1      50062 0      44726 1      00002 0      00004 0      54061 1
 5550        50002 0      60000 1      50000 1      30000 1      54001 1      30061 0      50002 0      60001 0
 5560        50000 1      22000 1      10061 1      15547 0      16762 0      44740 1      71043 0      55043 0
 5570        05146 1      00004 0      30002 0      55363 1      50002 0      30000 1      54001 1      30006 1

 5600        00006 1      04007 1      55364 0      30002 0      54061 1      10375 1      15612 0      30001 0
 5610        54375 1      15616 1      10376 1      15616 1      30001 0      54376 1      22377 1      41035 1
 5620        75634 1      27035 1      56061 0      00003 1      50000 1      00001 0      00004 0      30002 0
 5630        55363 1      50002 0      30000 1      05576 0   C: 40400 1      00004 0      34743 0      60005 1

 5640        54017 0      50017 1      04626 1   C: 12767 1      00004 0      30002 0      55363 1      50002 0
 5650        30000 1      05576 0   C: 77770 1      11043 0      15635 0      34756 1      54001 1      40000 0
 5660        52760 1      00004 0      04607 1   C: 43007 1      30103 0      74737 1      10000 0      15675 1
 5670        04607 1   C: 12654 0      04607 1   C: 12645 0      15636 0      35737 1      04720 0      04607 1

 5700     C: 57324 0      00004 0      30002 0      05646 0   C: 21103 0      00004 0      30002 0      05573 0
 5710     C: 00217 0      01363 0      00004 0      53364 0      35736 0      54061 1      50002 0      30000 1
 5720        54001 1      15605 0      00004 0      53364 0      35735 0      15715 0      00004 0      53364 0
 5730        00004 0      50002 0      30000 1      54001 1      15603 0      15652 1      15634 1   C: 56067 0

 5740        00004 0      54001 1      30002 0      55363 1      05577 1   C: 00014 1      01363 0      31472 1
 5750        00006 1      01006 0      00002 0      31473 0      54001 1      45770 0      00006 1      02005 0
 5760        60001 0      00006 1      01005 0      00002 0      31474 1      54001 1      35770 1      15756 1
 5770     C: 00314 1   C: 05771 0   C: 05772 0 CKSM 73055 0         @            @            @            @
```

```
OCTAL LISTING FOR PARAGRAPH # 014,  WITH PARITY BIT IN BINARY AT THE RIGHT OF EACH WORD, "@" DENOTES UNUSED FIXED MEMORY

ALL VALID WORDS ARE BASIC INSTRUCTIONS EXCEPT THOSE MARKED "I" (INTERPRETIVE OPERATOR WORDS) OR "C" (CONSTANTS)

   6000      C: 00464 1      34755 1      54001 1      40000 0      52760 1      04626 1   C: 10040 1   C: 00024 1
   6010      C: 00031 0      34346 1      05063 1   C: 06001 0   C: 06067 0      04626 1   C: 03212 0   C: 00500 1
   6020         04355 0      41040 0      55012 1      04607 1   C: 62366 0      04626 1   C: 62022 0      44743 1
   6030         00006 1      03012 1      46037 1      00004 0      70110 0      54110 0      00002 0   C: 41000 1

   6040         37745 0      56004 0      12022 1      00006 1      36047 1      15167 0   C: 03020 0   C: 66107 1
   6050         36057 0      00004 0      22000 1      50002 0      30000 1      22006 1      12200 0   C: 56063 1
   6060         00003 1      00006 1      22164 1      30006 1      54165 1      74726 1      54115 0      54023 1
   6070         16111 1      22006 1      16063 0      00006 1      50116 1      30001 0      52155 1      34746 0

   6100         54156 1      54163 1      30165 0      54006 0      10023 1      16120 0      10067 1      15117 1
   6110         24164 1      50164 1      30000 1      10000 0      16403 1   C: 00177 0      54023 1      76115 0
   6120         54020 1      10020 1      16270 0      16764 0      74744 0      10000 0      16167 0      50164 1
   6130         40001 1      10000 0      16236 1   C: 77773 1      24164 1      54116 0      66272 0      10000 0

   6140         67764 0      16146 0      30120 1      26116 0      50020 0      76314 0      00006 1      66157 1
   6150         75003 0      65003 1      56116 1      60115 1      54004 1      50020 0      76314 0      74350 1
   6160         65000 1      56116 1      54003 0      50020 0      76314 0      37754 0      54020 1      30120 1
   6170         54130 1      24164 1      50164 1      40000 0      10000 0      24130 0      16177 1      54116 0

   6200         77763 0      00006 1      16205 1      30115 1      26116 0      50130 0      40046 1      26116 0
   6210         77765 0      00006 1      16225 0      77763 0      00006 1      16227 1      30116 1      54004 1
   6220         75003 0      64732 0      54116 0      50020 0      36314 1      30120 1      16233 1      35000 1
   6230         56116 1      54003 0      74350 1      26116 0      50020 0      36314 1      34351 1      70020 1

   6240         66243 1      10000 0      16254 0   C: 77767 1      66133 0      10000 0      50000 1      46265 1
   6250         16256 1      50163 0      46263 1      16256 1      50163 0      46265 1      26166 1      54116 0
   6260         50020 0      76314 0   C: 00002 0   C: 00006 1   C: 00006 1   C: 00002 0   C: 00003 1   C: 00006 1
   6270         10020 1      16304 1   C: 77722 0      24164 1      50164 1      30000 1      54117 1      35004 0

   6300         54004 1      70020 1      50000 1      16355 0      54004 1      10020 1      50000 1      12000 1
   6310         10163 1      12017 1      12017 1      12121 0   C: 00122 0      16526 1      17112 0      17676 0
   6320         17422 0      16724 1      16511 0      16073 1      17645 0      16522 0      16641 0      16544 0
   6330         17355 1      16600 0      16647 0      17360 1      17637 0      17615 0      17620 0      17624 1

   6340         17642 1      16772 1      16770 0      17057 0      17352 0      17501 0      17446 1      17026 0
   6350         17103 0      17016 0      16352 1      17613 0      17634 0      12350 1      12355 1      12360 1
   6360         12364 0      12370 0      12376 0      12412 0      12421 0      12404 1      12415 1      12473 1
   6370         12500 1      12453 0      12513 0      12522 1      12463 0      30165 0      54004 1      24164 1
```

```
OCTAL LISTING FOR PARAGRAPH # 015,  WITH PARITY BIT IN BINARY AT THE RIGHT OF EACH WORD, "@" DENOTES UNUSED FIXED MEMORY

ALL VALID WORDS ARE BASIC INSTRUCTIONS EXCEPT THOSE MARKED "I" (INTERPRETIVE OPERATOR WORDS) OR "C" (CONSTANTS)

  6400      50164 1     40000 0     67770 0     54116 0     74347 1     56116 1     77743 1     00006 1
  6410      74740 1     50000 1     16413 0     06443 1     16102 0     06435 0     16102 0     06440 1
  6420      16102 0     06443 1     16501 1     06443 1     16165 1     06443 1     16504 1     06443 1
  6430      16507 1     06443 1     34757 0     54020 1     16273 0     50120 1     40046 1     16442 1

  6440      50120 1     40047 0     26116 0     40116 0     64763 1     10000 0     30120 1     16454 0
  6450      35000 1     56116 1     54003 0     74350 1     26116 0     00006 1     30155 0     50116 1
  6460      52001 1     10163 1     16475 0     00002 0     00006 1     30160 0     50116 1     52003 0
  6470      00006 1     30162 1     50116 1     52005 0     00002 0     30156 0     50116 1     54002 1

  6500      00002 0     37753 1     54020 1     16127 1     34726 0     54020 1     16127 1     36130 0
  6510      16166 1     50116 1     30002 0     54156 1     00006 1     50116 1     30001 0     52155 1
  6520      34744 1     16101 0     22007 0     50116 1     30000 1     16076 1     00006 1     50116 1
  6530      30001 0     52155 1     00006 1     50116 1     30003 1     52160 1     00006 1     50116 1

  6540      30005 1     52162 0     44744 0     16101 0     00006 1     50116 1     30001 0     52155 1
  6550      50166 0     52001 1     50163 0     36265 0     26166 1     10163 1     16573 1     16571 0
  6560      54163 1     54156 1     52160 1     50166 0     51775 0     52162 0     50166 0     51777 1
  6570      16102 0     54156 1     16102 0     54163 1     56156 0     50166 0     53777 0     16102 0

  6600      00006 1     50116 1     30001 0     52155 1     50166 0     52001 1     50163 0     36265 0
  6610      26166 1     10163 1     16631 1     16532 1     00006 1     50116 1     30003 1     52160 1
  6620      50166 0     51775 0     00006 1     50116 1     30005 1     52162 0     50166 0     51777 1
  6630      16102 0     00006 1     50116 1     30003 1     52160 1     30156 0     50166 0     53777 0

  6640      16536 0     24164 1     50164 1     30000 1     50116 1     54000 0     16102 0     24164 1
  6650      50164 1     30000 1     50116 1     60000 1     54004 1     75003 0     50000 1     32000 0
  6660      54117 1     30165 0     74341 1     64341 0     60164 1     50120 1     54052 1     30117 0
  6670      77763 0     00006 1     16703 1     30165 0     54006 0     30117 0     54004 1     75003 0

  6700      64732 0     54164 0     16063 0     30117 0     66272 0     10000 0     30117 0     16716 0
  6710      30120 1     60117 0     50000 1     30000 1     54117 1     16670 1     54003 0     74350 1
  6720      50000 1     31400 1     54117 1     16670 1     50164 1     30001 0     50116 1     60000 1
  6730      54004 1     75003 0     50000 1     32000 0     54117 1     16670 1     30165 0     54004 1

  6740      50164 1     30001 0     54117 1     16670 1     10154 0     00002 0     16750 1     16762 0
  6750      10155 1     00002 0     16754 0     16762 0     10156 1     00002 0     16760 1     16762 0
  6760      50002 0     00001 0     50002 0     00002 0     30165 0     54006 0     50164 1     00001 0
  6770      34726 0     16773 0     34346 1     26116 0     00006 1     50116 1     00003 1     20160 1
```

```
OCTAL LISTING FOR PARAGRAPH # 016,  WITH PARITY BIT IN BINARY AT THE RIGHT OF EACH WORD, "@" DENOTES UNUSED FIXED MEMORY

ALL VALID WORDS ARE BASIC INSTRUCTIONS EXCEPT THOSE MARKED "I" (INTERPRETIVE OPERATOR WORDS) OR "C" (CONSTANTS)

  7000        00006 1     17003 1     07035 0     00006 1     50116 1     00005 1     20162 0     00006 1
  7010        17012 1     07032 1     00006 1     50116 1     00001 0     17021 1     00006 1     50116 1
  7020        30001 0     20155 1     00006 1     16102 0     07040 1     16102 0     00006 1     50116 1
  7030        40001 1     17021 1     54001 1     34747 1     17037 0     54001 1     36266 0     56001 0

  7040        50000 1     44725 1     54130 1     00006 1     24000 1     50001 0     26155 1     54007 1
  7050        34746 0     60130 0     50001 0     26154 0     54007 1     00002 0     17173 1     00006 1
  7060        50116 1     30003 1     52160 1     00006 1     40001 1     20160 1     00006 1     17071 1
  7070        07035 0     00006 1     50116 1     30005 1     52162 0     00006 1     40001 1     20162 0

  7100        00006 1     17103 0     07032 1     00006 1     50116 1     30001 0     52155 1     00006 1
  7110        40001 1     17021 1     00006 1     50116 1     30002 0     20156 1     50116 1     60000 1
  7120        60154 1     54154 0     16102 0     17024 1     50002 0     30000 1     24002 0     54116 0
  7130        50116 1     30001 0     54156 1     34746 0     56155 0     54135 1     00006 1     70156 1

  7140        56156 0     00006 1     70154 0     20156 1     50116 1     30000 1     56135 0     00006 1
  7150        70135 1     20156 1     56154 1     00006 1     70135 1     20155 1     00002 0     34746 0
  7160        54163 1     56156 0     60000 1     54001 1     00002 0     60155 0     54155 1     00002 0
  7170        60154 1     54154 0     00002 0     54121 1     00002 0     34743 0     54136 1     00006 1

  7200        22137 1     07130 1     52160 1     52155 1     52131 0     30156 0     54132 0     30136 0
  7210        26116 0     07130 1     52156 1     20132 0     60154 1     60130 0     54130 1     17221 0
  7220        54121 1     52162 0     52155 1     30136 0     26116 0     07130 1     52132 0     20156 1
  7230        60154 1     60130 0     54154 0     00137 1     07040 1     00137 1     00006 1     22141 0

  7240        54117 1     22140 1     17253 0     50002 0     30000 1     54140 0     60000 1     60002 0
  7250        54117 1     64747 1     54141 1     36314 1     54116 0     00006 1     50117 0     30004 0
  7260        52155 1     52123 0     17266 0     54140 0     44743 1     26117 1     07130 1     00006 1
  7270        50117 0     30002 0     20155 1     10140 0     17263 0     00141 0     34746 0     54156 1

  7300        22002 0     06744 0     17306 1     17326 0     44724 0     17307 0     34724 1     54002 1
  7310        00006 1     24000 1     60156 0     54156 1     34746 0     60002 0     60155 0     54155 1
  7320        34746 0     60002 0     60154 1     54154 0     54155 1     00001 0     54156 1     17323 0
  7330        54135 1     00006 1     70156 1     54156 1     34746 0     56155 0     17147 0     54135 1

  7340        00006 1     70155 1     52155 1     00006 1     70135 1     30001 0     26154 0     00006 1
  7350        30155 0     00002 0     07175 0     34746 0     16101 0     34743 0     54140 0     17363 1
  7360        44354 0     54140 0     36263 0     54136 1     07553 0     07177 1     00006 1     30123 1
  7370        52155 1     52134 0     00006 1     30125 1     52160 1     00006 1     30127 0     52162 0
```

```
OCTAL LISTING FOR PARAGRAPH # 017,  WITH PARITY BIT IN BINARY AT THE RIGHT OF EACH WORD, "@" DENOTES UNUSED FIXED MEMORY

ALL VALID WORDS ARE BASIC INSTRUCTIONS EXCEPT THOSE MARKED "I" (INTERPRETIVE OPERATOR WORDS) OR "C" (CONSTANTS)

  7400         30140 1      26116 0      07177 1      52123 0      52155 1      52125 0      52160 1      52127 1
  7410         52162 0      30140 1      26116 0      07177 1      52134 0      52155 1      52162 0      52125 0
  7420         52160 1      16102 0      10163 1      17451 1      17451 1      07130 1      07161 0      52160 1
  7430         52155 1      52160 1      07130 1      07161 0      52162 0      52155 1      52162 0      07130 1

  7440         07161 0      52155 1      52162 0      52160 1      52155 1      16102 0      07175 0      44742 0
  7450         26116 0      00006 1      30155 0      52160 1      07130 1      07161 0      34743 0      26116 0
  7460         00006 1      30160 0      52155 1      52162 0      07130 1      07161 0      34743 0      26116 0
  7470         52160 1      52155 1      52160 1      07130 1      07161 0      52155 1      52162 0      52155 1

  7500         16542 0      00006 1      30162 1      52155 1      52123 0      07130 1      00006 1      40160 1
  7510         52155 1      52125 0      07130 1      34743 0      26116 0      00006 1      40162 0      52155 1
  7520         52162 0      07130 1      00006 1      30123 1      52155 1      52127 1      07130 1      34743 0
  7530         26116 0      00006 1      40123 0      52155 1      20162 0      00006 1      17540 0      07032 1

  7540         07130 1      52125 0      52160 1      52155 1      20160 1      00006 1      17550 1      07035 0
  7550         07130 1      52127 1      17021 1      00006 1      30155 0      52123 0      00006 1      30160 0
  7560         52125 0      00006 1      30162 1      52127 1      00002 0      10000 0      17572 1      00002 0
  7570         17602 0      00002 0      56001 0      64727 1      64727 1      54000 0      17600 1      24001 0

  7600         56001 0      00002 0      56001 0      64726 0      67770 0      54000 0      17610 0      24001 0
  7610         56001 0      40000 0      00002 0      07130 1      16102 0      07130 1      07160 1      16102 0
  7620         00006 1      50116 1      30001 0      17630 1      00006 1      50116 1      30001 0      52155 1
  7630         52131 0      34746 0      54004 1      12353 1      30116 1      54166 1      16104 0      34746 0

  7640         54004 1      12172 0      36115 1      54004 1      12214 0      10163 1      17657 0      17657 0
  7650         00006 1      50116 1      30001 0      52131 0      34746 0      54004 1      12654 0      00006 1
  7660         50116 1      30003 1      52160 1      00006 1      50116 1      30005 1      52162 0      44744 0
  7670         54163 1      00006 1      50116 1      30001 0      52155 1      17653 1      50116 1      10000 0

  7700         16102 0      17703 0      17711 0      50116 1      10001 1      16102 0      16102 0      17711 0
  7710         16102 0      00006 1      40155 1      52155 1      10163 1      17726 1      17726 1      00006 1
  7720         40160 1      52160 1      00006 1      40162 0      52162 0      16102 0      40156 1      54156 1
  7730         16102 0   C: 22000 1   C: 23000 0   C: 24000 1   C: 25000 0   C: 26000 0   C: 27000 1   C: 31000 0

  7740      C: 31103 1   C: 32000 0   C: 33000 1   C: 34000 0   C: 35000 1   C: 36000 1   C: 37000 0   C: 37401 0
  7750      C: 37766 1   C: 37774 1   C: 37776 0   C: 40014 0   C: 40015 1   C: 40040 1   C: 40200 1   C: 57777 1
  7760      C: 65552 0   C: 70000 0   C: 73777 1   C: 74000 1   C: 74056 1   C: 77700 0   C: 77774 0   C: 77775 1
  7770      C: 77776 1      74731 1      10000 0      15425 0      15404 0      00006 1      07775 0   CKSM 53777 0
```

```
OCTAL LISTING FOR PARAGRAPH # 020,  WITH PARITY BIT IN BINARY AT THE RIGHT OF EACH WORD, "@" DENOTES UNUSED FIXED MEMORY

ALL VALID WORDS ARE BASIC INSTRUCTIONS EXCEPT THOSE MARKED "I" (INTERPRETIVE OPERATOR WORDS) OR "C" (CONSTANTS)

00,2000        13207 0      13530 0      13517 0      13610 1      13612 0      13174 1      12116 1      17711 0
00,2010        13232 0      13023 1      13176 0      13245 0      16375 1      13274 1      13247 1      36263 0
00,2020        70020 1      54021 0      10020 1      12101 1   C: 00024 1      50021 1      34727 1      54135 1
00,2030        10020 1      02050 0      16101 0      30135 0      00006 1      70156 1      54156 1      30135 0

00,2040        00006 1      70154 0      52155 1      30135 0      00006 1      70001 1      20156 1      16102 0
00,2050        30156 0      00006 1      70135 1      56155 0      00006 1      70135 1      56155 0      60001 0
00,2060        60000 1      54156 1      12064 0      26155 1      34746 0      54156 1      56154 1      00006 1
00,2070        70135 1      20155 1      00002 0      30135 0      00006 1      70155 1      54155 1      56001 0

00,2100        12060 1      30021 1      54135 1      00006 1      30156 0      20156 1      60154 1      60154 1
00,2110        54154 0      12113 1      54121 1      10135 1      12102 1      10020 1      07157 0      16102 0
00,2120        16102 0      34750 1      70020 1      54135 1      10020 1      12145 1   C: 00176 1      50135 0
00,2130        34727 1      54135 1      02073 1      52155 1      52160 1      52155 1      02073 1      52155 1

00,2140        52162 0      52155 1      02073 1      17441 0      54135 1      00006 1      30155 0      20155 1
00,2150        00006 1      12153 0      07040 1      00006 1      30160 0      20160 1      00006 1      12161 1
00,2160        07035 0      00006 1      30162 1      20162 0      00006 1      12167 1      07032 1      10135 1
00,2170        12144 0      16102 0      54135 1      06744 0      12176 1      12212 0      07300 0      30154 1

00,2200        12207 1      24135 0      00006 1      30156 0      20156 1      60154 1      26154 0      60000 1
00,2210        54000 0      12201 1      40135 1      16644 0      70116 0      10000 0      12224 0      34733 1
00,2220        70116 0      10000 0      07157 0      16102 0      54135 1      34735 1      00006 1      70116 0
00,2230        76266 1      50000 1      12233 0      12332 0      12342 1      12336 1      10163 1      12277 0

00,2240        12277 0      30135 0      63733 0      00006 1      62127 1      67770 0      54135 1      34746 0
00,2250        54001 1      56154 1      56155 0      02272 1      20155 1      56157 1      56160 0      02272 1
00,2260        20160 1      56161 1      56162 1      02272 1      20162 0      10135 1      54135 1      12242 0
00,2270     C: 04604 1      16102 0      60000 1      54156 1      34746 0      56001 0      00002 0      30135 0

00,2300        63733 0      00006 1      62322 0      67770 0      54135 1      34746 0      56154 1      56155 0
00,2310        54156 1      10135 1      54135 1      02300 0   C: 22650 1      34733 1      70116 0      10000 0
00,2320        07157 0      16102 0      50135 0      34727 1      54135 1      34733 1      70116 0      10000 0
00,2330        12031 0      12033 1      40135 1      62126 0      54135 1      12236 0      42126 1      60135 0

00,2340        40000 0      54135 1      10163 1      12346 0      12346 0      12145 1      40116 0      00006 1
00,2350        74737 1      54020 1      12103 0      44744 0      54136 1      54137 0      54140 0      10130 1
00,2360        12516 0      12363 1      12531 0      54156 1      07300 0      10154 0      12414 0      12371 1
00,2370        12413 1      56131 1      56130 0      56155 0      56154 1      10130 1      12422 0      12401 1
```

```
OCTAL LISTING FOR PARAGRAPH # 021,  WITH PARITY BIT IN BINARY AT THE RIGHT OF EACH WORD, "@" DENOTES UNUSED FIXED MEMORY

ALL VALID WORDS ARE BASIC INSTRUCTIONS EXCEPT THOSE MARKED "I" (INTERPRETIVE OPERATOR WORDS) OR "C" (CONSTANTS)

00,2400        12416 1     40154 0     00006 1     62405 1     24136 0     34724 1     54154 0     02630 0
00,2410        34744 1     54121 1     06102 1     24136 0     40131 0     12402 1     00006 1     40131 0
00,2420        52131 0     24136 0     10154 0     12437 1     12426 1     12433 0     10155 1     12437 1
00,2430        16102 0     12433 0     16102 0     00006 1     40155 1     52155 1     24136 0     40154 0

00,2440        67770 0     60130 0     10000 0     12505 1  C: 60001 0     12446 1     34727 1     60000 1
00,2450        60155 0     54155 1     34746 0     64724 1     26154 0     34727 1     60000 1     60131 1
00,2460        54131 0     34746 0     64724 1     26130 1     40154 0     60130 0     10000 0     12505 1
00,2470     C: 00133 0     12405 0     54140 0     40155 1     60131 1     00006 1     62405 1     12505 1

00,2500        00006 1     24137 1     00006 1     30131 1     20131 0     30130 0     60000 1     54000 0
00,2510        12500 1     52155 1     50137 1     02565 0     54156 1     16102 0     10000 0     12422 0
00,2520        40131 0     00006 1     62422 1     34727 1     60000 1     26131 0     34746 0     54130 1
00,2530        12363 1     10000 0     12416 1     30131 1     00006 1     62416 0     44727 0     12524 1

00,2540        22021 1     00006 1     74727 0     56001 0     60021 1     56001 0     12571 1     20001 1
00,2550        20001 1     20001 1     20001 1     20001 1     20001 1     20001 1     20001 1     20001 1
00,2560        20001 1     20001 1     20001 1     20001 1     52155 1     10140 0  C: 06552 0     12642 1
00,2570        52155 1     00006 1     10130 1     52155 1     40154 0     00006 1     70131 0     60155 0

00,2600        54000 0     12606 1     00006 1     60130 0     24154 1     12610 0     00006 1     62620 1
00,2610        00006 1     60130 0     00006 1     12616 0     00006 1     62624 0     24154 1     12625 0
00,2620        00006 1     12630 1     00006 1     26154 0     60130 0     22007 0     00006 1     10130 1
00,2630        54155 1     10136 1     00002 0     00002 0     00002 0     00006 1     40155 1     52155 1

00,2640        34746 0     00002 0     40154 0     60130 0     00006 1     12647 1     12570 0     34724 1
00,2650        54154 0     40131 0     60155 0     12624 1     44744 0     54137 0     54127 1     03010 0
00,2660        52131 0     07565 0     52131 0     10130 1     12721 0     12667 0     12715 1     56131 1
00,2670        56130 0     56155 0     56154 1     00006 1     12676 0     12405 0     56160 0     56157 1

00,2700        00006 1     12703 0     12405 0     56162 1     56161 1     00006 1     12710 1     12405 0
00,2710        10130 1     12721 0     12405 0     12715 1     12405 0     00006 1     40131 0     52131 0
00,2720        24127 0     00006 1     30131 1     52134 0     12732 1     00006 1     24137 1     00006 1
00,2730        30131 1     20131 0     30130 0     60000 1     54000 0     12725 1     02750 1     52160 1

00,2740        52155 1     52160 1     02750 1     52162 0     52155 1     52162 0     02750 1     17441 0
00,2750        30127 0     54136 1     10154 0     12767 1     12756 0     12763 0     10155 1     12767 1
00,2760        00002 0     12763 0     00002 0     00006 1     40155 1     52155 1     24136 0     44744 0
00,2770        54140 0     40154 0     60133 0     10000 0     13004 1     12777 0     12405 0     54140 0
```

```
OCTAL LISTING FOR PARAGRAPH # 022,  WITH PARITY BIT IN BINARY AT THE RIGHT OF EACH WORD, "@" DENOTES UNUSED FIXED MEMORY

ALL VALID WORDS ARE BASIC INSTRUCTIONS EXCEPT THOSE MARKED "I" (INTERPRETIVE OPERATOR WORDS) OR "C" (CONSTANTS)

00,3000        40155 1     60134 1     00006 1     62405 1     52155 1     50137 1     12565 1   C: 32506 0
00,3010        56002 0     52155 1     07565 0     52155 1     52160 1     07565 0     52160 1      52162 0
00,3020        07565 0     52162 0     00000 1     03010 0     07553 0     34746 0     56121 0      54141 1
00,3030        03317 1     30141 0     56121 0     00006 1     13036 0     12405 0     00006 1      30155 0

00,3040        50120 1     52043 1     03343 0     10154 0     13051 1     54001 1     50120 1      52045 1
00,3050        12405 0     44310 0     60135 0     10000 0     40000 0     13133 1     13065 0      44752 1
00,3060        54135 1     30154 1     54001 1     34746 0     13112 1     10135 1     13074 0      42024 1
00,3070        54135 1     00006 1     30155 0     13112 1     40000 0     54135 1     40000 0      50000 1

00,3100        34727 1     54130 1     00006 1     70155 1     56130 0     00006 1     70154 0      56001 0
00,3110        60130 0     56001 0     50120 1     52045 1     44744 0     54140 0     52123 0      52155 1
00,3120        52131 0     03151 1     52125 0     52155 1     52160 1     03151 1     52127 1      52155 1
00,3130        52162 0     03151 1     17441 0     54135 1     34746 0     56123 1     56122 0      56125 1

00,3140        56124 0     56127 0     56126 1     40135 1     50000 1     34727 1     00006 1      70154 0
00,3150        13062 1     10154 0     13170 0     13155 1     13162 0     10155 1     13170 0      00002 0
00,3160        13162 0     00002 0     44746 1     54136 1     00006 1     40155 1     50135 0      12564 0
00,3170        54136 1     52155 1     50135 0     12564 0     03300 1     16102 0     10163 1      13226 0

00,3200        13226 0     03317 1     22163 0     00006 1     30155 0     50120 1     52043 1      03343 0
00,3210        10135 1     13213 0     16102 0     63733 0     00006 1     63221 0     22007 0      22116 1
00,3220        12303 1     50135 0     34726 0     54135 1     34746 0     12036 1     06744 0      16102 0
00,3230        16102 0     17711 0     44742 0     26166 1     00006 1     50000 1     30003 1      52160 1

00,3240        00006 1     50166 0     30001 0     52162 0     16542 0     03317 1     17353 1      00006 1
00,3250        30155 0     50166 0     52001 1     50163 0     36265 0     26166 1     10163 1      13272 1
00,3260        16102 0     00006 1     30160 0     50166 0     51775 0     00006 1     30162 1      50166 0
00,3270        51777 1     16102 0     30156 0     16575 1     50120 1     30052 0     54117 1      16673 1

00,3300        30155 0     00006 1     70000 0     54156 1     34746 0     56155 0     00006 1      70154 0
00,3310        20001 1     20156 1     56154 1     00006 1     70000 0     20155 1     00002 0      00006 1
00,3320        22137 1     03300 1     52160 1     52155 1     52131 0     30156 0     54132 0      03300 1
00,3330        52156 1     20132 0     60154 1     60130 0     54130 1     13337 1     54121 1      52162 0

00,3340        52155 1     03300 1     17226 1     34746 0     54135 1     10154 0     13405 1      13351 1
00,3350        13373 1     56156 0     56155 0     54154 0     34750 1     54135 1     10154 0      13405 1
00,3360        13362 1     13376 1     56155 0     54154 0     34750 1     26135 1     10154 0      13405 1
00,3370        00002 0     13376 1     13453 1     10000 0     13402 0     10155 1     34746 0      13453 1
```

```
OCTAL LISTING FOR PARAGRAPH # 023,  WITH PARITY BIT IN BINARY AT THE RIGHT OF EACH WORD, "@" DENOTES UNUSED FIXED MEMORY

ALL VALID WORDS ARE BASIC INSTRUCTIONS EXCEPT THOSE MARKED "I" (INTERPRETIVE OPERATOR WORDS) OR "C" (CONSTANTS)

00,3400         13402 0        13453 1        52165 1        05722 0     C: 21302 0        62444 1        00006 1        63456 0
00,3410         52155 1        22021 1        00006 1        74727 0        52155 1        56021 1        26155 1        32314 0
00,3420         00006 1        70154 0        62566 0        54130 1        30154 1        22007 0        00006 1        10130 1
00,3430         00006 1        74727 0        26130 1        00006 1        74727 0        52155 1        00006 1        10130 1

00,3440         54131 0        34746 0        56001 0        00006 1        10130 1        54001 1        30131 1        20155 1
00,3450         00006 1        13455 1        34724 1        54154 0        54155 1        00002 0        64730 1        00006 1
00,3460         63502 0        52155 1        22021 1        00006 1        74727 0        52155 1        56021 1        26155 1
00,3470         33007 0        00006 1        70154 0        62270 0        13423 0        00006 1        30156 0        20156 1

00,3500         60154 1        26154 0        24135 0        00006 1        30156 0        20156 1        60154 1        26154 0
00,3510         60000 1        54022 0        10022 0        10022 0        13475 0        13417 1        13470 0        06744 0
00,3520         13523 1        13526 1        13526 1        00006 1        40155 1        52155 1        34730 1        26154 0
00,3530         52155 1        20001 1        54000 0        13536 0        00006 1        40001 1        52155 1        30154 1

00,3540         60000 1        54001 1        13553 0        50000 1        34726 0        60000 1        00006 1        60154 1
00,3550         54154 0        40155 1        54155 1        00006 1        30155 0        52134 0        03300 1        07243 0
00,3560      C: 00003 1     C: 14441 0     C: 37325 1     C: 53250 0     C: 60764 1     C: 12146 1     C: 21276 1     C: 75466 1
00,3570      C: 71471 0     C: 00236 0     C: 32757 0        32470 0        07127 1        00006 1        30156 0        20156 1

00,3600         60154 1        26154 0        00006 1        30156 0        20156 1        60154 1        26154 0        16102 0
00,3610         33631 0        13613 1        33713 1        54136 1        06744 0        13625 1        13731 0        00006 1
00,3620         40155 1        52155 1        33734 1        56136 0        54137 0        44727 0        60154 1        10000 0
00,3630         13721 1        13707 0        13642 0        10155 1        34746 0        13637 1        13642 0        54155 1

00,3640         54154 0        00136 0        00006 1        40155 1        64727 1        52155 1        52134 0        03343 0
00,3650         10135 1        13714 1        52155 1        52134 0        52155 1        07243 0     C: 00006 1     C: 13240 0
00,3660      C: 23630 0     C: 74721 0     C: 47775 1     C: 02440 0     C: 20237 0     C: 75067 1     C: 70742 1     C: 03436 0
00,3670      C: 26756 1     C: 74037 0     C: 57640 1     C: 03046 0     C: 07143 0     C: 76654 1     C: 42244 0        32470 0

00,3700         07127 1        00136 0        00006 1        40155 1        64727 1        52155 1        00137 1        00006 1
00,3710         40155 1        64730 1        52155 1        16102 0        50000 1        34727 1        54135 1        02073 1
00,3720         13652 1        00006 1        13637 1        00006 1        30165 0        05726 1     C: 01301 1        34746 0
00,3730         13637 1        34730 1        13640 1     C: 77763 0        13702 0        34771 1        00004 0        54002 1

00,3740         34743 0        54070 1        50000 1        31323 1        00006 1        13753 1        10070 1        13741 1
00,3750         52134 0        05712 0     C: 31104 0        33773 1        54061 1        30004 0        60070 0        54001 1
00,3760         33774 0        15213 0        04636 0        50070 0        55323 0        05124 0        34746 0        50006 1
00,3770         57323 1        05130 0        05263 0     C: 03760 0     C: 03766 0     C: 03775 1     C: 03776 1   CKSM 71724 0
```

```
OCTAL LISTING FOR PARAGRAPH # 024,  WITH PARITY BIT IN BINARY AT THE RIGHT OF EACH WORD, "@" DENOTES UNUSED FIXED MEMORY

ALL VALID WORDS ARE BASIC INSTRUCTIONS EXCEPT THOSE MARKED "I" (INTERPRETIVE OPERATOR WORDS) OR "C" (CONSTANTS)

01,2000      C: 75675 1   C: 76731 0      00010 0      00020 0      00010 0      00026 0      00010 0      00056 1
01,2010         00062 0      00072 1      00145 1      00163 0      00010 0      00174 0   C: 21000 1   C: 05146 1
01,2020      C: 04060 0   C: 00144 0   C: 05263 0   C: 04060 0   C: 76300 0   C: 75427 1   C: 03710 1   C: 32000 0
01,2030      C: 03555 1   C: 66067 0   C: 02666 0   C: 75136 1   C: 26063 0   C: 05000 1   C: 02650 0   C: 26063 0

01,2040      C: 02734 0   C: 75455 1   C: 27710 1   C: 14000 1   C: 02476 0   C: 50067 0   C: 10000 0   C: 02231 0
01,2050      C: 54067 1   C: 26000 0   C: 02735 1   C: 50067 0   C: 77777 0   C: 75436 1   C: 03710 1   C: 00031 0
01,2060      C: 75735 1   C: 35710 1   C: 76355 0   C: 74107 1   C: 05710 1   C: 20000 0   C: 02536 0   C: 56067 0
01,2070      C: 04704 0   C: 75423 0   C: 03710 1   C: 77777 0   C: 75433 1   C: 03710 1   C: 25000 0   C: 03443 1

01,2100      C: 64067 1   C: 00062 0   C: 75216 0   C: 03710 1   C: 00764 1   C: 75370 1   C: 03710 1   C: 76260 1
01,2110      C: 74234 1   C: 03710 1   C: 12000 1   C: 03222 0   C: 74067 0   C: 00764 1   C: 75477 1   C: 03710 1
01,2120      C: 77777 0   C: 75423 0   C: 03710 1   C: 13000 0   C: 03026 0   C: 30065 1   C: 77777 0   C: 75344 0
01,2130      C: 03710 1   C: 01477 1   C: 75535 0   C: 74067 0   C: 52777 1   C: 02133 1   C: 42067 0   C: 52777 1

01,2140      C: 02136 1   C: 42067 0   C: 46777 1   C: 02040 1   C: 10067 1   C: 46777 1   C: 05661 0   C: 04067 1
01,2150      C: 52777 1   C: 02570 1   C: 74067 0   C: 22000 1   C: 03661 0   C: 64067 1   C: 00310 0   C: 74164 1
01,2160      C: 01710 0   C: 00310 0   C: 74164 1   C: 01710 0   C: 20000 0   C: 02121 1   C: 66067 0   C: 00310 0
01,2170      C: 74164 1   C: 01710 0   C: 77777 0   C: 74335 1   C: 01710 0   C: 77777 0   C: 74370 0   C: 01710 0

01,2200      C: 00144 0   C: 75061 1   C: 03710 1   C: 30000 1   C: 03603 1   C: 10063 0   C: 17000 1   C: 03355 1
01,2210      C: 74067 0   C: 17000 1   C: 03364 0   C: 74067 0      35006 1      54003 0      34736 1      70111 1
01,2220         10000 0      32343 1      62344 0      55444 0      32346 1      55476 1      34730 1      70111 1
01,2230         00006 1      12240 1      31444 1      00006 1      72345 0      55444 0      32347 0      55476 1

01,2240         00003 1      32341 0      04607 1   C: 20345 1      12252 1      12256 0      12241 0      34742 1
01,2250         05466 0      15146 0      00004 0      04665 0   C: 40115 0      15474 1      40106 1      74730 0
01,2260         10000 0      32000 0      62001 1      61326 1      00006 1      62241 1      30111 0      74730 0
01,2270         00006 1      12277 0      44732 1      61327 0      00006 1      62241 1      31327 0      61326 1

01,2300         22007 0      53244 0      00004 0      04665 0   C: 40115 0      00003 1      40106 1      74730 0
01,2310         00006 1      15474 1      32342 0      04607 1   C: 20345 1      05474 0      12323 0      12312 1
01,2320         34742 1      05466 0      15146 0      34744 1      05205 0   C: 03221 0   C: 56066 1      15146 0
01,2330         32342 0      04607 1   C: 20353 0      05474 0      05474 0      05474 0      36007 0      05466 0

01,2340         15146 0   C: 01457 0   C: 01460 1   C: 25101 0   C: 05220 1   C: 03146 1   C: 77445 1   C: 77622 1
01,2350         02445 0      30117 0      50130 0      54046 1      16102 0      02445 0      40117 1      02352 1
01,2360         02433 1      50117 0      30000 1      12352 0      02433 1      50117 0      40000 0      12352 0
01,2370         02433 1      50130 0      30046 0      50117 0      54000 0      16102 0      02433 1      50117 0
```

```
OCTAL LISTING FOR PARAGRAPH # 025,  WITH PARITY BIT IN BINARY AT THE RIGHT OF EACH WORD, "@" DENOTES UNUSED FIXED MEMORY

ALL VALID WORDS ARE BASIC INSTRUCTIONS EXCEPT THOSE MARKED "I" (INTERPRETIVE OPERATOR WORDS) OR "C" (CONSTANTS)

01,2400        30000 1      50130 0      56046 0      12373 0      02433 1      50117 0      30000 1      50130 0
01,2410        26046 1      16102 0      02445 0      30117 0      12407 1      02433 1      50117 0      40000 0
01,2420        12407 1      02445 0      50130 0      40050 0      50130 0      60046 0      00006 1      66102 1
01,2430        50130 0      56046 0      16667 1      40117 1      64763 1      10000 0      30120 1      12444 0

01,2440        35000 1      56117 0      54003 0      74350 1      26117 1      30120 1      54130 1      10020 1
01,2450        24130 0      00002 0      00002 0      10020 1      30117 0      04612 0      10154 0      16102 0
01,2460        16667 1      16102 0      16667 1      10121 1      12466 0      16102 0      54121 1      10020 1
01,2470        12454 1   C: 00360 1      16667 1      10020 1      06744 0      16102 0      16667 1      16102 0

01,2500        10020 1      12507 0   C: 12000 1      06744 0      16102 0      16102 0      16667 1      06744 0
01,2510        16667 1      16667 1      16102 0      10020 1      16661 1      05701 1      02433 1      50120 1
01,2520        30052 0      12373 0      34753 1      70117 1      50000 1      34726 0      54131 0      34736 1
01,2530        00006 1      70117 1      54130 1      00004 0      50000 1      30074 1      54002 1      34732 0

01,2540        00006 1      70117 1      72602 0      50000 1      12545 0      30131 1      00006 1      04002 1
01,2550        12557 0      30131 1      00006 1      06002 0      12557 0      40131 0      70002 1      50130 0
01,2560        54074 0      00003 1      34730 1      00006 1      70117 1      72602 0      50000 1      12570 0
01,2570        40002 1      70131 0      10000 0      12603 1      16736 1      12603 1      05701 1      05701 1

01,2600        30002 0      12571 1   C: 00014 1      24164 1      16102 0      54061 1      10400 1      12624 1
01,2610        10454 0      12624 1      10530 0      12624 1      10604 1      12624 1      10660 0      12624 1
01,2620        22061 0      30002 0      05712 0   C: 31201 0      64743 0      22007 0      50000 1      21777 0
01,2630        26063 0      34746 0      54064 1      32640 1      54062 1      50064 0      10167 0      12700 0

01,2640     C: 00007 0      12700 0      30063 1      50064 0      54167 0      74775 1      50064 0      54166 1
01,2650        10064 1      12665 1      54121 1      30166 0      54120 0      10067 1      12665 1      05701 1
01,2660        05701 1      54067 1      52066 0      52165 1      15151 0      52066 0      50064 0      52165 1
01,2670        50067 0      40167 0      60063 1      00006 1      65151 1      30064 0      54067 1      15151 0

01,2700        33037 0      26064 1      10062 1      12634 0      22061 0      30002 0      05712 0   C: 31202 0
01,2710        22164 1      30165 0      00004 0      00006 1      04007 1      56001 0      50067 0      52165 1
01,2720        52165 1      30165 0      00006 1      01007 1      52155 1      50067 0      52155 1      52155 1
01,2730        52157 0      50067 0      52157 0      52157 0      52161 0      50067 0      52161 0      52161 0

01,2740        52163 1      50067 0      52163 1      52163 1      34746 0      56121 0      00006 1      12752 1
01,2750        40166 1      54166 1      52167 0      50067 0      52167 0      52167 0      34775 0      70167 0
01,2760        54120 0      10166 1      34746 0      12770 1      40166 1      54166 1      34744 1      56121 0
01,2770        54067 1      00003 1      52165 1      00006 1      62776 0      52006 0      40000 0      64744 1
```

```
OCTAL LISTING FOR PARAGRAPH # 026,  WITH PARITY BIT IN BINARY AT THE RIGHT OF EACH WORD, "@" DENOTES UNUSED FIXED MEMORY

ALL VALID WORDS ARE BASIC INSTRUCTIONS EXCEPT THOSE MARKED "I" (INTERPRETIVE OPERATOR WORDS) OR "C" (CONSTANTS)

01,3000        54164 0      16071 0      00004 0      40167 0      54167 0      36115 1      70006 0      00006 1
01,3010        04007 1      54165 1      44746 1      54131 0      13124 1      00004 0      10067 1      13022 0
01,3020        00003 1      13220 0      34743 0      00006 1      05011 1      52165 1      12716 1      54061 1
01,3030        34746 0      54064 1      32640 1      54062 1      50064 0      10167 0      13041 0   C: 00014 1

01,3040        13050 0      33037 0      26064 1      10062 1      13033 0      44744 0      54064 1      15151 0
01,3050        40065 0      50064 0      60164 1      00006 1      13056 0      13041 0      50064 0      40167 0
01,3060        54063 0      50064 0      54167 0      44341 1      70065 0      64732 0      56065 1      74341 1
01,3070        50064 0      60165 0      54066 0      10064 1      12665 1      12655 1      54164 0      34746 0

01,3100        54130 1      34775 0      70167 0      60063 1      54167 0      40000 0      13013 1      00004 0
01,3110        44746 1      54131 0      56167 1      74775 1      54001 1      45155 1      60001 0      00006 1
01,3120        63124 0      10001 1      50000 1      54000 0      10203 1      03175 1      05701 1      13130 1
01,3130        10217 1      03175 1      05701 1      13134 0      10233 1      03175 1   C: 67610 1      13140 0

01,3140        10247 1      03175 1      05701 1      13144 1      10263 1      03175 1      05701 1      13150 1
01,3150        10277 1      03175 1      05701 1      13154 0      10313 1      03175 1      05701 1      13160 1
01,3160        10131 0      05701 1      05701 1      13165 1      13210 0      10130 1      13170 0      12770 1
01,3170        50000 1      27777 0      63136 0      54067 1      12710 1      54132 0      60131 1      10000 0

01,3200        40132 0      13214 0      13203 1      16762 0      54131 0      30002 0      54130 1      16762 0
01,3210        44746 1      54067 1      00003 1      44743 1      00006 1      03011 1      10067 1      13015 1
01,3220        34743 0      13230 1      25356 0      31361 1      54001 1      33227 0      15170 0   C: 66102 1
01,3230        00006 1      05011 1      52165 1      15167 0      54062 1      30002 0      00006 1      63525 0

01,3240        40026 1      64735 1      10000 0      66130 0      40000 0      63373 0      60002 0      10000 0
01,3250        61400 1      13313 1      13253 1      40002 1      64727 1      64727 1      56026 0      64726 0
01,3260        60002 0      00006 1      22007 0      57400 1      57401 0      57402 0      57403 1      57404 0
01,3270        57405 1      57406 1      57407 0      30063 1      50002 0      13276 0      53411 0      53413 1

01,3300        53415 1      53417 0      53421 0      53423 1      53425 1      53427 0      53431 1      65240 1
01,3310        00006 1      15217 1      13366 0      10000 0      61401 0      13321 0      64744 1      03377 1
01,3320     C: 00001 0      10000 0      61402 0      13327 0      64744 1      03377 1   C: 00002 0      10000 0
01,3330        61403 1      13335 0      64744 1      03377 1   C: 00003 1      10000 0      61404 0      13343 1

01,3340        64744 1      03377 1   C: 00004 0      10000 0      61405 1      13351 1      64744 1      03377 1
01,3350     C: 00005 1      10000 0      61406 1      13357 1      64744 1      03377 1   C: 00006 1      10000 0
01,3360        61407 0      13365 0      64744 1      03377 1   C: 00007 0      10000 0      03374 1      13370 1
01,3370        64744 1      03377 1   C: 00010 0   C: 40201 0      52062 1      05712 0   C: 31203 1      54064 1
```

```
OCTAL LISTING FOR PARAGRAPH # 027,  WITH PARITY BIT IN BINARY AT THE RIGHT OF EACH WORD, "@" DENOTES UNUSED FIXED MEMORY

ALL VALID WORDS ARE BASIC INSTRUCTIONS EXCEPT THOSE MARKED "I" (INTERPRETIVE OPERATOR WORDS) OR "C" (CONSTANTS)

01,3400        50002 0      30000 1      54002 1      34744 1      60064 0      50002 0      27377 1      40064 1
01,3410        50002 0      13263 1      00006 1      04007 1      54016 1      00006 1      22012 1      34725 0
01,3420        57407 0      57406 1      57405 1      57404 0      57403 1      57402 0      57401 0      57400 1
01,3430        64724 1      26026 1      54332 1      44746 1      54332 1      00006 1      45241 1      53431 1

01,3440        53427 0      53425 1      53423 1      53421 0      53417 0      53415 1      53413 1      53411 0
01,3450        56001 0      00006 1      01007 1      56001 0      52006 0      23435 1      34743 0      26002 1
01,3460        55434 1      31152 0      10000 0      13471 1      13466 1      13523 1      31153 1      00006 1
01,3470        63523 0      00006 1      43503 0      21153 0      11153 0      13513 1      13477 1      13500 0

01,3500        11152 1      13513 1   C: 00000 1   C: 20000 0      34727 1      27153 0      05175 1   C: 03520 0
01,3510        33522 1      53435 0      52006 0      34727 1      05205 0   C: 03471 0   C: 02063 0      13510 1
01,3520        53147 0      15167 0   C: 05263 0      53435 0      13526 1      52062 1      05722 0   C: 21204 1
01,3530        30161 1      60000 1      54155 1      33772 0      54157 0      33567 0      54707 0      30154 1

01,3540        75000 0      10000 0      13553 0      10154 0      10000 0      13653 0      35015 0      05076 0
01,3550     C: 03051 0   C: 20103 1      03567 0      75000 0      10000 0      13624 0      00006 1      50155 0
01,3560        31437 0      52706 1      30154 1      74750 0      67767 0      10000 0      13736 1      04622 0
01,3570        13572 0      13637 1      34343 1      54704 0      50155 0      31053 0      10000 0      24000 1

01,3600        13603 0      15440 0      13622 0      40000 0      54001 1      50155 0      41052 0      00006 1
01,3610        60025 0      10000 0      40000 0      67752 0      64744 1      60001 0      10000 0      34746 0
01,3620        13622 0      13622 0      64744 1      00704 1      33567 0      54157 0      33773 1      54707 0
01,3630        30154 1      76115 0      54154 0      00006 1      50155 0      31437 0      52706 1      50155 0

01,3640        31053 0      54704 0      00006 1      63647 1      34345 1      56704 1      00704 1      34342 0
01,3650        56704 1      40000 0      00704 1      54020 1      10020 1      13656 0      13754 0      33567 0
01,3660        54707 0      30154 1      54021 0      60021 1      50155 0      62003 0      54156 1      00006 1
01,3670        50156 0      32002 1      22706 0      10000 0      24000 1      13750 1      24000 1      54705 1

01,3700        34343 1      54704 0      30706 0      74733 0      10000 0      13743 0      50156 0      32000 0
01,3710        15447 1      53153 0      00006 1      40025 1      21153 0      00006 1      31151 0      21153 0
01,3720        11152 1      13731 0      13724 1      13617 0      11153 0      13731 0      13727 1      13617 0
01,3730        13622 0      33774 0      54704 0      00006 1      31153 1      00704 1      34343 1      54704 0

01,3740        50155 0      41053 1      15447 1      40706 1      54706 1      50156 0      32000 0      13576 1
01,3750        56705 0      50156 0      32000 0      13641 0      30157 1      54707 0      50155 0      32002 1
01,3760        60154 1      60154 1      60154 1      54156 1      13667 1      36266 0      26156 1      33567 0
01,3770        54707 0      13667 1   C: 03765 0   C: 03543 0   C: 05301 0   C: 03775 1   C: 03776 1 CKSM 41443 1
```

```
OCTAL LISTING FOR PARAGRAPH # 040,  WITH PARITY BIT IN BINARY AT THE RIGHT OF EACH WORD, "@" DENOTES UNUSED FIXED MEMORY

ALL VALID WORDS ARE BASIC INSTRUCTIONS EXCEPT THOSE MARKED "I" (INTERPRETIVE OPERATOR WORDS) OR "C" (CONSTANTS)

04,2000      C: 00302 0    C: 17755 0    C: 00065 1    C: 01265 1    C: 22437 1    C: 16067 1    C: 15625 1    C: 21042 1
04,2010      C: 30276 1    C: 04773 0    C: 25004 1    C: 06702 1    C: 16471 1    C: 01352 1    C: 21412 0    C: 20500 0
04,2020      C: 25477 1    C: 03367 0    C: 27533 1    C: 07571 0    C: 22572 1    C: 27325 0    C: 01315 1    C: 26266 1
04,2030      C: 77731 1    C: 55144 0    C: 21056 1    C: 30515 0    C: 10576 1    C: 10326 1    C: 34076 1    C: 30363 1

04,2040         05520 0    C: 00311 1       05520 0    C: 00314 1       05500 1       32053 0       04607 1    C: 20471 1
04,2050         12045 0       12045 0       12045 0    C: 11343 0       54774 1       34346 1       55264 1       31277 1
04,2060         74737 1       10000 0       12105 0       34740 0       71300 1       10000 0       12105 0       40774 1
04,2070         62435 1       00006 1       12430 0       64744 1       00006 1       12427 0       30774 0       00006 1

04,2100         12127 0       40076 1       74744 0       10000 0       12112 0       05571 1    C: 01520 1       04450 1
04,2110         04626 1    C: 21062 0       32524 0       54155 1       50155 0       32472 1       76115 0       40000 0
04,2120         60774 0       10000 0       10155 1       12113 1       12360 1       30155 0       54773 0       40103 1
04,2130         74737 1       10000 0       12160 0       04720 0       00004 0       04665 0    C: 75556 0       05520 0

04,2140      C: 00163 0       06050 1    C: 74350 1       15146 0       40074 0       74736 0       10000 0       12151 1
04,2150         12156 0       40074 0       74734 1       10000 0       32424 1       64740 0       62425 0       05361 0
04,2160         34746 0       00006 1       01007 1       32423 0       54373 1       05355 1    C: 00014 1       06060 1
04,2170      I: 77624 1    C: 27447 0    I: 77776 1       05520 0    C: 00124 0       05520 0    C: 00055 1       05520 0

04,2200      C: 00222 0       34726 0       54107 0       05520 0    C: 00063 1       05520 0    C: 00056 1       05520 0
04,2210      C: 00141 0       05520 0    C: 00217 0       05520 0    C: 00311 1       10774 1       12346 0       04450 1
04,2220         35010 0       55055 1       06027 1       44744 0       70076 1       54076 1       34747 1       54001 1
04,2230         40000 0       52754 0       42426 1       70074 0       54074 0       34746 0       54333 0       55321 1

04,2240         44732 1       70077 0       64732 0       54077 0       04665 0    C: 40205 1       44766 0       55071 1
04,2250         70075 1       54075 1       04665 0    C: 12654 0       10774 1       12264 1       04665 0    C: 12651 0
04,2260         30774 0       55010 0       04626 1    C: 12772 0       41010 0       62364 1       00006 1       12306 1
04,2270         40774 1       62364 1       00006 1       12306 1       67767 0       00006 1       12320 0       64747 1

04,2300         00006 1       12320 0       32362 1       70074 0       10000 0       12315 0       42426 1       70074 0
04,2310         54074 0       06027 1       00006 1       34746 0       52754 0       32422 1       54373 1       12262 1
04,2320         41010 0       66007 0       00006 1       12312 1       64747 1       00006 1       12312 1       32362 1
04,2330         70074 0       60774 0       40000 0       62365 0       00006 1       12342 1       62363 0       00006 1

04,2340         12342 1       12312 1       40075 1       74766 0       26075 1       12256 0       32362 1       70074 0
04,2350         10000 0       12354 0       05520 0    C: 00007 0       50773 1       32525 1       00004 0       12236 0
04,2360         04355 0       12107 1    C: 00500 1    C: 00305 1    C: 00026 0    C: 00124 0       00004 0       50773 1
04,2370         32472 1       55057 0       54020 1       30020 0       77746 1       55061 0       54063 0       31057 1
```

```
OCTAL LISTING FOR PARAGRAPH # 041,  WITH PARITY BIT IN BINARY AT THE RIGHT OF EACH WORD, "@" DENOTES UNUSED FIXED MEMORY

ALL VALID WORDS ARE BASIC INSTRUCTIONS EXCEPT THOSE MARKED "I" (INTERPRETIVE OPERATOR WORDS) OR "C" (CONSTANTS)

04,2400        00006 1      74735 0      74750 0      54001 1      50773 1      32440 0      55060 1      74341 1
04,2410        26001 1      31060 0      75003 0      64732 0      05107 1      31057 1      76115 0      05316 0
04,2420        04450 1      05146 1   C: 10371 0   C: 10172 1   C: 37667 1   C: 40072 0   C: 00700 0      36266 0
04,2430        54002 1      00006 1      32437 0      60002 0      52006 0   C: 00106 0   C: 02132 0   C: 42067 0

04,2440     C: 26207 0   C: 26207 0   C: 72647 1   C: 72457 1   C: 72225 1   C: 72036 1   C: 71271 0   C: 64602 1
04,2450     C: 33274 0   C: 32201 0   C: 31404 0   C: 75437 0   C: 75411 1   C: 75271 1   C: 75146 0   C: 72643 0
04,2460     C: 72455 0   C: 72223 1   C: 72034 0   C: 72000 1   C: 50462 1   C: 50000 1   C: 51441 1   C: 50000 1
04,2470     C: 60061 0   C: 77654 0   C: 27715 1   C: 27714 0   C: 27713 1   C: 27712 0   C: 27711 0   C: 27710 1

04,2500     C: 27704 1   C: 27677 1   C: 27271 0   C: 27264 1   C: 27263 0   C: 27657 0   C: 27652 0   C: 27651 0
04,2510     C: 27650 1   C: 27643 0   C: 27642 1   C: 27641 1   C: 27640 0   C: 27636 1   C: 27631 0   C: 27626 0
04,2520     C: 27625 0   C: 27624 1   C: 27614 1   C: 27006 1   C: 00031 0   C: 00002 0   C: 00002 0   C: 00002 0
04,2530     C: 00002 0   C: 00002 0   C: 00002 0   C: 00004 0   C: 00004 0   C: 00005 1   C: 00000 1   C: 00000 1

04,2540     C: 00003 1   C: 00003 1   C: 00003 1   C: 00003 1   C: 00002 0   C: 00002 0   C: 00002 0   C: 00002 0
04,2550     C: 00002 0   C: 00002 0   C: 00005 1   C: 00002 0   C: 00002 0   C: 00004 0   C: 00000 1   I: 44001 0
04,2560     C: 00001 0   C: 02736 1   I: 47135 0   C: 00012 1   C: 21606 1   I: 71406 0   I: 73525 1   I: 77626 0
04,2570     C: 00012 1   C: 00011 1   I: 77634 0   C: 21606 1   I: 71406 0   C: 00025 0   I: 73525 1   I: 57406 1

04,2600     C: 14027 1   C: 24007 0   C: 14023 0   I: 72405 0   C: 00001 0   C: 17767 1   I: 72405 0   I: 77626 0
04,2610     C: 50006 1   C: 00023 0   I: 53435 0   C: 03765 0   C: 00031 0   I: 77650 1   C: 02736 1      52134 0
04,2620        53167 1      25166 1      30006 1      75003 0      27167 1      51166 1      27777 0      04613 1
04,2630        02634 1      02633 0      25166 1      25166 1      53167 1      52006 0      22164 1      50001 0

04,2640        30001 0      24001 0      24001 0      53167 1      06060 1   I: 77624 1   C: 01166 1   I: 77776 1
04,2650        23167 0      16062 1      05130 0      44732 1      50064 0      26164 0      00072 1      56002 0
04,2660        54154 0      00004 0      34346 1      05063 1   C: 03572 1   C: 60101 1      00003 1      00154 1
04,2670        54001 1      04211 1      04215 0      04365 0      30001 0      55042 1      05124 0      00006 1

04,2700        31442 1      53051 0      33012 1      04607 1   C: 20323 1      15474 1      12710 1      12702 1
04,2710        06060 1   I: 53145 1   C: 01051 1   C: 11007 0   C: 34041 0   C: 27101 1   I: 63375 0   C: 00007 0
04,2720     C: 00001 0   C: 02200 1   I: 63256 0   I: 53435 0   I: 77626 0   C: 61571 0   C: 00015 0   C: 34041 0
04,2730     C: 27115 1   I: 63375 0   C: 00007 0   C: 00001 0   I: 41406 0   I: 63245 1   C: 02200 1   I: 72441 0

04,2740     C: 02206 1   C: 26172 1   C: 00001 0   I: 72441 0   C: 02206 1   C: 26174 1   C: 00007 0   I: 41456 0
04,2750     I: 47235 0   C: 00001 0   C: 00023 0   I: 53552 0   I: 77656 1   C: 24001 0   C: 00023 0   I: 74241 0
04,2760     C: 00015 0   I: 77752 1   I: 53445 1   I: 77656 1   I: 50206 0   C: 00001 0   I: 65552 0   C: 26176 0
04,2770     I: 50235 0   C: 00001 0   I: 71244 0   C: 11000 1   C: 24020 0   I: 77625 0   C: 02176 0   C: 02176 0
```

```
OCTAL LISTING FOR PARAGRAPH # 042,  WITH PARITY BIT IN BINARY AT THE RIGHT OF EACH WORD, "@" DENOTES UNUSED FIXED MEMORY

ALL VALID WORDS ARE BASIC INSTRUCTIONS EXCEPT THOSE MARKED "I" (INTERPRETIVE OPERATOR WORDS) OR "C" (CONSTANTS)

04,3000      I: 77776 1      33013 0      04607 1   C: 20323 1      15474 1      15474 1      12677 1   I: 52034 1
04,3010   C: 21603 1   C: 10714 1   C: 01420 0   C: 01532 1   I: 77220 1   C: 02746 0   C: 01555 0   I: 47235 0
04,3020   C: 01563 0   C: 03607 0   I: 77656 1   C: 03623 0   I: 53435 0   C: 03607 0   C: 37615 1   C: 02746 0
04,3030   C: 00000 1   C: 04000 0   C: 00000 1   C: 00200 0   C: 00000 1   C: 00400 0   C: 00000 1   C: 10000 0

04,3040   C: 00000 1   C: 02000 0   C: 00000 1   C: 01000 0   C: 00000 1   C: 00020 0   C: 00000 1   C: 00100 0
04,3050   C: 00000 1   C: 34631 1   C: 23146 0   C: 77467 1   C: 77777 0   C: 03110 1   C: 17665 1   C: 00000 1
04,3060   C: 00001 0   C: 37767 0   C: 37737 0   C: 40010 1   C: 40040 1   I: 43020 1   C: 02753 1   C: 03665 1
04,3070   I: 77614 1   C: 04273 0   I: 45131 0   C: 02673 1   C: 27777 0   C: 11131 1   C: 14045 0   I: 56261 1

04,3100   C: 20606 0   C: 00045 0   C: 32766 1   C: 10005 0   C: 14017 1   C: 02720 0   I: 60316 0   C: 00047 1
04,3110   I: 41275 1   C: 00017 1   C: 00041 1   I: 77657 0   C: 21576 0   I: 44206 0   C: 11044 1   C: 16742 1
04,3120   I: 60205 0   C: 00045 0   C: 00047 1   I: 53605 1   C: 00045 0   C: 20575 1   C: 02740 0   I: 77650 1
04,3130   C: 02753 1   I: 77656 1   C: 16712 1   C: 00045 0   C: 26720 0   I: 77656 1   C: 02722 1   I: 72441 0

04,3140   C: 02712 1   I: 77725 1   C: 00045 0   C: 24041 1   C: 02722 1   I: 76435 1   C: 02712 1   I: 75214 1
04,3150   C: 03705 0   C: 11163 0   C: 02673 1   I: 40056 0   C: 11161 1   C: 16674 0   C: 00045 0   I: 43565 0
04,3160   C: 02673 1   I: 52162 0   C: 11155 0   I: 75246 0   C: 02673 1   I: 77616 0   C: 00000 1   C: 00003 1
04,3170   C: 00000 1   C: 03720 1      06060 1   I: 53135 0   C: 01502 1   C: 11241 0   I: 77775 1   C: 01503 0

04,3200   C: 25535 0   C: 01511 0   I: 77624 1   C: 27735 0   I: 51535 0   C: 01502 1   I: 53025 0   C: 11250 0
04,3210   C: 11215 1   I: 43174 1   C: 00000 1   C: 00223 1   C: 11220 1   I: 43174 1   C: 00002 0   C: 00063 1
04,3220   I: 50135 0   C: 01502 1   C: 11230 0   I: 77624 1   C: 26717 1   I: 52014 0   C: 01671 0   C: 11232 1
04,3230   I: 77624 1   C: 26772 1   I: 77414 0   C: 02676 1      34746 0      00006 1      01077 0      55501 0

04,3240      06060 1   I: 77624 1   C: 27456 0   I: 77776 1      05355 1   C: 04026 1      03714 0   C: 00002 0
04,3250   C: 00000 1   C: 01200 1   C: 00000 1   C: 25252 0   C: 25253 1   C: 00027 1   C: 00063 1      54016 1
04,3260      56002 0      54012 0      04371 0      34337 1      00006 1      02015 1      54073 1      40101 0
04,3270      74726 1      26101 0      34346 1      05063 1   C: 02057 1   C: 60101 1      30073 0      50064 0

04,3300      54154 0      05272 0      54016 1      56002 0      54012 0      04371 0      34746 0      56045 0
04,3310      54073 1      30077 1      74732 1      10000 0      13320 1      30073 0      27245 1      25246 0
04,3320      34742 1      00006 1      05011 1      34337 1      70073 1      56073 0      00006 1      74733 0
04,3330      54332 1      74337 0      63366 1      03363 1      34733 1      00006 1      70332 1      74337 0

04,3340      40000 0      03363 1      43371 0      60073 0      00006 1      13353 0      34741 1      70103 1
04,3350      10000 0      05272 0      03272 0      44741 0      70103 1      54103 1      03272 0      40103 1
04,3360      74741 0      26103 1      05272 0      60073 0      10000 0      03357 0   C: 77740 1      03357 0
04,3370      00002 0   C: 00022 1      31010 1      00006 1      13376 1      03764 1      55170 1      31165 1
```

```
OCTAL LISTING FOR PARAGRAPH # 043,  WITH PARITY BIT IN BINARY AT THE RIGHT OF EACH WORD, "@" DENOTES UNUSED FIXED MEMORY

ALL VALID WORDS ARE BASIC INSTRUCTIONS EXCEPT THOSE MARKED "I" (INTERPRETIVE OPERATOR WORDS) OR "C" (CONSTANTS)

04,3400       55171 0      34744 1      55172 0      05355 1   C: 07026 1   C: 30000 1   C: 03714 0   C: 10102 0
04,3410       34744 1      54333 0      05313 0   C: 00033 1      51171 1      13416 0      13421 1      13424 1
04,3420       13424 1      34743 0      55167 1      13447 1      33517 1      54156 1      33520 0      04607 1
04,3430    C: 20323 1      13714 1      13426 0      03510 0      44743 1      61173 0      00006 1      63426 1

04,3440       41173 1      64353 0      00006 1      63426 1      31173 0      55167 1      25172 1      33664 0
04,3450       61172 1      54156 1      33520 0      04607 1   C: 20323 1      13714 1      13452 0      03510 0
04,3460       41172 0      61167 0      00006 1      63465 0      13446 0      33516 0      54156 1      33521 1
04,3470       04607 1   C: 20323 1      13714 1      13522 0      03510 0      31166 1      00006 1      63465 0

04,3500       41166 0      61167 0      64744 1      00006 1      63465 0      33664 0      61166 1      13451 0
04,3510       40154 0      74737 1      10000 0      00002 0      50002 0      77771 0   C: 01166 1   C: 01173 0
04,3520    C: 05201 1   C: 05202 1      00004 0      30103 0      56001 0      34742 1      00006 1      06001 0
04,3530       54103 1      05355 1   C: 04026 1      00004 0      44743 1      61171 1      00006 1      63546 0

04,3540       00006 1      31174 1      53204 1      03571 1      04355 0      03714 0      34346 1      05076 0
04,3550    C: 03553 1   C: 10103 1      05146 1      06060 1   I: 77624 1   C: 27447 0   I: 77776 1      05355 1
04,3560    C: 04026 1      05506 1   C: 00236 0      00004 0      51171 1      13566 0      13725 0      13634 1
04,3570       13666 0      00006 1      23166 1      34746 0      22007 0      52025 1      53216 1      34747 1

04,3600       54001 1      40000 0      52764 0      00004 0      34746 0      22007 0      54156 1      53204 1
04,3610       52155 1      00006 1      31216 0      20155 1      00006 1      13624 0      34746 0      53216 1
04,3620       20025 1      05355 1   C: 04026 1      01166 1      07300 0      52155 1      20025 1      05355 1
04,3630    C: 04026 1      00004 0      51166 1      00001 0      31174 1      54003 0      74350 1      55166 0

04,3640       67766 1      61167 0      00006 1      13651 1      74734 1      10000 0      13762 0      37766 1
04,3650       61167 0      54154 0      50000 1      31175 0      54001 1      30154 1      61166 1      50000 1
04,3660       23400 1      10154 0      13651 1      13713 0   C: 01172 1      13713 0      34744 1      71167 1
04,3670       10000 0      13673 1      13762 0      44743 1      61167 0      54154 0      50000 1      31174 1

04,3700       22000 1      10154 0      54154 0      50000 1      31174 1      54003 0      74350 1      50000 1
04,3710       23400 1      10154 0      13675 1      03172 0      31170 0      05316 0      34746 0      54333 0
04,3720       03767 1      00006 1      34746 0      52764 0      05474 0      00006 1      41174 0      53204 1
04,3730       03571 1      03762 1      00006 1      41174 0      53206 0      00006 1      41174 0      53210 1

04,3740       05355 1   C: 04026 1      34746 0      22007 0      53206 0      21571 1      34746 0      22007 0
04,3750       53210 1      21643 0      34746 0      22007 0      53174 0      21710 1      27706 0      05355 1
04,3760    C: 04026 1      03713 1      04355 0      13713 0      04355 0      03767 1      05474 0      44742 0
04,3770       00006 1      03011 1      00002 0   C: 03773 1   C: 03774 0 CKSM 00516 0         @            @
```

```
OCTAL LISTING FOR PARAGRAPH # 044,  WITH PARITY BIT IN BINARY AT THE RIGHT OF EACH WORD, "@" DENOTES UNUSED FIXED MEMORY

ALL VALID WORDS ARE BASIC INSTRUCTIONS EXCEPT THOSE MARKED "I" (INTERPRETIVE OPERATOR WORDS) OR "C" (CONSTANTS)

05,2000      C: 02357 1    C: 20000 0    C: 00000 1    C: 00000 1    C: 00000 1    C: 00000 1    C: 00000 1    C: 00000 1
05,2010      C: 00000 1    C: 16533 0    C: 31537 1    C: 77333 1    C: 66677 1    C: 00000 1    C: 00000 1    C: 06273 1
05,2020      C: 02330 0    C: 01242 1    C: 01302 1    C: 01076 1    C: 02200 1    C: 00621 1    C: 31256 1    C: 02245 0
05,2030      C: 06475 1    C: 00161 1    C: 32301 1    C: 21230 0    C: 23473 0    C: 02000 0    C: 00000 1    C: 00256 0

05,2040      C: 13014 0    C: 77500 1    C: 46146 0    C: 00131 1    C: 26730 1    C: 77340 0    C: 32107 0    C: 24340 0
05,2050      C: 03451 1    C: 13443 0    C: 02247 1    C: 01341 0    C: 25731 0    C: 03633 1    C: 12257 1    C: 13700 1
05,2060      C: 01335 0    C: 03630 1    C: 32116 0    C: 00024 1    C: 32125 0    C: 24340 0    C: 32134 0    C: 07115 0
05,2070      C: 01355 0    C: 01774 1    C: 12265 0    C: 03635 1    C: 12356 1    C: 01330 0    C: 05333 1    C: 03577 1

05,2100      C: 01326 1    C: 01277 1    C: 03441 0    C: 32140 0    C: 32151 0    C: 01363 0    C: 74261 1    C: 76060 0
05,2110      C: 01721 1    C: 01723 0    C: 01725 0    C: 01727 1    C: 01570 1    C: 76062 1    C: 04320 1    C: 01432 0
05,2120      C: 07021 0    C: 07234 0    C: 04032 1    C: 24074 1    C: 52755 1    C: 76556 0    C: 01223 0    C: 01225 0
05,2130      C: 01227 1    C: 01231 0    C: 01233 1    C: 76560 0    C: 07242 1    C: 34076 1    C: 04374 0    C: 77667 0

05,2140      C: 07021 0    C: 07234 0    C: 04032 1    C: 03024 1    C: 03113 1    C: 34011 0    C: 34013 1    C: 34030 0
05,2150      C: 43745 0    C: 03560 1    C: 67453 1    C: 32107 0    C: 24340 0    C: 03371 1    C: 02774 1    C: 07115 0
05,2160      C: 01330 0    C: 01341 0    C: 25731 0    C: 01235 1    C: 12020 0    C: 05333 1    C: 13700 1    C: 32116 0
05,2170      C: 00024 1    C: 32125 0    C: 24340 0    C: 32134 0    C: 32215 0    C: 01355 0    C: 01516 1    C: 04036 0

05,2200      C: 00112 0    C: 01326 1    C: 01277 1    C: 03441 0    C: 32207 0    C: 32144 1    C: 52755 1    C: 07021 0
05,2210      C: 07234 0    C: 04032 1    C: 76520 1    C: 05700 0    C: 77665 1    C: 12737 1    C: 02755 1    C: 12760 0
05,2220      C: 65011 1    C: 32107 0    C: 24340 0    C: 32265 1    C: 32275 0    C: 03451 1    C: 13433 1    C: 03633 1
05,2230      C: 12257 1    C: 01355 0    C: 03630 1    C: 32213 0    C: 32116 0    C: 00024 1    C: 32125 0    C: 24340 0

05,2240      C: 32134 0    C: 07115 0    C: 01363 0    C: 01774 1    C: 12265 0    C: 03635 1    C: 12356 1    C: 02247 1
05,2250      C: 04036 0    C: 00112 0    C: 01326 1    C: 01277 1    C: 03441 0    C: 32207 0    C: 32144 1    C: 01516 1
05,2260      C: 03620 0    C: 03466 0    C: 03577 1    C: 02340 1    C: 77770 1    C: 74320 0    C: 03461 1    C: 03752 1
05,2270      C: 03753 0    C: 03760 0    C: 03761 1    C: 01073 1    C: 74023 0    C: 24340 0    C: 77423 1    C: 01363 0

05,2300      C: 32347 0    C: 10340 1    C: 32340 1    C: 24340 0    C: 01341 0    C: 13251 0    C: 13645 1    C: 03642 1
05,2310      C: 00007 0    C: 12020 0    C: 02267 0    C: 32213 0    C: 32116 0    C: 00024 1    C: 32125 0    C: 24340 0
05,2320      C: 32134 0    C: 07115 0    C: 12623 0    C: 13626 1    C: 13634 1    C: 02253 1    C: 02026 1    C: 03507 0
05,2330      C: 00112 0    C: 01326 1    C: 01277 1    C: 03441 0    C: 32140 0    C: 32151 0    C: 03614 1    C: 74324 1

05,2340      C: 74001 0    C: 03652 0    C: 03457 1    C: 03461 1    C: 03732 1    C: 01355 0    C: 74023 0    C: 74113 1
05,2350      C: 03615 0    C: 03752 1    C: 74041 1    C: 32107 0    C: 24340 0    C: 32407 0    C: 14340 0    C: 02774 1
05,2360      C: 25731 0    C: 26227 1    C: 01700 1    C: 01516 1    C: 00112 0    C: 32116 0    C: 00024 1    C: 32125 0
05,2370      C: 24340 0    C: 32134 0    C: 32215 0    C: 12221 0    C: 03371 1    C: 00112 0    C: 01326 1    C: 01277 1
```

```
OCTAL LISTING FOR PARAGRAPH # 045,  WITH PARITY BIT IN BINARY AT THE RIGHT OF EACH WORD, "@" DENOTES UNUSED FIXED MEMORY

ALL VALID WORDS ARE BASIC INSTRUCTIONS EXCEPT THOSE MARKED "I" (INTERPRETIVE OPERATOR WORDS) OR "C" (CONSTANTS)

05,2400     C: 03441 0    C: 32207 0    C: 01235 1    C: 32145 0    C: 32151 0    C: 03561 0    C: 76537 1    C: 74320 0
05,2410     C: 03461 1    C: 03752 1    C: 03754 1    C: 74017 1    C: 12171 0    C: 02205 1    C: 12172 0    C: 02206 1
05,2420     C: 12177 0    C: 02205 1    C: 12200 0    C: 02206 1    C: 25167 0    C: 25203 1    C: 32116 0    C: 00024 1
05,2430     C: 32125 0    C: 24340 0    C: 32134 0    C: 07115 0    C: 01355 0    C: 01363 0    C: 03371 1    C: 25173 0

05,2440     C: 15207 0    C: 01326 1    C: 01277 1    C: 00007 0    C: 32140 0    C: 52755 1    C: 02153 1    C: 02414 1
05,2450     C: 02221 1    C: 02046 1    C: 02277 1    C: 02353 0       00004 0       03107 1       12463 0       34727 1
05,2460        05076 0    C: 77777 0    C: 77777 0       31035 0       74762 1       64726 0       55035 1       34746 0
05,2470        55365 1       54375 1       54376 1       54377 0       54320 1       00006 1       01077 0       44635 1

05,2500        55310 0       34727 1       00006 1       01011 0       44746 1       54055 0       34346 1       55264 1
05,2510        34746 0       55245 1       54370 1       55071 1       55257 1       55260 0       55273 1       55360 1
05,2520        55362 0       54333 0       55321 1       55501 0       00006 1       01005 0       00006 1       01006 0
05,2530        00006 1       01012 0       00006 1       01013 1       00006 1       01014 0       41035 1       74762 1

05,2540        10000 0       02545 1       34762 0       00006 1       05012 1       02645 1       44746 1       55010 0
05,2550        33377 1       55277 0       33067 0       55343 0       34742 1       55322 1       33064 0       54111 1
05,2560        35006 1       54003 0       33062 0       55444 0       33063 1       55476 1       32000 0       55400 0
05,2570        44775 1       55403 0       55406 0       33065 1       55405 0       55410 1       34746 0       55407 1

05,2600        34354 1       55404 1       34735 1       55411 0       35017 1       64737 0       55300 1       00006 1
05,2610        33404 1       52075 1       33405 0       54076 1       34730 1       64732 0       70077 0       63406 0
05,2620        54077 0       00006 1       33410 1       52101 0       00006 1       33412 0       52103 1       33061 0
05,2630        70104 0       63413 1       54104 0       33414 0       54105 1       34730 1       70106 1       63415 1

05,2640        54106 1       33416 1       54107 0       04626 1    C: 03212 0       00004 0       00006 1       34746 0
05,2650        52754 0       00006 1       34746 0       52760 1       00006 1       34746 0       52762 0       00006 1
05,2660        34746 0       52756 1       00006 1       34746 0       52752 0       00006 1       34746 0       52764 0
05,2670        00002 0       24320 0       22002 0       00006 1       04007 1       53433 0       31035 0       74741 0

05,2700        00006 1       12705 0       64737 0       00006 1       05012 1       03070 0       34341 0       71360 1
05,2710        00006 1       12713 1       13105 1       41360 1       00006 1       12732 1       61377 0       00006 1
05,2720        12722 0       13105 1       31374 0       54003 0       00006 1       31376 1       51377 0       52001 1
05,2730        34746 0       55360 1       03107 1       44727 0       70106 1       54106 1       33401 1       71035 1

05,2740        64726 0       57035 0       33365 1       71277 0       63400 0       55277 0       31321 0       54333 0
05,2750        34741 1       00006 1       05014 1       40101 0       74736 0       10000 0       12763 0       34730 1
05,2760        00006 1       05011 1       12777 0       34727 1       00006 1       05011 1       12777 0       00004 0
05,2770        03116 1       12773 1       03156 0       03070 0       44727 0       70106 1       54106 1       34747 1
```

```
OCTAL LISTING FOR PARAGRAPH # 046,  WITH PARITY BIT IN BINARY AT THE RIGHT OF EACH WORD, "@" DENOTES UNUSED FIXED MEMORY

ALL VALID WORDS ARE BASIC INSTRUCTIONS EXCEPT THOSE MARKED "I" (INTERPRETIVE OPERATOR WORDS) OR "C" (CONSTANTS)

05,3000        54161 0     60000 1     00006 1     50000 1     30752 1     00006 1     06001 0     10000 0
05,3010        13056 0     13056 0     13056 0     10161 0     13000 0     54162 0     05317 1     00004 0
05,3020        44727 0     70075 1     54075 1     44731 1     70075 1     54075 1     44732 1     70074 0
05,3030        54074 0     34747 1     54161 0     60000 1     50000 1     10752 0     13040 1     13045 1

05,3040        54154 0     24154 1     24162 1     04607 1  C: 03530 1     10161 0     13032 1     10162 0
05,3050        12643 0     34726 0     71010 0     00006 1     16011 0     12643 0     05571 1  C: 01107 0
05,3060        12506 1  C: 06200 0  C: 32321 0  C: 77445 1  C: 21322 1  C: 00074 1  C: 20100 1  C: 03434 1
05,3070        34740 0     00006 1     02016 1     00006 1     13102 0     00006 1     00015 0     63376 0

05,3100        00006 1     13103 1     00002 0     03107 1     12501 0     03107 1     12506 1     33366 1
05,3110        54335 0     34737 0     00006 1     02033 0     63402 1     54110 0     34724 1     54026 1
05,3120        67767 0     54027 0     67770 0     54030 0     35006 1     54003 0     34724 1     55466 0
05,3130        00006 1     03013 0     34746 0     55465 0     55472 0     44742 0     70111 1     54111 1

05,3140        00006 1     33304 0     53263 0     40107 0     74726 1     00006 1     13156 1     24006 1
05,3150        11674 1     13153 1     25674 0     11675 0     13156 1     25675 1     33375 0     00006 1
05,3160        03011 1     43371 0     70110 0     54110 0     33373 0     00006 1     03012 1     44742 0
05,3170        70107 0     54107 0     44741 0     70101 0     54101 0     44732 1     70101 0     54101 0

05,3200        33374 1     00006 1     03013 0     34731 0     00006 1     05013 0     34762 0     00006 1
05,3210        03014 1     46130 1     71035 1     64726 0     55035 1     35000 1     54003 0     34725 0
05,3220        55407 1     55406 0     55405 0     55404 1     55403 0     55402 1     55401 1     55400 0
05,3230        45240 0     55410 1     55412 0     55414 0     55416 1     55420 1     55422 0     55424 0

05,3240        55426 1     55430 0     45241 1     55411 0     55413 1     55415 1     55417 0     55421 0
05,3250        55423 1     55425 1     55427 0     55431 1     44746 1     54167 0     54203 1     54217 1
05,3260        54233 1     54247 1     54263 1     54277 1     54313 1     55310 0     54067 1     33370 0
05,3270        54400 1     63372 1     54454 0     63372 1     54530 0     63372 1     54604 1     63372 1

05,3300        54660 0     34354 1     54154 0     44731 1     50154 1     55022 1     10154 0     13302 1
05,3310        55323 0     55324 1     55325 0     54045 1     54775 0     55041 1     55012 1     55014 1
05,3320        55011 1     55017 1     55020 0     55000 1     55001 0     55042 1     55307 0     55043 0
05,3330        55301 0     55302 0     55303 1     55304 0     55311 1     55776 1     55777 0     54100 1

05,3340        34751 0     55015 0     34727 1     55073 0     34737 0     71300 1     65017 1     55300 1
05,3350        33367 0     55361 0     44351 0     54776 0     00006 1     22070 0     37736 1     05063 1
05,3360     C: 03576 0  C: 42066 1     00070 0  C: 02037 1  C: 34066 0  C: 00435 0  C: 03524 1  C: 03341 1
05,3370     C: 00400 0  C: 32001 1  C: 00054 0  C: 27470 1  C: 74160 0  C: 30001 0  C: 77755 0  C: 37411 1
```

```
OCTAL LISTING FOR PARAGRAPH # 047,  WITH PARITY BIT IN BINARY AT THE RIGHT OF EACH WORD, "@" DENOTES UNUSED FIXED MEMORY

ALL VALID WORDS ARE BASIC INSTRUCTIONS EXCEPT THOSE MARKED "I" (INTERPRETIVE OPERATOR WORDS) OR "C" (CONSTANTS)

05,3400      C: 37000 0    C: 00450 0    C: 00102 1    C: 00000 1    C: 00000 1    C: 00000 1    C: 00000 1    C: 00000 1
05,3410      C: 00000 1    C: 00000 1    C: 00100 0    C: 00000 1    C: 00000 1    C: 00000 1    C: 40000 0       33422 0
05,3420         54017 0       50017 1       13423 0       33503 1       60002 0       54001 1       40000 0       52760 1
05,3430         50002 0       33502 0       55010 0       55162 1       10002 1       40106 1       74730 0       26106 1

05,3440         43505 0       70111 1       54111 1       33506 1       55343 0       40101 0       74736 0       26101 0
05,3450         44346 0       00006 1       02011 0       64730 1       00006 1       01011 0       34726 0       54107 0
05,3460         40074 0       74743 1       25074 0       00006 1       30025 0       53342 1       00006 1       33501 0
05,3470         53252 1       02657 1       36266 0       54001 1       40000 0       52760 1       04626 1    C: 12767 1

05,3500      C: 03656 1    C: 64067 1    C: 00106 0    C: 00027 1    C: 00107 1    C: 40640 1    C: 00554 0       54016 1
05,3510         00006 1       22012 1       34736 1       00006 1       02013 1       10000 0       00335 1       06040 0
05,3520         34736 1       00006 1       05013 0       00335 1       37770 0       54337 1       54336 0       33654 0
05,3530         54335 0       13545 1       10336 0       03667 0    C: 77753 0       13536 0       10337 1       13702 0

05,3540      C: 74001 0       30334 0       00006 1       63545 0       13552 1       50333 1       32446 0       54334 1
05,3550         40333 0       13771 1       50334 0       30000 1       10000 0       24334 0       13562 1       56334 0
05,3560         40000 0       56334 0       24000 1       54336 0       63534 0       10000 0       13572 0    C: 47777 0
05,3570         13572 0       03614 1       30336 1       63567 0       00006 1       63667 0       67762 0       00006 1

05,3600         63625 0       00006 1       50336 1       44000 1       54001 1       00006 1       50336 1       43777 1
05,3610         54336 0       37770 0       56336 1       13715 0       00006 1       23265 1       22070 0       06040 0
05,3620         22070 0       44736 0       00006 1       03013 0       01265 1       50336 1       00000 1       10000 0
05,3630         30336 1       13701 0       56336 1       54337 1       34746 0       56336 1       54003 0       74350 1

05,3640         00006 1       50000 1       31402 0       50336 1       52341 0       24336 1       24336 1       24337 0
05,3650         50337 0       00000 1       10000 0       13636 0    C: 03532 0       54337 1       37770 0       54336 0
05,3660         56337 0       54003 0       74350 1       00006 1       50000 1       31402 0       13715 0       30336 1
05,3670         54003 0       74350 1       54001 1       33540 0       26336 0       00006 1       50001 0       31401 0

05,3700         13715 0       54337 1       50337 0       00000 1       10000 0       24337 0       13712 1       54337 1
05,3710         37770 0       56337 0       24000 1       54336 0       13573 1       00006 1       01034 1       30001 0
05,3720         00006 1       01035 0       15272 1       34746 0       54336 0       03766 0       33735 0       54335 0
05,3730         30025 0       56001 0       30336 1       13715 0    C: 03736 0    C: 03750 0       34743 0       26336 0

05,3740         74350 1       10000 0       13752 0       30336 1       74730 0       00006 1       13725 0       13524 0
05,3750         33734 1       54335 0       30336 1       54003 0       74350 1       54002 1       34745 0       54001 1
05,3760         50002 0       71401 1       56001 0       50002 0       71400 0       13715 0       00006 1       22335 1
05,3770         35002 0       54001 1       03614 1       32045 1       56001 0       13715 0    C: 03776 1  CKSM 54133 1
```

```
OCTAL LISTING FOR PARAGRAPH # 050,  WITH PARITY BIT IN BINARY AT THE RIGHT OF EACH WORD, "@" DENOTES UNUSED FIXED MEMORY

ALL VALID WORDS ARE BASIC INSTRUCTIONS EXCEPT THOSE MARKED "I" (INTERPRETIVE OPERATOR WORDS) OR "C" (CONSTANTS)

06,2000      54016 1      00006 1      22012 1      11310 0      12010 0      12007 0      12134 1      34750 1
06,2010      54070 1      55310 0      11035 1      02063 0      02063 0      57035 0      74347 1      55035 1
06,2020      64101 0      00006 1      01010 1      02071 0      55015 0      44746 1      54073 1      56775 1
06,2030      64745 0      54775 0      50775 1      11022 1      10775 0      12030 1      12047 1   C: 00012 1

06,2040      10073 1   C: 37764 0      55015 0      00002 0      54073 1      32037 1      12031 0      64744 1
06,2050      50775 1      55022 1      74347 1      54073 1      34341 0      50775 1      74066 1      60073 0
06,2060      00006 1      01010 1      16760 1      10101 0      34746 0      12130 0      11015 0      02024 0
06,2070      12130 0      42171 0      27310 0      37752 0      54027 0      31300 0      00006 1      06032 0

06,2100      74727 0      00006 1      12116 1      23300 0      00006 1      06001 0      55300 1      74727 0
06,2110      10000 0      12116 1      34346 1      05063 1   C: 03501 0   C: 60101 1      50070 0      12120 1
06,2120      03213 1      13035 0      12172 0      13167 0      03213 1      13035 0      12172 0      13167 0
06,2130      00006 1      01010 1      32041 0      12074 1      34727 1      71310 0      00006 1      12165 0

06,2140      11015 0      02024 0      12152 1      44727 0      27310 0      37752 0      54027 0      34734 0
06,2150      27310 0      05272 0      00006 1      01010 1      37752 0      26027 0      34734 0      27310 0
06,2160      11310 0      05272 0   C: 37737 0      02154 0      05272 0      00006 1      01010 1      34727 1
06,2170      12144 0   C: 22400 0      31277 1      00006 1      06030 1      72761 1      00006 1      12227 0

06,2200      54070 1      23277 1      00006 1      06001 0      55277 0      44744 0      56070 0      00006 1
06,2210      62514 0      12213 1      64744 1      24070 0      60000 1      54000 0      12213 1      56071 1
06,2220      50070 0      34727 1      71277 0      50070 0      02755 1      10071 0      12212 0      41277 0
06,2230      74736 0      10000 0      12374 1      34735 1      71277 0      10000 0      12242 0      34735 1

06,2240      27277 0      12374 1      42777 0      71277 0      55277 0      74727 0      10000 0      12347 1
06,2250      41277 0      74734 1      10000 0      12256 0      05571 1   C: 00213 1      02735 1      33005 1
06,2260      05205 0   C: 02266 1   C: 14106 0      12374 1      33005 1      05226 1      44743 1      71277 0
06,2270      57277 1      74743 1      00006 1      12306 1      34727 1      71277 0      00006 1      12264 1

06,2300      40074 0      74735 0      10000 0      15263 1      04626 1   C: 17656 1      34726 0      00006 1
06,2310      05012 1      04665 0   C: 17253 0      05461 1      44754 1      00006 1      03012 1      34732 0
06,2320      05226 1      42774 0      71277 0      55277 0      44737 1      71300 1      55300 1      40076 1
06,2330      74726 1      00006 1      12336 1      26076 1      30025 0      57074 0      02703 1      44726 1

06,2340      00006 1      03012 1      34774 1      05205 0   C: 03241 0   C: 16103 1      15263 1      34741 1
06,2350      00006 1      02012 0      10000 0      12374 1      34735 1      70074 0      10000 0      12374 1
06,2360      02746 0      04665 0   C: 17253 0      34740 0      00006 1      05012 1      05461 1      34737 0
06,2370      05205 0   C: 02313 1   C: 14106 0      12374 1      31300 0      75017 0      54001 1      35017 1
```

OCTAL LISTING FOR PARAGRAPH # 051, WITH PARITY BIT IN BINARY AT THE RIGHT OF EACH WORD, "@" DENOTES UNUSED FIXED MEMORY

ALL VALID WORDS ARE BASIC INSTRUCTIONS EXCEPT THOSE MARKED "I" (INTERPRETIVE OPERATOR WORDS) OR "C" (CONSTANTS)

```
06,2400        00006 1      03033 1      00006 1      06001 0      00006 1      12434 1      54070 1      23300 0
06,2410        00006 1      06001 0      55300 1      34746 0      56070 0      60000 1      12421 0      64744 1
06,2420        24070 0      60000 1      54000 0      12420 1      56071 1      50070 0      34730 1      71300 1
06,2430        50070 0      02763 1      10071 0      12417 0      10034 1      12441 0      12465 0      12441 0

06,2440        12455 0      62512 0      00006 1      62464 0      62513 1      00006 1      62462 0      34741 1
06,2450        00006 1      02012 0      10000 0      12462 1      04665 0   C: 17131 1      36263 0      05205 0
06,2460     C: 03125 1   C: 16103 1      34737 0      12465 0      34746 0      61035 0      74737 1      00006 1
06,2470        13006 0      71035 1      10000 0      12507 0      34737 0      71277 0      10000 0      13006 0

06,2500        41035 1      74737 1      64726 0      57035 0      72162 1      27035 1      13006 0      02766 1
06,2510        13006 0      12500 1   C: 63434 1   C: 75252 0      74724 0      54071 0      11277 0      12525 0
06,2520        12525 0      34741 1      00006 1      05011 1      12225 1      02766 1      12225 1      44741 0
06,2530        00006 1      03011 1      12225 1      34743 0      71277 0      10000 0      12225 1      34727 1

06,2540        71277 0      00006 1      12556 1      34726 0      00006 1      02012 0      00006 1      12551 0
06,2550        12225 1      34743 0      27277 0      05571 1   C: 00207 1      12225 1      41277 0      74736 0
06,2560        27277 0      32564 1      54110 0      12225 1   C: 00102 1      10000 0      12361 0      43002 1
06,2570        00006 1      03014 1      42776 1      00006 1      03012 1      44736 0      70101 0      54101 0

06,2600        44346 0      00006 1      02011 0      64727 1      00006 1      01011 0      02743 0      04665 0
06,2610     C: 17162 1      44746 1      54050 0      54051 1      54052 1      54047 0      43001 1      00006 1
06,2620        03014 1      12225 1      00006 1      12643 0      41300 1      74737 1      27300 1      04665 0
06,2630     C: 17152 1      42777 0      70074 0      56074 1      40000 0      74735 0      10000 0      12225 1

06,2640        05571 1   C: 00214 0      12225 1      34743 0      71277 0      10000 0      12225 1      12556 1
06,2650        10000 0      34733 1      57277 1      73004 1      27277 0      02703 1      41277 0      74744 0
06,2660        10000 0      12432 1      31277 1      73000 0      10000 0      12432 1      05571 1   C: 00212 0
06,2670        12432 1      10000 0      12432 1      05571 1   C: 01105 1      12432 1      10000 0      12432 1

06,2700        05571 1   C: 01106 1      12432 1      34752 0      71277 0      00006 1      74733 0      31277 1
06,2710        00006 1      04001 1      40000 0      75016 1      10000 0      12726 1      34744 1      71300 1
06,2720        10000 0      00002 0      44744 0      00006 1      03011 1      00002 0      00006 1      22066 1
06,2730        05740 1      34744 1      00006 1      05011 1      00066 1      43003 0      00006 1      03012 1

06,2740        34754 0      00006 1      05012 1      41035 1      72773 1      27035 1      41277 0      72775 1
06,2750        27277 0      41300 1      74737 1      27300 1      00002 0      12533 1      12703 0      12703 0
06,2760        12565 1   C: 76400 1      12622 1      12650 1      12671 1      12676 0      41300 1      74744 0
06,2770        10000 0      24002 0      00002 0   C: 40010 1   C: 00054 0   C: 00075 0   C: 00272 0   C: 00300 1
```

OCTAL LISTING FOR PARAGRAPH # 052, WITH PARITY BIT IN BINARY AT THE RIGHT OF EACH WORD, "@" DENOTES UNUSED FIXED MEMORY

ALL VALID WORDS ARE BASIC INSTRUCTIONS EXCEPT THOSE MARKED "I" (INTERPRETIVE OPERATOR WORDS) OR "C" (CONSTANTS)

```
06,3000     C: 01720 0    C: 00740 1    C: 77000 1    C: 40040 1    C: 76777 1    C: 21450 0       40106 1       74743 1
06,3010        61035 0       74743 1       00006 1       13025 1       71035 1       10000 0       13032 1       41035 1
06,3020        74743 1       64726 0       57035 0       73031 1       27035 1       40106 1       74743 1       26106 1
06,3030        15272 1    C: 37775 0       02766 1       13025 1       13017 0       30110 1       00006 1       06033 1

06,3040        74743 1       00006 1       13066 0       22110 1       00006 1       06001 0       73062 1       54110 0
06,3050        74743 1       10000 0       13063 0       37704 0       26110 0       34744 1       05205 0    C: 02053 0
06,3060     C: 52107 0       13155 1    C: 05776 1       44743 1       00006 1       03012 1       30110 1       00006 1
06,3070        06030 1       74736 0       00006 1       13120 0       34743 0       70110 0       10000 0       13155 1

06,3100        34736 1       22110 1       00006 1       06001 0       54110 0       30110 1       74606 1       10000 0
06,3110        13117 1       40074 0       74736 0       10000 0       13117 1       05571 1    C: 00515 0       04555 0
06,3120        30101 1       74741 0       10000 0       13155 1       40103 1       74740 1       10000 0       13134 0
06,3130        30102 1       74735 0       10000 0       13155 1       33164 1       70110 0       10000 0       13155 1

06,3140        04514 0    C: 00035 1       13144 1       13155 1       34732 0       26110 0       43165 1       00006 1
06,3150        03012 1       34743 0       05205 0    C: 02120 0    C: 52107 0       30110 1       74743 1       10000 0
06,3160        13161 0       00006 1       05012 1       13167 0    C: 32002 1    C: 20002 1    C: 02100 1       30034 0
06,3170        05024 1       55414 0       30034 0       05023 0       54061 1       30032 0       05024 1       55417 0

06,3200        41417 0       00006 1       70061 1       55416 1       30032 0       05023 0       55420 1       00006 1
06,3210        70061 1       55415 1       05272 0       44746 1       00006 1       06032 0       74350 1       54002 1
06,3220        41273 1       70002 1       54001 1       40002 1       71273 1       26001 1       00006 1       15272 1
06,3230        00006 1       74736 0       56001 0       24001 0       60000 1       54000 0       13233 1       50001 0

06,3240        34734 0       54002 1       71273 1       10000 0       13260 1       41257 1       50001 0       73277 1
06,3250        27257 1       41260 0       50001 0       73307 1       27260 0       30002 0       27273 1       13273 0
06,3260        50001 0       43277 1       71257 1       55257 1       50001 0       43307 1       71260 0       55260 0
06,3270        40002 1       71273 1       55273 1       37736 1       05063 1    C: 03603 1    C: 42106 0       15272 1

06,3300     C: 00040 0    C: 00020 0    C: 00100 0    C: 00200 0    C: 00010 0    C: 00001 0    C: 00004 0    C: 00002 0
06,3310     C: 00010 0    C: 00020 0    C: 00004 0    C: 00200 0    C: 00001 0    C: 00002 0    C: 00040 0    C: 00100 0
06,3320     I: 64375 1    C: 03575 0    C: 01732 0    I: 45056 0    C: 47663 1    I: 72441 0    C: 03765 0    I: 41326 0
06,3330     C: 23773 0    I: 52012 0    C: 32046 1       33601 0       56003 1       54163 1       11477 0       13342 0

06,3340        13342 0       13423 0       34742 1       54132 0       50132 1       31453 1       00006 1       50132 1
06,3350        70324 0       54002 1       30001 0       00006 1       74737 1       50132 1       54325 1       30002 0
06,3360        00006 1       74737 1       50132 1       20325 1       50132 1       41452 1       00006 1       71074 1
06,3370        00006 1       74737 1       50132 1       20325 1       10132 0       67770 0       13343 1       13400 1
```

```
OCTAL LISTING FOR PARAGRAPH # 053,  WITH PARITY BIT IN BINARY AT THE RIGHT OF EACH WORD, "@" DENOTES UNUSED FIXED MEMORY

ALL VALID WORDS ARE BASIC INSTRUCTIONS EXCEPT THOSE MARKED "I" (INTERPRETIVE OPERATOR WORDS) OR "C" (CONSTANTS)

06,3400      55477 0      54130 1      03426 1      41460 0      03524 1      03443 1      41461 1      03524 1
06,3410      03460 0      31462 0      03524 1      11477 0      13416 0      13423 0      35022 1      05063 1
06,3420   C: 03557 0   C: 14063 1      00003 1      30163 0      54003 0      14622 1      00006 1      22156 0
06,3430      00006 1      40325 1      52155 1      31463 1      03475 1      00006 1      40327 0      52155 1

06,3440      41466 0      03475 1      00156 0      00006 1      22156 0      00006 1      40327 0      52155 1
06,3450      31464 0      03475 1      00006 1      40331 1      52155 1      41467 1      03475 1      00156 0
06,3460      00006 1      22156 0      00006 1      40327 0      52155 1      31470 0      03475 1      00006 1
06,3470      40331 1      52155 1      31465 1      03475 1      00156 0      56154 1      00006 1      70154 0

06,3500      52123 0      30155 0      00006 1      70154 0      54001 1      34746 0      20123 0      30122 0
06,3510      00006 1      74734 1      50130 0      21472 0      30123 1      00006 1      74734 1      54001 1
06,3520      34746 0      50130 0      21472 0      00002 0      00006 1      22131 1      00006 1      71074 1
06,3530      22155 0      00006 1      74741 0      50130 0      21472 0      30155 0      00006 1      74741 0

06,3540      54001 1      34746 0      50130 0      21472 0      34743 0      60130 0      56130 0      50000 1
06,3550      11471 0      13553 0      00131 1      73623 1      10000 0      55477 0      00131 1      34742 1
06,3560      54130 1      50130 0      31472 1      00006 1      74735 0      50130 0      55472 0      34746 0
06,3570      50130 0      57471 1      00006 1      74735 0      50130 0      21472 0      10130 1      67770 0

06,3600      13560 0   C: 01471 1      33601 0      04607 1   C: 17310 0      04607 1   C: 17735 0      13610 1
06,3610      34742 1      54130 1      50130 0      31472 1      00006 1      74735 0      50130 0      23472 1
06,3620      10130 1      67770 0      13611 0   C: 77776 1      15146 0      11477 0      13631 1      13631 1
06,3630      15146 0      00004 0      10076 1      15146 0      15146 0      13636 0      30104 1      74735 0

06,3640      54141 1      00006 1      13645 1      04665 0   C: 77543 0      30025 0      57074 0      00003 1
06,3650      40000 0      61074 0      64727 1      64727 1      56001 0      56001 0      00006 1      74733 0
06,3660      52125 0      34746 0      55477 0      54130 1      10141 1      03426 1      00006 1      30125 1
06,3670      52155 1      41460 0      03714 0      10141 1      03443 1      00006 1      40125 0      52155 1

06,3700      31461 0      03714 0      10141 1      03460 0      00006 1      40125 0      52155 1      41462 1
06,3710      03714 0      11477 0      13557 1      15146 0      56002 0      54131 0      30002 0      00006 1
06,3720      70154 0      50130 0      21472 0      30002 0      00006 1      70155 1      54001 1      34746 0
06,3730      50130 0      21472 0      13544 0      04607 1   C: 17264 1      11477 0      13741 1      13741 1

06,3740      15146 0      30104 1      74735 0      54141 1      37737 0      57074 0      40000 0      61234 0
06,3750      13652 1      33601 0      56003 1      54163 1      34746 0      55477 0      55471 0      55472 0
06,3760      55473 1      55474 0      55475 1      55476 1      13423 0   I: 57545 1   C: 01714 1   C: 14017 1
06,3770   C: 01712 1   C: 14021 1   C: 24007 0   C: 24023 0   C: 00017 1   I: 77616 0   C: 03776 1 CKSM 53646 0
```

```
OCTAL LISTING FOR PARAGRAPH # 054,  WITH PARITY BIT IN BINARY AT THE RIGHT OF EACH WORD, "@" DENOTES UNUSED FIXED MEMORY

ALL VALID WORDS ARE BASIC INSTRUCTIONS EXCEPT THOSE MARKED "I" (INTERPRETIVE OPERATOR WORDS) OR "C" (CONSTANTS)

07,2000       00004 0      36263 0      71043 0      10000 0      12037 0      34743 0      27043 0      10400 1
07,2010       12024 1      10454 0      12024 1      10530 0      12024 1      10604 1      12024 1      10660 0
07,2020       12024 1      52134 0      05712 0   C: 31207 0      64743 0      55307 0      34746 0      51307 1
07,2030       53777 0      35016 0      05076 0   C: 02056 0   C: 16067 1      00003 1      14622 1      52134 0

07,2040       05712 0   C: 31211 1      34746 0      57307 1      74775 1      10000 0      50000 1      54000 0
07,2050       34744 1      04665 0   C: 17704 1      34746 0      55043 0      06001 0      41307 0      74731 1
07,2060       27307 0      32352 1      04607 1   C: 20323 1      12053 1      12067 0      12056 1      37765 1
07,2070       71235 0      00006 1      74734 1      55551 0      00006 1      62056 0      65652 0      00006 1

07,2100       12102 1      12116 1      32353 0      04607 1   C: 20323 1      12053 1      12110 1      12102 1
07,2110       00006 1      31345 1      50120 1      52011 0      34746 0      12132 1      51551 1      31411 1
07,2120       50120 1      54011 0      51551 1      31403 1      50120 1      54010 1      31405 1      00006 1
07,2130       50120 1      20010 1      50120 1      54012 0      06060 1   I: 52014 0   C: 02276 0   C: 30347 1

07,2140       34746 0      55573 0      55236 0      55237 1      55551 0      55762 1      55763 0      40104 0
07,2150       74735 0      00006 1      12156 0      30105 0      74741 0      10000 0      34744 1      55550 1
07,2160       34775 0      71307 0      55307 0      51550 0      32566 0      04607 1   C: 20331 1      12053 1
07,2170       12212 0      44737 1      70154 0      00006 1      12056 1      41550 1      55550 1      11551 0

07,2200       12202 1      34744 1      55551 0      00006 1      31763 1      53237 1      34730 1      51551 1
07,2210       27236 0      12160 0      41307 0      74731 1      27307 0      74775 1      55551 0      34746 0
07,2220       55552 0      11762 1      12224 0      12331 0      55762 1      11763 0      12230 0      12331 0
07,2230       55763 0      40000 0      61762 0      00006 1      62237 0      31763 1      55762 1      41762 1

07,2240       00006 1      74741 0      41551 0      60001 0      50120 1      54046 1      30120 1      54166 1
07,2250       06060 1   I: 43014 0   C: 04307 1   C: 32004 1   C: 04713 0   C: 32004 1   I: 77773 1   C: 00002 0
07,2260    C: 24766 0   C: 03533 1   I: 77624 1   C: 47656 1   I: 76606 0   C: 00001 0   C: 24766 0   C: 03525 0
07,2270    I: 77624 1   C: 47656 1   I: 53435 0   I: 77626 0   C: 77746 1   I: 77776 1      34731 0      27552 0

07,2300       06060 1   I: 63335 1   C: 03553 1   C: 00031 0   I: 70322 0   C: 00001 0   C: 14031 0   C: 00001 0
07,2310    I: 56225 1   C: 16571 0   I: 53361 0   C: 02767 0   C: 00031 0   I: 77656 1   C: 02767 0   I: 77776 1
07,2320       11762 1      12236 0      11573 0      12334 0      34747 1      05205 0   C: 02042 0   C: 16067 1
07,2330       05474 0      05571 1   C: 00111 0      12140 1      34310 1      55044 1      31573 1      55045 0

07,2340       32351 1      04607 1   C: 20350 0      12053 1      12324 1      12056 1      34742 1      05466 0
07,2350       05146 1   C: 14431 1   C: 00307 0   C: 01527 0      54016 1      30033 1      54063 0      30034 0
07,2360       54064 1      30032 0      54065 0      00006 1      30025 0      52062 1      56002 0      54012 0
07,2370       34767 0      00006 1      02016 1      00006 1      62376 1      02441 1      02451 0      34740 0
```

```
OCTAL LISTING FOR PARAGRAPH # 055,  WITH PARITY BIT IN BINARY AT THE RIGHT OF EACH WORD, "@" DENOTES UNUSED FIXED MEMORY

ALL VALID WORDS ARE BASIC INSTRUCTIONS EXCEPT THOSE MARKED "I" (INTERPRETIVE OPERATOR WORDS) OR "C" (CONSTANTS)

07,2400       00006 1     02016 1     10000 0     12572 1     11550 1     12425 1     12410 1     12427 0
07,2410       34741 1     00006 1     02016 1     10000 0     12427 0     34742 1     00006 1     02016 1
07,2420       10000 0     12425 1     05571 1  C: 00113 1     05272 0     34746 0     12430 0     34744 1
07,2430       55551 0     50000 1     41762 1     64747 1     00006 1     62467 0     51551 1     25762 0

07,2440       12467 1     74736 0     54001 1     34740 0     70103 1     10000 0     12462 1     02451 0
07,2450       12404 1     11307 0     12456 0     05571 1  C: 00112 0     05272 0     74731 1     10000 0
07,2460       12453 0     00002 0     10001 1     44743 1     64744 1     27746 1     05272 0     00006 1
07,2470       30062 0     53562 0     34775 0     71307 0     55552 0     51551 1     11762 1     00006 1

07,2500       74741 0     56001 0     61551 1     27552 0     30063 1     51552 1     54000 0     30064 0
07,2510       51552 1     54002 1     30065 1     51552 1     54004 1     12516 0     35016 0     05063 1
07,2520    C: 02523 1  C: 16067 1     05272 0     31550 0     00006 1     12203 0     41307 0     74731 1
07,2530       27307 0     51550 0     32563 0     04607 1  C: 20345 1     12053 1     12543 0     12543 0

07,2540       34750 1     05466 0     05146 1     32563 0     04607 1  C: 20345 1     02053 0     12555 1
07,2550       12543 0     41551 0     66263 0     05466 0     05146 1     51551 1     31240 0     51552 1
07,2560       54006 0     12203 0  C: 05517 1  C: 01517 0  C: 05317 1  C: 15307 1  C: 15507 1  C: 15107 0
07,2570    C: 04000 0  C: 00000 1     51551 1     11762 1     12600 1     05571 1  C: 00115 1     05272 0

07,2600       51551 1     55762 1     35016 0     05063 1  C: 02203 1  C: 16067 1     05272 0  C: 03562 0
07,2610    I: 77420 1  C: 02736 1     47765 0     71235 0     00006 1     76263 1     56001 0     51757 0
07,2620       55755 0     10000 0     12637 0     32676 1     04607 1  C: 20471 1     02623 1     02631 1
07,2630       02623 1     06060 1  I: 74375 0  C: 02707 0  C: 16700 1  I: 52056 0  C: 02736 1     40000 0

07,2640       62675 1     00006 1     62553 0     51757 0     31755 1     50120 1     54046 1     06060 1
07,2650    I: 52173 0  C: 30347 1  C: 02736 1     06060 1  I: 45145 0  C: 03562 0  C: 30515 0  I: 77340 0
07,2660    C: 02757 0  C: 02707 0  C: 24001 0  C: 02715 0  C: 26707 0  C: 00001 0  C: 02715 0  I: 70143 0
07,2670    C: 02756 1  C: 00154 1  I: 52173 0  C: 02343 1  C: 02736 1  C: 00343 0  C: 01530 0  C: 22363 1

07,2700    C: 11623 0     00004 0     41035 1     74762 1     10000 0     12711 0     05571 1  C: 00206 0
07,2710       13676 1     03672 1     41300 1     74764 1     27300 1     41277 0     75745 0     27277 0
07,2720       44762 1     00006 1     03012 1     03253 0     34740 0     00006 1     05012 1     05461 1
07,2730       34737 0     05205 0  C: 02744 1  C: 16103 1     41277 0     74734 1     10000 0     12742 0

07,2740       05571 1  C: 00210 1     00003 1     14622 1     03660 1     05461 1     44740 1     00006 1
07,2750       03012 1     34732 0     05226 1     03660 1     45745 0     71277 0     55277 0     44764 1
07,2760       71300 1     55300 1     04665 0  C: 14703 0     13633 0     00004 0     03672 1     03131 1
07,2770       36263 0     05205 0  C: 02775 0  C: 16103 1     12742 0     03660 1     34737 0     00006 1
```

```
OCTAL LISTING FOR PARAGRAPH # 056,  WITH PARITY BIT IN BINARY AT THE RIGHT OF EACH WORD, "@" DENOTES UNUSED FIXED MEMORY

ALL VALID WORDS ARE BASIC INSTRUCTIONS EXCEPT THOSE MARKED "I" (INTERPRETIVE OPERATOR WORDS) OR "C" (CONSTANTS)

07,3000        05012 1      34743 0      55474 0      51474 1      30321 1      00006 1      51474 1      20032 1
07,3010        00006 1      74730 0      56001 0      60000 1      54061 1      13017 0      26001 1      51474 1
07,3020        23471 1      11474 0      03002 0      34743 0      05226 1      03660 1      54061 1      34743 0
07,3030        55474 0      51474 1      11471 0      03037 0      03046 0      03104 1      03046 0      63764 1

07,3040        00006 1      63114 0      51474 1      55471 0      43765 1      24061 0      64745 0      51474 1
07,3050        54050 0      11474 0      03030 1      10061 1      13120 0      05223 1   C: 00226 1      34743 0
07,3060        54061 1      50000 1      30032 0      00006 1      50061 0      20321 0      10000 0      13075 1
07,3070        13072 0      13075 1      10061 1      13060 0      13633 0      63103 0      00006 1      63072 1

07,3100        05571 1   C: 00211 0      13656 0   C: 77511 1      63764 1      00006 1      63114 0      40000 0
07,3110        51474 1      55471 0      33765 0      03045 0      34746 0      51474 1      57471 1      03045 0
07,3120        37761 0      00006 1      05014 1      33766 0      13024 0      34737 0      00006 1      05012 1
07,3130        05263 0      34741 1      00006 1      02012 0      10000 0      00002 0      44737 1      00006 1

07,3140        03012 1      44733 0      00006 1      03014 1      44746 1      54047 0      34741 1      00006 1
07,3150        05012 1      41035 1      73174 1      27035 1      41300 1      74737 1      27300 1      41277 0
07,3160        74741 0      27277 0      44740 1      70075 1      54075 1      44726 1      70076 1      54076 1
07,3170        44730 0      70077 0      54077 0      00002 0   C: 40010 1      00004 0      03672 1      43763 1

07,3200        00006 1      03012 1      44737 1      71300 1      55300 1      03253 0      34733 1      05205 0
07,3210     C: 03221 0   C: 16103 1      34771 1      05205 0   C: 03217 0   C: 16103 1      12742 0      03660 1
07,3220        13633 0      03665 1      15263 1      34741 1      00006 1      02012 0      10000 0      15263 1
07,3230        41277 0      74730 0      27277 0      44741 0      71277 0      55277 0      04665 0   C: 14703 0

07,3240        15263 1      03665 1      15263 1      41277 0      74733 0      27277 0      41300 1      74730 0
07,3250        27300 1      44740 1      13234 0      43174 1      71035 1      64726 0      55035 1      00002 0
07,3260        44746 1      54037 1      54040 1      54041 0      03665 1      14622 1      00004 0      44744 0
07,3270        71277 0      55277 0      04665 0   C: 14703 0      12742 0      00004 0      41277 0      74744 0

07,3300        27277 0      74733 0      10000 0      12742 0      05571 1   C: 00212 0      00004 0      13272 1
07,3310        54161 0      03672 1      11311 1      03354 0      54156 1      34737 0      00006 1      05014 1
07,3320        34742 1      05205 0   C: 03372 1   C: 16103 1      30161 1      56003 1      56161 1      55311 1
07,3330        74350 1      54061 1      34743 0      54157 0      60000 1      60061 0      54160 1      00006 1

07,3340        50000 1      31401 0      52155 1      07300 0      52155 1      50160 0      53401 1      10157 0
07,3350        13333 0      30161 1      54003 0      12742 0      00006 1      30134 1      52155 1      33371 1
07,3360        15124 1      11311 1      13357 1      54156 1      00006 1      30155 0      52134 0      34744 1
07,3370        13321 0   C: 17361 0      43630 0      00006 1      03014 1      03646 0      31311 0      00006 1
```

```
OCTAL LISTING FOR PARAGRAPH # 057,  WITH PARITY BIT IN BINARY AT THE RIGHT OF EACH WORD, "@" DENOTES UNUSED FIXED MEMORY

ALL VALID WORDS ARE BASIC INSTRUCTIONS EXCEPT THOSE MARKED "I" (INTERPRETIVE OPERATOR WORDS) OR "C" (CONSTANTS)

07,3400        74741 0        50000 1        13403 1        03420 1     C: 00202 1        03420 1     C: 00302 0        03416 1
07,3410     C: 00100 0        34746 0        55311 1        33371 1        05130 0        13217 1        44742 0        27311 1
07,3420        50002 0        30000 1        54064 1        74750 0        64730 1        27311 1        54003 0        74350 1
07,3430        54061 1        44750 0        70064 1        54064 1        00006 1        50061 0        31401 0        52071 0

07,3440        10070 1        13454 0        13444 1        13611 0        10071 0        13451 0        13376 1        13606 0
07,3450        13376 1        63505 1        00006 1        63376 0        00006 1        33632 0        20071 0        30064 0
07,3460        00006 1        05014 1        35115 1        70071 0        56071 1        00006 1        74735 0        54062 1
07,3470        30070 0        00006 1        74734 1        54070 1        30001 0        00006 1        74727 0        26062 1

07,3500        00006 1        30071 1        67770 0        10000 0        13552 1     C: 77601 0        13512 0        34727 1
07,3510        26062 1        34746 0        50061 0        53401 1        30062 0        54047 0        03641 1        30047 1
07,3520        00006 1        74733 0        66266 0        05205 0     C: 03536 1     C: 16103 1        03532 0        15263 1
07,3530        34743 0        54047 0        34733 1        00006 1        05014 1        00002 0        44734 1        00006 1

07,3540        03014 1        03530 1        34744 1        05175 1     C: 03372 1        34734 0        00006 1        05014 1
07,3550        03530 1        15263 1        50061 0        53401 1        34727 1        60062 0        54047 0        00006 1
07,3560        74733 0        67766 1        05205 0     C: 03566 1     C: 16103 1        13526 1        03641 1        31311 0
07,3570        54003 0        74350 1        54061 1        50061 0        11400 0        13601 1        34727 1        26047 0

07,3600        13516 1        50061 0        55400 0        34727 1        26047 0        13557 1        63505 1        00006 1
07,3610        63376 0        00006 1        43632 1        20071 0        30064 0        64734 0        00006 1        05014 1
07,3620        40070 1        54070 1        40071 0        76115 0        40000 0        56071 1        40000 0        13465 1
07,3630     C: 01700 1     C: 00000 1     C: 00034 0        00006 1        00011 1        74744 0        10000 0        13656 0

07,3640        13704 0        34741 1        00005 1        02012 0        10000 0        13652 1        41277 0        74737 1
07,3650        10000 0        00002 0        34746 0        55311 1        33371 1        05130 0        34746 0        13701 0
07,3660        34737 0        71277 0        10000 0        13656 0        00002 0        41277 0        74737 1        10000 0
07,3670        24002 0        00002 0        41277 0        74737 1        10000 0        00002 0        44746 1        55301 0

07,3700        12742 0        54071 0        44746 1        13706 1        54071 0        44744 0        54072 0        50071 1
07,3710        11301 0        13715 0        13725 0        00006 1        13726 0        34746 0        50071 1        57301 1
07,3720        05130 0        40072 0        50064 0        26164 0        15263 1        30072 1        50071 1        55301 0
07,3730        15263 1        34744 1        03736 0        34743 0        13736 1        34746 0        00004 0        54071 0

07,3740        50000 1        11301 0        13760 1        13754 0        13750 1        50071 1        55301 0        12742 0
07,3750        10000 0        13760 1        24133 0        13745 0        04636 0        50071 1        55301 0        15124 1
07,3760        52134 0        05712 0     C: 31210 0     C: 00030 1     C: 77500 1     C: 77477 0     C: 00074 1     C: 03767 1
07,3770     C: 03770 1   CKSM 62330 0          @              @              @              @              @              @
```

```
OCTAL LISTING FOR PARAGRAPH # 060,  WITH PARITY BIT IN BINARY AT THE RIGHT OF EACH WORD, "@" DENOTES UNUSED FIXED MEMORY

ALL VALID WORDS ARE BASIC INSTRUCTIONS EXCEPT THOSE MARKED "I" (INTERPRETIVE OPERATOR WORDS) OR "C" (CONSTANTS)

10,2000      I: 77160 0   C: 00002 0   C: 00000 1   I: 77614 1   C: 04343 1   C: 20011 0   I: 77160 0   C: 00012 1
10,2010      C: 00002 0   I: 66143 1   C: 10011 0   C: 02776 0   C: 22310 0   C: 10003 0   I: 54214 1   C: 04343 1
10,2020      C: 20022 0   C: 20607 1   C: 02312 0   I: 43134 0   C: 02777 1   C: 01271 1   I: 77650 1   C: 73516 1
10,2030      I: 77776 1      04607 1   C: 20036 0      06060 1   I: 77616 0   C: 02664 1      32035 0      54142 1

10,2040         56003 1      56142 0      74350 1      65000 1      54141 1      00006 1      30744 0      52155 1
10,2050         07124 1   C: 00745 1      52155 1      20001 1      50141 0      52001 1      00006 1      30740 1
10,2060         50141 0      52003 0      00006 1      40736 1      52155 1      07130 1      52155 1      20001 1
10,2070         50141 0      52005 0      00006 1      40742 1      52155 1      07130 1      52155 1      20001 1

10,2100         52160 1      00006 1      40742 1      52155 1      07124 1   C: 00737 1      00006 1      40155 1
10,2110         52162 0      07124 1   C: 00735 0      52155 1      20001 1      20001 1      52162 0      52155 1
10,2120         07124 1   C: 00743 1      52155 1      20001 1      20001 1      52131 0      00006 1      30744 0
10,2130         52155 1      07124 1   C: 00747 0      52155 1      20001 1      20162 0      00006 1      30736 0

10,2140         52155 1      07130 1      52155 1      20001 1      20131 0      52131 0      52155 1      00006 1
10,2150         30155 0      50141 0      52015 1      00006 1      30160 0      50141 0      52017 0      00006 1
10,2160         30162 1      50141 0      52021 0      30141 0      54116 0      00006 1      30006 1      64742 1
10,2170         52165 1      34735 1      54023 1      17501 0      52155 1      20001 1      50141 0      52007 1

10,2200         52160 1      20001 1      50141 0      52011 0      52162 0      20001 1      50141 0      52013 1
10,2210         30142 0      54003 0      14622 1      22073 0      30065 1      74750 0      60000 1      54061 1
10,2220         30065 1      75021 0      00006 1      74731 1      54062 1      30065 1      74101 1      56065 1
10,2230         75015 1      10000 0      15372 0      30062 0      50061 0      54750 1      10066 0      12253 0

10,2240         12241 0      40072 0      22072 1      50071 1      52750 1      10066 0      12247 0      12253 0
10,2250         40025 1      50071 1      55050 1      10065 0      12267 1      12272 0      40025 1      50061 0
10,2260         55050 1      30065 1      62265 1      10000 0      12265 0   C: 17777 0      12272 0      00006 1
10,2270         30025 0      53151 1      40062 1      50061 0      54747 1      30002 0      22073 0      00003 1

10,2300         52006 0      22073 0      30062 0      50061 0      54750 1      30070 0      50061 0      55051 0
10,2310         00006 1      30064 0      50061 0      53435 0      12236 0      05476 1      13427 1      54155 1
10,2320         34726 0      12473 1      34746 0      54155 1      33043 0      12473 1      54155 1      33553 1
10,2330         12473 1      54155 1      33526 0      12473 1      54155 1      33513 0      12473 1      54155 1

10,2340         33514 1      12473 1      54155 1      34726 0      12446 1      54155 1      33043 0      12651 0
10,2350         54155 1      33526 0      12651 0      65014 1      54155 1      33513 0      12651 0      34744 1
10,2360         02747 1      30100 0      73527 0      10000 0      12422 0      30100 0      74734 1      00006 1
10,2370         12372 1      15146 0      00004 0      44747 0      70100 1      64744 1      54100 1      00003 1
```

```
OCTAL LISTING FOR PARAGRAPH # 061,  WITH PARITY BIT IN BINARY AT THE RIGHT OF EACH WORD, "@" DENOTES UNUSED FIXED MEMORY

ALL VALID WORDS ARE BASIC INSTRUCTIONS EXCEPT THOSE MARKED "I" (INTERPRETIVE OPERATOR WORDS) OR "C" (CONSTANTS)

10,2400        41070 0      74740 1      10000 0      12406 0      40367 1      54367 1      34744 1      12630 1
10,2410        30165 0      54156 1      50164 1      33537 0      54162 0      50164 1      31067 1      54160 1
10,2420        54003 0      00002 0      30100 0      73274 1      10000 0      13462 0      40100 1      74742 0
10,2430        00004 0      26100 1      12534 0      30367 0      74144 0      13140 0      54155 1      34746 0

10,2440        12473 1      54155 1      34737 0      12473 1      54155 1      34746 0      54160 1      34746 0
10,2450        12653 1      34746 0      54155 1      33512 1      12473 1      54155 1      33512 1      12651 0
10,2460        54155 1      34727 1      12473 1      54155 1      34727 1      12446 1      54155 1      33551 0
10,2470        12473 1      54155 1      34741 1      54160 1      02734 0      00003 1      12560 1      54155 1

10,2500        33531 0      12651 0      54155 1      33531 0      12473 1      34746 0      54164 0      03402 1
10,2510        12515 0      30100 0      73550 0      10000 0      12607 0      00004 0      41035 1      76130 1
10,2520        27035 1      00003 1      30100 0      75634 1      00006 1      12530 1      34746 0      13006 0
10,2530        30100 0      73546 1      00006 1      12536 1      34744 1      13006 0      02746 0      03225 1

10,2540        05130 0      03242 0      30025 0      55164 1      34746 0      54164 0      41067 0      74735 0
10,2550        10000 0      13102 0      30366 1      74144 0      54001 1      40366 0      54366 0      13103 1
10,2560        30167 1      77746 1      54163 1      37742 1      05137 1      30160 0      73530 0      10000 0
10,2570        12505 1      12573 0      12357 0      34743 0      54164 0      03402 1      12611 1      41071 1

10,2600        74741 0      10000 0      12611 1      30100 0      73521 0      00006 1      12611 1      05626 0
10,2610     C: 31502 1      02750 1      30163 0      00006 1      04007 1      55264 1      30100 0      73522 0
10,2620        10000 0      12766 0      12624 1      12766 0      03225 1      05130 0      03242 0      34743 0
10,2630        54164 0      13102 0      54155 1      37755 1      12473 1      55044 1      33504 0      54155 1

10,2640        33503 1      12473 1      54155 1      33507 0      12473 1      02727 1      12473 1      54155 1
10,2650        34741 1      54160 1      36266 0      00004 0      54072 0      30167 1      77746 1      54063 0
10,2660        30160 0      74741 0      10000 0      12671 1      30063 1      05063 1   C: 02560 0   C: 20067 1
10,2670        12677 1      30006 1      00006 1      04007 1      54001 1      33545 0      05107 1      02734 0

10,2700        00006 1      30156 0      50064 0      52156 1      00006 1      30160 0      50064 0      52160 1
10,2710        30064 0      54161 0      02741 1      00003 1      14631 0      55044 1      33504 0      54155 1
10,2720        33503 1      12651 0      54155 1      33507 0      12651 0      02727 1      12651 0      55143 1
10,2730        33510 0      54155 1      33511 1      00002 0      00004 0      43520 1      70160 1      60003 1

10,2740        54160 1      22002 0      04636 0      54157 0      60072 1      00001 0      34746 0      54164 0
10,2750        00004 0      30160 0      50164 1      55067 0      73536 0      00006 1      12762 1      30157 1
10,2760        50164 1      54371 0      30155 0      50164 1      54366 0      13251 0      50164 1      33537 0
10,2770        12772 0      03554 0   C: 03004 0      44744 0      60164 1      54154 0      50154 1      33516 0
```

```
OCTAL LISTING FOR PARAGRAPH # 062,  WITH PARITY BIT IN BINARY AT THE RIGHT OF EACH WORD, "@" DENOTES UNUSED FIXED MEMORY

ALL VALID WORDS ARE BASIC INSTRUCTIONS EXCEPT THOSE MARKED "I" (INTERPRETIVE OPERATOR WORDS) OR "C" (CONSTANTS)

10,3000        00004 0      05130 0      03242 0      50154 1      33516 0      15124 1      54154 0      03225 1
10,3010        05130 0      30154 1      50064 0      54154 0      33027 1      03243 1      50154 1      33540 0
10,3020        73542 0      03564 0   C: 74004 0      50154 1      34740 0      64742 1      03554 0   C: 02776 0
10,3030        30100 0      74742 0      10000 0      02372 0      12536 1      34746 0      54160 1      50160 0

10,3040        33532 0      64742 1      03564 0   C: 40010 1      50160 0      33516 0      00004 0      05130 0
10,3050        13355 0      31071 0      54003 0      31264 0      04720 0      77746 1      05137 1      46266 1
10,3060        60373 0      14631 0      00003 1      31072 0      54156 1      30100 0      77761 1      10000 0
10,3070        13073 1      13477 1      12372 1      05506 1   C: 00105 0      34727 1      70100 1      10000 0

10,3100        12544 1      12627 1      22007 0      02412 1      30160 0      74750 0      26001 1      44730 0
10,3110        50164 1      71067 0      50164 1      55067 0      74735 0      50164 1      13117 1      33552 0
10,3120        54141 1      30156 0      54165 1      55072 1      50164 1      10366 0      13137 0      13253 1
10,3130        50164 1      40366 0      50164 1      54366 0      76115 0      63523 0      60141 0      64744 1

10,3140        04146 0      13265 1      04424 1      02410 0      05520 0   C: 00102 1      05520 0   C: 00103 0
10,3150        05520 0   C: 00104 1      30160 0      04246 0      13102 0      34740 0      70160 1      10000 0
10,3160        13203 1      34741 1      70160 1      10000 0      13300 0      40160 1      74737 1      10000 0
10,3170        13175 0      50164 1      30371 1      54157 0      13373 1      50164 1      30366 1      76115 0

10,3200        00006 1      13300 0      15146 0      30160 0      74730 0      10000 0      13161 0      34730 1
10,3210        50164 1      27067 0      22007 0      00006 1      62433 1      74731 1      00006 1      13723 0
10,3220        41066 1      63547 1      13140 0      33506 1      13140 0      44740 1      00006 1      03011 1
10,3230        30100 0      73524 0      10000 0      34744 1      54001 1      34746 0      50001 0      57041 0

10,3240        00004 0      00002 0      34210 0      56064 0      00006 1      63251 1      56064 0      50064 0
10,3250        54164 0      00003 1      00002 0      37741 1      05076 0   C: 04222 1   C: 04060 0      13301 1
10,3260        30100 0      73306 0      00006 1      12607 0      15146 0      11041 1      15146 0      13271 1
10,3270        15146 0      30162 1      73525 1      03554 0   C: 24100 0      50164 1      33515 0      04433 1

10,3300        04420 0      30164 1      54157 0      30162 1      73022 0      03554 0   C: 40040 1      11041 1
10,3310        13260 1      13313 1      13260 1      04200 1      13400 1      13417 1      43534 1      60154 1
10,3320        00006 1      26000 0      00006 1      13467 0      34743 0      54161 0      30100 0      74101 1
10,3330        10000 0      13334 1      13435 1      13421 1      40025 1      61164 0      10000 0      40000 0

10,3340        67752 0      64744 1      63600 1      00006 1      62544 0      00004 0      46130 1      71035 1
10,3350        64726 0      55035 1      13435 1      34744 1      13036 0      10161 0      64744 1      13361 1
10,3360        15146 0      50157 1      60371 1      54157 0      30162 1      73367 1      03564 0   C: 74044 1
10,3370        46266 1      04145 0      13373 1      30163 0      77746 1      05137 1      30157 1      14631 0
```

```
OCTAL LISTING FOR PARAGRAPH # 063,  WITH PARITY BIT IN BINARY AT THE RIGHT OF EACH WORD, "@" DENOTES UNUSED FIXED MEMORY

ALL VALID WORDS ARE BASIC INSTRUCTIONS EXCEPT THOSE MARKED "I" (INTERPRETIVE OPERATOR WORDS) OR "C" (CONSTANTS)

10,3400       34746 0     13325 1     40160 1     74727 0     10000 0     16760 1     40157 0     50164 1
10,3410       60371 1     00006 1     13414 1     00002 0     11011 1     05146 1     00002 0     34744 1
10,3420       13325 1     46263 1     70100 1     00004 0     54100 1     00003 1     13355 0     37770 0
10,3430       54161 0     30100 0     74346 0     10000 0     13073 1     30100 0     73532 1     10000 0

10,3440       13035 0     30100 0     73533 0     10000 0     13353 0     31071 0     74762 1     10000 0
10,3450       13355 0     30370 0     00006 1     13355 0     35016 0     00004 0     05063 1  C: 02627 0
10,3460    C: 20060 0   . 13355 0     30100 0     73532 1     10000 0     15146 0     12766 0     50157 1
10,3470       30366 1     76115 0     40000 0     60155 0     00006 1     13324 0     13062 1     46266 1

10,3500       04145 0     15146 0     15146 0  C: 00036 1  C: 00231 1  C: 01407 0  C: 14400 0  C: 00030 1
10,3510    C: 01006 0  C: 00014 1  C: 20010 1  C: 40230 1  C: 40036 0  C: 20542 0  C: 20372 0  C: 20627 0
10,3520    C: 03400 0  C: 11210 1  C: 66521 1  C: 01177 1  C: 00700 0  C: 00704 1  C: 40030 0  C: 34300 0
10,3530    C: 40100 1  C: 00110 1  C: 02020 1  C: 01010 1  C: 00026 0  C: 77730 0  C: 00050 1  C: 20144 1

10,3540    C: 42424 0  C: 11254 1  C: 74704 1  C: 67777 1  C: 40420 0  C: 02560 0  C: 10200 1  C: 30200 0
10,3550    C: 20100 1  C: 24030 1  C: 02600 0  C: 00310 0     00004 0     75652 1     54001 1     40100 1
10,3560       70001 1     26100 1     00003 1     16760 1     00004 0     75652 1     40000 0     70100 1
10,3570       54100 1     13562 1     00004 0     54001 1     30133 0     55363 1     30134 1     05600 1

10,3600    C: 77467 1     34777 1     12477 0     00006 1     30025 0     16076 1     10154 0     34746 0
10,3610       13613 1     13612 0     44727 0     54155 1     34746 0     56154 1     00006 1     74727 0
10,3620       20155 1     16102 0     07300 0     16102 0     03654 0     34746 0     54155 1     16101 0
10,3630       03654 0     52162 0     52155 1     03654 0     54156 1     52160 1     52155 1     03654 0

10,3640       54155 1     30161 1     54154 0     34744 1     16101 0     03654 0     52160 1     52155 1
10,3650       03654 0     54001 1     30157 1     16076 1     52155 1     20001 1     10000 0     64744 1
10,3660       13662 1     40000 0     54154 0     00002 0     50000 1     34725 0     26154 0     00002 0
10,3670       54142 1     50130 0     10000 0     64744 1     13700 1     64744 1     64744 1     40000 0

10,3700       60142 0     10000 0     64744 1     13705 1     40000 0     54142 1     13712 1     50000 1
10,3710       34725 0     60142 0     50130 0     54000 0     00002 0     50120 1     30046 0     04607 1
10,3720    C: 17310 0     16102 0     34744 1     13725 0     34746 0     60120 1     54156 1     04607 1
10,3730    C: 01010 1     10154 0     13766 1     13735 1     13766 1     10157 0     13766 1     13741 1

10,3740       13766 1     10161 0     13766 1     13745 0     13766 1     30155 0     00006 1     74727 0
10,3750       20155 1     30160 0     00006 1     74727 0     20160 1     30162 1     00006 1     74727 0
10,3760       20162 0     34752 0     50156 0     54045 1     04626 1  C: 01024 0     34746 0     13762 0
10,3770       04607 1  C: 01010 1     06102 1  C: 03773 1  C: 03774 0  CKSM 40773 0        @           @
```

```
OCTAL LISTING FOR PARAGRAPH # 064,  WITH PARITY BIT IN BINARY AT THE RIGHT OF EACH WORD, "@" DENOTES UNUSED FIXED MEMORY

ALL VALID WORDS ARE BASIC INSTRUCTIONS EXCEPT THOSE MARKED "I" (INTERPRETIVE OPERATOR WORDS) OR "C" (CONSTANTS)

11,2000      I: 77614 1    C: 00475 1    I: 44175 1    C: 03444 0    C: 03463 0    C: 03472 0    I: 77646 0    C: 03723 1
11,2010      I: 46135 1    C: 03000 1    C: 22026 0    I: 72575 0    C: 02314 0    C: 26314 0    C: 02322 0    I: 77752 1
11,2020      C: 26322 0    C: 03472 0    I: 77752 1    C: 03472 0    I: 77646 0    C: 03723 1    I: 71331 0    C: 03617 1
11,2030      C: 77776 1    I: 70546 1    C: 17667 0    I: 67154 0    C: 00154 1    C: 02701 0    I: 77775 1    C: 02314 0

11,2040      C: 26655 0    C: 03472 0    C: 16663 0    C: 03452 1    C: 02671 0    I: 77201 1    C: 00001 0    C: 02314 0
11,2050      I: 41456 0    I: 53435 0    C: 02322 0    C: 26674 0    C: 03472 0    I: 50256 0    I: 43015 1    C: 03667 0
11,2060      C: 03665 1    C: 03667 0    I: 43044 0    C: 22105 0    C: 03465 0    I: 41575 0    C: 02663 0    I: 63246 1
11,2070      I: 46206 1    C: 02674 0    I: 51352 1    I: 74256 0    I: 77772 0    C: 02663 0    I: 67351 1    C: 24007 0

11,2100      C: 03617 1    I: 77244 0    C: 22105 0    C: 02663 0    C: 03472 0    I: 63345 0    C: 26007 1    C: 02663 0
11,2110      I: 63256 0    C: 02655 0    I: 41456 0    I: 57435 1    C: 00003 1    I: 77606 1    I: 71350 1    C: 02776 0
11,2120      C: 00023 0    I: 62040 1    C: 22124 0    C: 77767 1    I: 67310 1    C: 00012 1    C: 00047 1    I: 77230 0
11,2130      C: 22132 1    I: 41476 1    I: 77775 1    I: 50235 0    I: 71244 0    C: 22137 1    I: 41476 1    I: 67154 0

11,2140      C: 00000 1    C: 02672 0    I: 66350 1    C: 02776 0    C: 00027 1    C: 00024 1    I: 77624 1    C: 25212 1
11,2150      I: 77214 0    C: 00675 0    C: 02744 1    C: 16330 0    C: 02702 0    I: 45030 0    C: 22233 0    C: 27447 0
11,2160      I: 43135 1    C: 03000 1    C: 00263 0    I: 43030 0    C: 22166 0    C: 00063 1    I: 77775 1    C: 02314 0
11,2170      C: 02655 0    C: 25535 0    C: 02330 0    C: 15543 1    C: 03610 0    C: 01517 0    I: 43015 1    C: 03452 1

11,2200      C: 01673 1    C: 34041 0    C: 27145 1    I: 77775 1    C: 00025 0    C: 02703 1    I: 63154 1    C: 03616 0
11,2210      C: 00001 0    I: 55134 1    C: 03616 0    C: 02701 0    I: 46135 1    C: 00050 1    C: 22230 0    I: 52375 1
11,2220      C: 03472 0    C: 00017 1    I: 77655 1    C: 02663 0    C: 16663 0    C: 03667 0    I: 77650 1    C: 22062 0
11,2230      I: 77775 1    C: 02663 0    C: 03472 0    I: 52375 1    C: 02330 0    C: 02322 0    C: 26357 1    C: 02703 1

11,2240      C: 03566 1    I: 46135 1    C: 03000 1    C: 22260 0    I: 70575 1    C: 03566 1    C: 27566 1    C: 02330 0
11,2250      I: 77742 0    C: 26330 0    C: 03472 0    I: 77742 0    C: 27472 0    C: 02357 1    I: 77742 0    C: 02357 1
11,2260      I: 70750 1    C: 02776 0    C: 10003 0    I: 41206 0    C: 02742 1    I: 56342 1    C: 00041 1    C: 17721 0
11,2270      I: 77661 0    C: 20607 1    C: 03717 0    I: 77201 1    C: 00001 0    C: 03472 0    C: 03444 0    I: 52014 0

11,2300      C: 01267 0    C: 03463 0       56016 0       00006 1       22012 1       05323 0    C: 00100 0       15272 1
11,2310         00006 1       00031 0       40000 0       72401 1       55647 1       34743 0       55646 0       34747 1
11,2320         05175 1    C: 02326 1       15272 1       55646 0       34750 1       05226 1       00006 1       00031 0
11,2330         40000 0       72401 1       57647 0       54001 1       11647 1       12324 1       10001 1       12347 1

11,2340         11646 0       12323 0       06040 0       34731 0       00006 1       05013 0       15263 1       34730 1
11,2350         00006 1       02031 1       00006 1       12342 1       30001 0       74737 1       10000 0       42402 1
11,2360         27644 1       30001 0       74740 1       10000 0       32402 0       27644 1       30001 0       74744 0
11,2370         10000 0       42402 1       27645 0       30001 0       74743 1       10000 0       32402 0       27645 0
```

```
OCTAL LISTING FOR PARAGRAPH # 065,  WITH PARITY BIT IN BINARY AT THE RIGHT OF EACH WORD, "@" DENOTES UNUSED FIXED MEMORY

ALL VALID WORDS ARE BASIC INSTRUCTIONS EXCEPT THOSE MARKED "I" (INTERPRETIVE OPERATOR WORDS) OR "C" (CONSTANTS)

11,2400          12342 1   C: 00063 1   C: 00436 0   I: 40354 1   C: 02030 0   C: 00001 0   I: 75543 1   C: 51770 0
11,2410       I: 53515 0   C: 01535 0   I: 60325 0   C: 00045 0   C: 00047 1   I: 77715 1   I: 65241 0   C: 01543 1
11,2420       C: 02074 0   I: 60225 1   C: 01551 1   C: 00051 0   I: 77742 0   I: 65271 0   C: 00003 1   I: 41405 0
11,2430       C: 00005 1   I: 65316 0   C: 00005 1   I: 64716 0   C: 51770 0   I: 40442 1   I: 47515 0   C: 01543 1

11,2440       I: 44205 0   C: 00045 0   I: 41271 0   C: 00003 1   I: 53605 1   C: 11254 1   C: 20176 0   I: 43260 1
11,2450       C: 00050 1   I: 45257 0   C: 20211 1   I: 41205 0   C: 00001 0   C: 00005 1   I: 53657 0   C: 20211 1
11,2460       C: 20201 0   I: 65215 1   C: 01553 0   I: 53605 1   C: 00001 0   C: 20202 0   I: 43204 0   C: 57756 1
11,2470       I: 77626 0   C: 75656 0   I: 74020 0   C: 02111 1   C: 00012 1   I: 74014 1   C: 00303 1   C: 24023 0

11,2500       C: 00002 0   I: 77650 1   C: 24023 0   I: 66350 1   C: 01500 0   C: 00051 0   C: 77762 1   I: 54345 1
11,2510       C: 02076 1   C: 20612 0   I: 61500 0   C: 22514 1   I: 43206 1   C: 01551 1   C: 16074 0   I: 77615 0
11,2520       C: 01517 0   C: 35517 1   C: 22403 0   I: 73150 1   C: 02030 0   C: 02030 0   I: 77775 1   C: 24007 0
11,2530       C: 26062 1   C: 02032 1   I: 53257 1   C: 57605 0   C: 01535 0   C: 02040 1   I: 65014 1   C: 01756 1

11,2540       C: 22545 0   C: 01500 0   C: 12123 1   I: 77724 0   C: 01500 0   I: 53575 0   C: 02032 1   C: 16032 1
11,2550       C: 00045 0   C: 36070 0   C: 22653 1   I: 66175 1   C: 02040 1   C: 00051 0   C: 16032 1   C: 02072 0
11,2560       C: 02070 1   I: 71214 0   C: 00342 1   C: 23024 0   C: 01517 0   I: 77624 1   C: 33646 0   I: 72174 0
11,2570       C: 00002 0   C: 00051 0   I: 77614 1   C: 00343 0   C: 22577 1   I: 77076 0   C: 00000 1   C: 02040 1

11,2600       C: 26104 0   C: 00003 1   C: 02113 0   I: 45335 0   C: 01011 0   C: 11256 0   I: 43030 0   C: 22612 1
11,2610       C: 01756 1   C: 22625 0   I: 74375 0   C: 02032 1   C: 02070 1   I: 52257 0   C: 57175 0   C: 02040 1
11,2620       I: 77724 0   C: 01500 0   C: 12131 1   I: 77724 0   C: 01500 0   I: 62175 0   C: 02104 0   C: 00004 0
11,2630       I: 43014 0   C: 04260 1   C: 00343 0   C: 22640 0   I: 53261 1   C: 20612 0   C: 02113 0   C: 02113 0

11,2640       I: 77624 1   C: 22653 1   I: 62174 1   C: 00004 0   C: 00004 0   I: 77775 1   C: 02113 0   C: 36040 0
11,2650       C: 22653 1   I: 77650 1   C: 23024 0   I: 74575 0   C: 02040 1   I: 40236 1   C: 00001 0   I: 61501 1
11,2660       C: 00040 0   I: 60325 0   C: 02070 1   C: 00041 1   I: 63342 1   C: 02040 1   I: 77656 1   C: 16040 1
11,2670       C: 00045 0   C: 02072 0   I: 55301 0   C: 00042 1   I: 41562 0   I: 77743 1   C: 27760 0   C: 00051 0

11,2700       I: 57124 1   C: 00050 1   C: 00040 0   I: 71264 1   C: 00041 1   C: 00003 1   I: 65057 0   C: 57177 1
11,2710       C: 00050 1   I: 74406 0   I: 50315 0   C: 02032 1   C: 02040 1   I: 44372 1   I: 57206 1   C: 00005 1
11,2720       I: 77752 1   I: 43206 1   C: 25766 1   I: 75406 1   I: 41475 1   C: 00013 0   I: 43352 1   C: 25766 1
11,2730       I: 43325 1   C: 00013 0   C: 24005 1   I: 72475 1   C: 00011 1   I: 56215 1   C: 25760 1   C: 00017 1

11,2740       I: 74275 1   C: 00007 0   C: 02040 1   I: 64515 1   C: 02032 1   I: 41455 0   I: 41345 0   C: 00001 0
11,2750       C: 00015 0   I: 61501 1   C: 00037 0   I: 40665 0   C: 00003 1   C: 51770 0   I: 74276 1   I: 57124 1
11,2760       C: 00050 1   C: 00051 0   I: 55064 0   C: 00036 1   C: 00037 0   I: 53604 0   C: 57756 1   C: 57177 1
11,2770       I: 53324 1   C: 00050 1   C: 02062 1   C: 02062 1   I: 43400 1   C: 22776 1   I: 51575 1   C: 01521 0
```

```
OCTAL LISTING FOR PARAGRAPH # 066,  WITH PARITY BIT IN BINARY AT THE RIGHT OF EACH WORD, "@" DENOTES UNUSED FIXED MEMORY

ALL VALID WORDS ARE BASIC INSTRUCTIONS EXCEPT THOSE MARKED "I" (INTERPRETIVE OPERATOR WORDS) OR "C" (CONSTANTS)

11,3000      I: 77654 0   C: 23021 0   I: 54345 1   C: 02100 1   C: 20612 0   I: 44206 0   C: 01551 1   C: 16074 0
11,3010      C: 01517 0   I: 45425 0   C: 42260 0   C: 22403 0   I: 77624 1   C: 27720 1   I: 77614 1   C: 04020 1
11,3020      C: 27315 0   I: 77776 1      05644 1   C: 20430 1   I: 71354 0   C: 02030 0   C: 02070 1   I: 44601 0
11,3030      C: 00001 0   C: 50003 1   I: 43044 0   C: 23262 0   C: 00343 0   C: 23271 1   I: 65375 0   C: 02032 1

11,3040      C: 01517 0   I: 45125 0   C: 25756 1   C: 51644 0   C: 24017 1   C: 24001 0   I: 45006 0   C: 23277 1
11,3050      I: 77715 1   C: 24005 1   I: 45006 0   C: 23277 1   I: 77772 0   C: 24041 1   I: 77772 0   C: 14025 0
11,3060      C: 00023 0   I: 65275 1   C: 25770 0   C: 00023 0   I: 57316 1   C: 25772 1   I: 41425 1   C: 25764 0
11,3070      I: 41275 1   C: 00023 0   C: 23775 0   I: 65372 1   C: 00001 0   I: 44275 1   C: 11254 1   I: 57206 1

11,3100      C: 00023 0   I: 65275 1   C: 25774 1   C: 00003 1   I: 44275 1   C: 11252 1   I: 56203 0   C: 51764 0
11,3110      C: 02070 1   I: 56615 0   C: 00005 1   C: 51760 1   I: 43271 1   C: 02070 1   C: 00003 1   I: 77761 1
11,3120      C: 02032 1   C: 14033 1   I: 70403 1   C: 51764 0   I: 43271 1   C: 02070 1   I: 50473 1   C: 51760 1
11,3130      I: 43271 1   C: 02070 1   I: 76561 1   C: 00025 0   I: 77645 0   C: 00033 1   C: 14033 1   C: 02070 1

11,3140      I: 63501 0   C: 00047 1   I: 60316 0   C: 00051 0   I: 54606 0   C: 51754 0   I: 40161 0   C: 00033 1
11,3150      C: 23151 0   I: 56070 0   C: 00046 0   C: 00046 0   I: 53670 0   C: 00050 1   C: 20153 1   I: 40055 0
11,3160      C: 02062 1   C: 22776 1   C: 16062 1   C: 00017 1   I: 41414 0   C: 00343 0   C: 23262 0   I: 65316 0
11,3170      C: 00021 1   I: 45316 1   I: 74205 0   C: 27762 1   C: 02032 1   I: 65332 0   I: 53361 0   C: 00041 1

11,3200      I: 47315 0   C: 00041 1   C: 00025 0   I: 74372 1   C: 00021 1   I: 41455 0   I: 77745 1   C: 00023 0
11,3210      I: 41516 0   I: 65265 0   C: 27762 1   I: 43302 1   C: 00011 1   I: 41221 0   C: 11044 1   C: 00017 1
11,3220      I: 74205 0   C: 27762 1   C: 02032 1   I: 65272 0   I: 74225 1   C: 11044 1   C: 00041 1   I: 53372 1
11,3230      I: 41325 0   C: 00017 1   C: 00023 0   I: 74205 0   C: 27762 1   C: 00025 0   I: 53352 0   I: 60325 0

11,3240      C: 02070 1   C: 00050 1   I: 67206 1   C: 01351 1   I: 74271 0   I: 63257 1   C: 57601 1   I: 67206 1
11,3250      C: 01350 0   I: 53361 0   I: 70257 0   C: 20146 0   I: 40055 0   C: 02062 1   C: 22776 1   C: 02062 1
11,3260      I: 77754 1   C: 02030 0   I: 72135 0   C: 01501 1   C: 00154 1   I: 73205 1   C: 27764 1   C: 00155 0
11,3270      C: 23304 1   I: 77745 1   C: 02036 0   C: 24023 0   C: 24001 0   I: 77650 1   C: 23057 1   I: 57435 1

11,3300      C: 02013 1   I: 77655 1   I: 43505 0   C: 00025 0   C: 23473 0   C: 23477 1   C: 23510 1   I: 77214 0
11,3310      C: 00342 1   C: 23340 1   C: 01535 0   I: 41241 0   C: 01543 1   C: 02076 1   I: 77640 0   C: 23340 1
11,3320      I: 43014 0   C: 00303 1   C: 23415 0   C: 04340 1   C: 23412 1   I: 45145 0   C: 01517 0   C: 33646 0
11,3330      C: 02104 0   I: 77754 1   C: 02030 0   I: 51445 0   C: 01535 0   I: 50025 0   C: 27770 1   C: 23432 0

11,3340      I: 51575 1   C: 01521 0   I: 77600 1   C: 23366 0   I: 51025 1   C: 23773 0   C: 23366 0   I: 53615 0
11,3350      C: 23773 0   C: 57605 0   I: 45271 1   C: 00013 0   C: 27766 0   I: 77244 0   C: 23366 0   C: 01527 0
11,3360      I: 45246 0   C: 23773 0   I: 77600 1   C: 23366 0   I: 77640 0   C: 23370 1   I: 77624 1   C: 27720 1
11,3370      I: 77775 1   C: 01527 0   C: 25134 0   C: 01521 0   C: 01126 0   I: 77614 1   C: 00261 1   I: 66375 0
```

```
OCTAL LISTING FOR PARAGRAPH # 067,  WITH PARITY BIT IN BINARY AT THE RIGHT OF EACH WORD, "@" DENOTES UNUSED FIXED MEMORY

ALL VALID WORDS ARE BASIC INSTRUCTIONS EXCEPT THOSE MARKED "I" (INTERPRETIVE OPERATOR WORDS) OR "C" (CONSTANTS)

11,3400     C: 01126 0    C: 01501 1    C: 00000 1    C: 16032 1    C: 24007 0    C: 02100 1    I: 52014 0    C: 00301 0
11,3410     C: 23712 1    C: 22523 0    I: 52175 0    C: 02104 0    C: 23333 0    I: 60545 0    C: 00013 0    I: 50025 0
11,3420     C: 27770 1    C: 23340 1    I: 71214 0    C: 04340 1    C: 23432 0    C: 01517 0    I: 77624 1    C: 33646 0
11,3430     I: 77676 0    C: 02104 0    I: 77624 1    C: 23436 1    I: 77650 1    C: 23370 1    I: 45020 1    C: 02111 1

11,3440     C: 27720 1    I: 53775 1    C: 01535 0    C: 57576 1    I: 53651 0    C: 02104 0    C: 57574 0    C: 01503 0
11,3450     C: 01535 0    I: 57414 1    C: 00343 0    C: 23454 0    I: 53715 1    C: 01543 1    C: 57576 1    I: 77651 0
11,3460     I: 77657 0    C: 57574 0    C: 01511 0    C: 01543 1    I: 67154 0    C: 02111 1    C: 00052 0    I: 52014 0
11,3470     C: 00303 1    C: 26747 1    C: 26754 0    I: 64575 1    C: 02062 1    C: 36046 0    C: 23653 0    I: 74575 0

11,3500     C: 02062 1    I: 53206 0    C: 02046 1    C: 26054 1    I: 53362 0    C: 02046 1    C: 36046 0    C: 23653 0
11,3510     I: 57345 1    C: 02100 1    C: 11254 1    I: 74206 0    C: 02046 1    I: 53372 1    C: 01134 0    I: 53361 0
11,3520     C: 02100 1    C: 01126 0    C: 25126 0    C: 02062 1    I: 53322 1    C: 02054 1    I: 76561 1    I: 77655 1
11,3530     C: 01134 0    C: 01134 0    I: 45014 0    C: 00341 1    C: 23604 1    C: 51770 0    I: 77354 0    C: 01116 0

11,3540     C: 01134 0    I: 77732 1    C: 12467 1    I: 77775 1    C: 01126 0    I: 40132 0    C: 23676 1    C: 12401 1
11,3550     I: 77624 1    C: 51770 0    I: 66354 0    C: 01116 0    C: 00052 0    C: 00000 1    I: 67114 1    C: 00006 1
11,3560     C: 01125 0    I: 45104 0    C: 23647 0    C: 51770 0    I: 67154 0    C: 01125 0    C: 01116 0    I: 77624 1
11,3570     C: 51770 0    I: 70754 0    C: 01116 0    C: 75376 1    I: 77722 0    C: 01126 0    I: 76173 0    C: 75310 1

11,3600     C: 00000 1    I: 77722 0    C: 35134 1    C: 23377 0    I: 77200 0    C: 22776 1    C: 01134 0    C: 25527 0
11,3610     C: 01126 0    C: 01521 0    I: 43014 0    C: 04715 0    C: 27662 0    C: 01756 1    C: 27315 0    I: 77776 1
11,3620        05355 1    C: 04022 0       05506 1    C: 00236 0       06060 1    I: 77731 1    C: 00053 1    C: 23634 1
11,3630     I: 52014 0    C: 01714 1    C: 26717 1    C: 26772 1    I: 66214 0    C: 00061 0    C: 01117 1    C: 77741 0

11,3640     I: 66214 0    C: 01755 1    C: 23567 1    C: 01117 1    C: 77717 0    I: 77650 1    C: 23567 1    I: 77745 1
11,3650     C: 01115 0    C: 34041 0    C: 27177 0    I: 43345 1    C: 02076 1    C: 02100 1    I: 66110 1    C: 77763 0
11,3660     C: 01500 0    C: 02100 1    I: 74561 0    C: 02062 1    I: 74255 0    C: 01134 0    C: 02100 1    I: 77655 1
11,3670     C: 01126 0    C: 02032 1    I: 52014 0    C: 00301 0    C: 23712 1    C: 22503 1    I: 43014 0    C: 01676 1

11,3700     C: 01671 0    I: 77614 1    C: 02676 1    I: 77414 0    C: 01472 1       05571 1    C: 00421 0       06060 1
11,3710     I: 77650 1    C: 27315 0    I: 70754 0    C: 02030 0    C: 51770 0    C: 36072 1    C: 23740 0    C: 02062 1
11,3720     I: 62014 0    C: 00342 1    C: 23262 0    C: 77771 0    I: 70744 1    C: 02030 0    C: 51772 1    C: 36072 1
11,3730     C: 23740 0    I: 50414 0    C: 00303 1    C: 23734 0    I: 77655 1    C: 02062 1    C: 36062 0    C: 23262 0

11,3740     I: 60575 0    C: 02032 1    I: 53513 0    C: 02123 0    I: 46315 1    C: 02032 1    I: 52361 1    C: 23773 0
11,3750     I: 60325 0    C: 00045 0    C: 00052 0    I: 63406 0    I: 77605 1    I: 65301 0    C: 00043 0    C: 02072 0
11,3760     I: 56342 1    I: 77761 1    I: 57154 0    C: 00051 0    C: 00051 0    I: 57074 0    C: 00051 0    C: 00042 1
11,3770     I: 43457 0    C: 57606 0    C: 30000 1    C: 00000 1    C: 22525 0    C: 12525 0    C: 03776 1  CKSM 61164 0
```

```
OCTAL LISTING FOR PARAGRAPH # 070,  WITH PARITY BIT IN BINARY AT THE RIGHT OF EACH WORD, "@" DENOTES UNUSED FIXED MEMORY

ALL VALID WORDS ARE BASIC INSTRUCTIONS EXCEPT THOSE MARKED "I" (INTERPRETIVE OPERATOR WORDS) OR "C" (CONSTANTS)

12,2000     C: 00000 1    C: 00000 1    C: 00000 1    C: 00000 1    C: 20000 0    C: 00000 1    C: 00000 1    C: 00000 1
12,2010     C: 00000 1    C: 00000 1    C: 00000 1    C: 00000 1    C: 77777 0    C: 77771 0    C: 77763 0    C: 37777 1
12,2020     C: 37777 1    C: 37777 1    C: 37777 1    I: 40001 1    C: 00001 0    C: 24026 0    I: 77773 1    C: 10005 0
12,2030     C: 24017 1    C: 01503 0    I: 66256 0    C: 00027 1    C: 00024 1    C: 16647 0    C: 00045 0    C: 24041 1

12,2040     C: 01503 0    I: 76441 1    C: 01511 0    I: 76405 1    C: 00023 0    C: 24043 0    C: 01511 0    I: 57236 1
12,2050     C: 00017 1    I: 52405 1    C: 00041 1    I: 61425 0    C: 11036 1    C: 00045 0    I: 74421 0    C: 11036 1
12,2060     I: 77671 1    C: 00041 1    C: 00011 1    I: 71244 0    C: 24073 0    C: 11054 0    I: 40071 0    C: 00011 1
12,2070     C: 24077 1    I: 52166 1    C: 24077 1    I: 55366 1    C: 11056 1    I: 77600 1    C: 24077 1    C: 00013 0

12,2100     I: 65205 0    C: 00023 0    C: 00011 1    I: 65301 0    C: 00047 1    I: 56257 1    C: 20173 0    I: 50000 1
12,2110     C: 24124 0    C: 24124 0    I: 51525 1    C: 02074 0    I: 50025 0    C: 00001 0    C: 24124 0    I: 77765 0
12,2120     C: 02074 0    C: 16074 0    I: 77650 1    C: 24112 0    I: 71201 1    C: 00001 0    C: 02121 1    C: 00025 0
12,2130     I: 53165 0    C: 02074 0    C: 24302 0    I: 51440 0    C: 24302 0    I: 51025 1    C: 00013 0    C: 24302 0

12,2140     I: 51145 0    C: 02074 0    C: 24152 1    I: 57545 1    C: 00013 0    C: 14015 0    C: 24007 0    C: 00013 0
12,2150     I: 77650 1    C: 24155 0    I: 77745 1    C: 24007 0    C: 00015 0    I: 57345 1    C: 02074 0    C: 11047 1
12,2160     I: 77646 0    C: 16170 0    C: 01553 0    I: 77621 1    C: 00025 0    C: 02643 1    I: 63545 0    C: 00025 0
12,2170     I: 41501 0    C: 00047 1    I: 53605 1    C: 00011 1    C: 21573 0    C: 34031 1    C: 24421 0    I: 44200 0

12,2200     C: 24311 1    C: 02074 0    C: 02645 1    I: 44246 1    C: 02170 0    I: 71244 0    C: 24333 1    C: 00037 0
12,2210     I: 60225 1    C: 01551 1    C: 00047 1    I: 60325 0    C: 02643 1    C: 00050 1    I: 41260 0    C: 00047 1
12,2220     C: 02645 1    I: 56257 1    C: 21202 1    I: 41542 1    I: 71244 0    C: 24246 1    C: 00025 0    C: 00013 0
12,2230     I: 45221 1    C: 00015 0    I: 51000 0    C: 24240 1    C: 24240 1    I: 52145 0    C: 00001 0    C: 24260 0

12,2240     I: 45345 1    C: 00015 0    C: 00025 0    I: 52075 1    C: 11052 0    C: 24260 0    I: 77745 1    C: 00025 0
12,2250     C: 00015 0    I: 45221 1    C: 00013 0    I: 50000 1    C: 24274 0    C: 24274 0    I: 77745 1    C: 00001 0
12,2260     C: 02643 1    I: 43254 0    C: 24333 1    C: 00025 0    C: 14025 0    C: 00037 0    C: 01551 1    I: 46034 1
12,2270     C: 24644 1    C: 24333 1    I: 77650 1    C: 24166 0    I: 45345 1    C: 00013 0    C: 00025 0    I: 52075 1

12,2300     C: 11052 0    C: 24260 0    I: 70545 1    C: 00013 0    I: 77765 0    C: 02074 0    C: 00025 0    I: 77650 1
12,2310     C: 24140 1    I: 50145 1    C: 00025 0    C: 24330 1    C: 00013 0    I: 70545 1    C: 02643 1    C: 02643 1
12,2320     I: 44254 1    C: 02111 1    C: 00025 0    C: 14025 0    C: 01551 1    C: 00037 0    I: 77650 1    C: 24267 1
12,2330     C: 00015 0    I: 77650 1    C: 24315 0    I: 44545 0    C: 00041 1    I: 74225 1    C: 00035 1    C: 02647 0

12,2340     I: 65372 1    C: 00025 0    I: 60316 0    C: 00047 1    I: 57275 0    C: 00023 0    C: 00025 0    I: 53605 1
12,2350     C: 00033 1    C: 21572 1    I: 77621 1    C: 00037 0    I: 74352 0    C: 01511 0    I: 53372 1    I: 77712 0
12,2360     C: 01535 0    I: 60246 1    C: 00050 1    C: 14043 0    C: 00031 0    I: 45275 0    C: 00033 1    C: 11034 0
12,2370     I: 76405 1    C: 00021 1    I: 53605 1    C: 00025 0    C: 56601 0    I: 74271 0    C: 00043 0    C: 02647 0
```

```
OCTAL LISTING FOR PARAGRAPH # 071,  WITH PARITY BIT IN BINARY AT THE RIGHT OF EACH WORD, "@" DENOTES UNUSED FIXED MEMORY

ALL VALID WORDS ARE BASIC INSTRUCTIONS EXCEPT THOSE MARKED "I" (INTERPRETIVE OPERATOR WORDS) OR "C" (CONSTANTS)

12,2400      I: 65372 1    C: 00035 1    I: 56257 1    C: 56602 0    C: 00043 0    I: 74221 0    C: 11050 1    C: 01511 0
12,2410      I: 42455 0    I: 77626 0    C: 62234 0    C: 00037 0    C: 15551 1    C: 00025 0    C: 01553 0    I: 77650 1
12,2420      C: 02111 1    I: 77776 1       07243 0    C: 00010 0    C: 02525 1    C: 12526 0    C: 67356 0    C: 75666 0
12,2430      C: 15001 1    C: 23771 1    C: 64342 0    C: 43674 0    C: 06563 1    C: 04645 1    C: 75173 0    C: 52672 0

12,2440      C: 00656 1    C: 14331 0    C: 77633 1    C: 40512 0    C: 00023 0    C: 11210 1    C: 77774 0    C: 67506 0
12,2450         06060 1    C: 14033 1    C: 00031 0    I: 77776 1       07243 0    C: 00010 0    C: 01000 0    C: 00000 1
12,2460      C: 72525 0    C: 52506 0    C: 13301 1    C: 15337 1    C: 62776 0    C: 54733 1    C: 11176 1    C: 13267 0
12,2470      C: 73410 0    C: 51674 0    C: 01446 0    C: 33641 1    C: 77451 1    C: 65233 0    C: 00055 1    C: 37266 1

12,2500      C: 77767 1    C: 52336 0       06060 1    I: 53605 1    C: 00001 0    C: 21574 1    C: 00035 1    I: 72405 0
12,2510      C: 00043 0    I: 65234 1    C: 21643 0    I: 53605 1    C: 00033 1    C: 21574 1    I: 72405 0    C: 00045 0
12,2520      I: 65234 1    C: 21643 0    C: 00041 1    I: 76261 0    C: 20607 1    I: 41301 0    C: 00047 1    C: 00025 0
12,2530      I: 76257 0    C: 20576 1    I: 57232 0    C: 00023 0    C: 00037 0    I: 77616 0    I: 71214 0    C: 00614 1

12,2540      C: 24606 1    C: 00037 0    I: 60225 1    C: 02762 0    C: 00047 1    I: 60325 0    C: 00015 0    C: 00050 1
12,2550      I: 41260 0    C: 00047 1    C: 02760 1    I: 56257 1    C: 21202 1    I: 43142 1    C: 04351 1    C: 24562 0
12,2560      I: 75246 0    C: 02760 1    I: 51006 0    C: 24620 0    I: 43145 0    C: 02766 1    C: 04311 0    C: 24571 1
12,2570      C: 00017 1    I: 45221 1    C: 00011 1    I: 51000 0    C: 24600 1    C: 24600 1    I: 77650 1    C: 24632 0

12,2600      I: 45345 1    C: 00011 1    C: 02766 1    I: 52005 0    C: 11052 0    C: 24634 0    I: 41345 0    C: 00011 1
12,2610      C: 00051 0    I: 41325 0    C: 00017 1    C: 00051 0    I: 77625 0    I: 52165 1    C: 02760 1    C: 24562 0
12,2620      I: 43145 0    C: 02766 1    C: 04311 0    C: 24625 0    C: 00011 1    I: 45221 1    C: 00017 1    I: 50000 1
12,2630      C: 24636 1    C: 24636 1    I: 77745 1    C: 00001 0    C: 00015 0    I: 77616 0    I: 45345 1    C: 00017 1

12,2640      C: 02766 1    I: 52005 0    C: 11052 0    C: 24634 0       44744 0       50120 1       60026 0       50120 1
12,2650         54026 1       54154 0       06102 1    I: 44545 0    C: 00041 1    I: 74225 1    C: 00035 1    C: 02722 1
12,2660      I: 65372 1    C: 00025 0    I: 60316 0    C: 00047 1    I: 57275 0    C: 00023 0    C: 00025 0    I: 53605 1
12,2670      C: 00033 1    C: 21572 1    I: 77621 1    C: 00037 0    I: 74352 0    C: 02744 1    I: 53372 1    I: 41512 1

12,2700      I: 77646 0    I: 77701 1    C: 00047 1    C: 16720 0    C: 00031 0    I: 45205 1    C: 00033 1    C: 11034 0
12,2710      I: 76405 1    C: 00021 1    I: 53605 1    C: 00025 0    C: 21176 1    I: 74271 0    C: 02720 0    C: 02722 1
12,2720      I: 65372 1    C: 00035 1    I: 56257 1    C: 21175 1    C: 02720 0    I: 77621 1    C: 11050 1    I: 53361 0
12,2730      C: 02744 1    I: 43412 1    I: 40220 0    C: 02710 0    C: 00001 0    I: 77600 1    C: 24737 1    I: 63375 0

12,2740      C: 02655 0    C: 02744 1    I: 77624 1    C: 11065 1    I: 45000 0    C: 24764 1    C: 24767 1    I: 43145 0
12,2750      C: 00031 0    C: 04310 1    C: 25752 0    I: 45014 0    C: 04273 0    C: 24421 0    I: 45014 0    C: 03706 0
12,2760      C: 02710 0    C: 24653 1    I: 77650 1    C: 02710 0    I: 77614 1    C: 04033 0    C: 25752 0    I: 66374 1
12,2770      C: 00003 1    C: 00052 0    C: 00001 0    I: 77614 1    C: 04276 0    I: 65366 1    C: 02732 0    I: 44342 1
```

```
OCTAL LISTING FOR PARAGRAPH # 072,  WITH PARITY BIT IN BINARY AT THE RIGHT OF EACH WORD, "@" DENOTES UNUSED FIXED MEMORY

ALL VALID WORDS ARE BASIC INSTRUCTIONS EXCEPT THOSE MARKED "I" (INTERPRETIVE OPERATOR WORDS) OR "C" (CONSTANTS)

12,3000      C: 11040 0    I: 54325 1    C: 02730 1    C: 21607 0    I: 77671 1    I: 77600 1    C: 25122 1    I: 41225 1
12,3010      C: 02766 1    I: 40132 0    C: 25122 1    I: 63406 0    I: 65351 0    C: 00155 0    C: 02742 1    I: 76202 0
12,3020      I: 75440 0    C: 25205 1    I: 43306 0    I: 61000 0    C: 25120 0    C: 25013 1    I: 40065 0    C: 11034 0
12,3030      C: 25205 1    I: 41440 1    C: 25205 1    I: 77716 1    I: 41301 0    C: 00047 1    C: 02742 1    I: 77457 1

12,3040      C: 21567 0       07243 0    C: 00005 1    C: 20000 0    C: 00000 1    C: 72525 0    C: 52471 1    C: 03146 1
12,3050      C: 15003 0    C: 75556 0    C: 45210 0    C: 01615 1    C: 13553 0    C: 76371 0    C: 63777 0    C: 01232 0
12,3060      C: 27367 0       06060 1    I: 76405 1    I: 43006 0    C: 04316 1    C: 25172 1    I: 60316 0    C: 00047 1
12,3070      I: 53605 1    C: 02742 1    C: 21565 1    C: 14031 0    C: 00041 1    I: 75542 0    I: 41306 1    I: 77632 0

12,3100      C: 00025 0    I: 60316 0    C: 00047 1    I: 41325 0    C: 02740 0    C: 00041 1    I: 75452 0    I: 56405 0
12,3110      C: 02766 1    C: 14043 0    C: 02742 1    I: 43021 0    C: 11036 1    C: 04270 0    C: 00045 0    I: 77616 0
12,3120      I: 77774 0    C: 00003 1    I: 51001 1    C: 00001 0    C: 25127 1    I: 77614 1    C: 04076 1    I: 75545 1
12,3130      C: 02740 0    I: 41325 0    C: 02730 1    C: 02766 1    I: 65352 0    C: 02732 0    I: 43202 0    C: 11044 1

12,3140      I: 41225 1    I: 55301 0    C: 00047 1    C: 02730 1    I: 51457 0    C: 21174 0    I: 63406 0    C: 14043 0
12,3150      C: 11042 1    I: 63406 0    I: 65234 1    C: 21643 0    C: 02742 1    I: 40405 1    C: 00043 0    I: 77771 0
12,3160      I: 75440 0    C: 25205 1    I: 77615 0    I: 60304 0    C: 25151 0    C: 00047 1    I: 77665 1    I: 52057 1
12,3170      C: 21172 0    C: 25031 1    I: 50145 1    C: 02742 1    C: 25205 1    I: 60366 1    C: 00047 1    I: 53665 1

12,3200      C: 11056 1    C: 20176 0    I: 41425 1    I: 77650 1    C: 25066 0    I: 40001 1    C: 00001 0    C: 25210 0
12,3210      I: 43414 1    C: 04070 1    I: 40220 0    C: 02710 0    C: 00001 0    I: 77600 1    C: 25217 1    I: 76614 0
12,3220      C: 02674 0    C: 10005 0    C: 14017 1    C: 02671 0    I: 77675 0    C: 11043 0    C: 02764 0    I: 77214 0
12,3230      C: 00474 0    C: 02655 0    I: 45115 0    C: 02663 0    C: 11131 1    C: 16730 1    C: 02720 0    I: 65301 0

12,3240      C: 00047 1    C: 00041 1    I: 56342 1    I: 65257 1    C: 20173 0    I: 77626 0    C: 75045 1    I: 44342 1
12,3250      C: 11040 0    C: 02734 0    I: 53106 0    C: 25473 0    I: 65301 0    C: 00047 1    C: 00001 0    I: 56342 1
12,3260      I: 75457 0    C: 20176 0    I: 54325 1    C: 02730 1    C: 20607 1    I: 43271 1    C: 02734 0    I: 77626 0
12,3270      C: 77760 0    I: 50000 1    C: 25277 1    C: 25302 1    I: 50025 0    C: 11062 0    C: 25302 1    I: 77745 1

12,3300      C: 11062 0    C: 00017 1    I: 77745 1    C: 02732 0    I: 45261 0    C: 20607 1    I: 77626 0    C: 61041 0
12,3310      C: 02673 1    I: 71240 1    C: 25513 1    C: 02736 1    I: 56352 0    C: 02730 1    I: 77600 1    C: 25513 1
12,3320      C: 00011 1    I: 66214 0    C: 00715 1    C: 25477 1    C: 00051 0    C: 00001 0    I: 77745 1    C: 02766 1
12,3330      I: 77605 1    C: 02730 1    I: 45342 0    C: 02736 1    I: 65301 0    C: 00047 1    C: 02734 0    I: 56257 1

12,3340      C: 20170 0    I: 53040 0    C: 25427 1    C: 25427 1    C: 16740 0    C: 02766 1    I: 43316 1    C: 11046 0
12,3350      I: 41301 0    C: 00047 1    C: 02740 0    I: 44257 1    C: 20571 0    C: 11044 1    C: 16742 1    C: 02740 0
12,3360      I: 45000 0    C: 25432 0    C: 24767 1    I: 77745 1    C: 00037 0    C: 16762 0    C: 00031 0    I: 45014 0
12,3370      C: 04310 1    C: 25427 1    C: 24421 0    I: 44200 0    C: 25447 1    C: 02671 0    C: 02760 1    I: 44246 1
```

```
OCTAL LISTING FOR PARAGRAPH # 073,  WITH PARITY BIT IN BINARY AT THE RIGHT OF EACH WORD, "@" DENOTES UNUSED FIXED MEMORY

ALL VALID WORDS ARE BASIC INSTRUCTIONS EXCEPT THOSE MARKED "I" (INTERPRETIVE OPERATOR WORDS) OR "C" (CONSTANTS)

12,3400     C: 02764 0    I: 47044 1    C: 25516 1    C: 24644 1    I: 43030 0    C: 25460 1    C: 00714 0    C: 25415 0
12,3410     I: 45345 1    C: 00037 0    C: 02762 0    I: 77654 0    C: 25460 1    I: 77624 1    C: 24536 1    I: 53145 1
12,3420     C: 00155 0    C: 25460 1    I: 77615 0    C: 02766 1    C: 02766 1    I: 77650 1    C: 25330 0    I: 51145 0
12,3430     C: 00015 0    C: 25452 0    I: 71201 1    C: 00001 0    C: 02766 1    C: 00011 1    I: 70545 1    C: 00015 0

12,3440     C: 00015 0    I: 44254 1    C: 25460 1    C: 02766 1    C: 02766 1    I: 77650 1    C: 25330 0    I: 77745 1
12,3450     C: 02762 0    C: 00037 0    I: 71201 1    C: 00001 0    C: 02766 1    C: 00017 1    I: 77650 1    C: 25436 1
12,3460     I: 51545 1    C: 02760 1    I: 41325 0    C: 02671 0    C: 11031 0    I: 45215 0    C: 11060 1    I: 43044 0
12,3470     C: 25516 1    C: 02434 0    C: 25516 1    I: 43001 1    C: 00001 0    C: 02434 0    C: 02710 0    I: 71331 0

12,3500     C: 00051 0    C: 10000 0    C: 00011 1    I: 65342 1    C: 00017 1    I: 43342 0    I: 77626 0    C: 75011 0
12,3510     C: 00015 0    I: 77650 1    C: 25330 0    I: 52145 0    C: 11064 0    C: 25320 1    I: 60345 0    C: 00041 1
12,3520     C: 00047 1    I: 70525 1    C: 02740 0    I: 77671 1    I: 75457 0    C: 20175 0    I: 72405 0    C: 00021 1
12,3530     I: 41206 0    C: 02766 1    I: 74261 1    C: 20206 1    C: 02722 1    I: 77725 1    I: 76561 1    C: 02674 0

12,3540     I: 53235 0    C: 02722 1    I: 77772 0    C: 02744 1    I: 53135 0    C: 02702 0    C: 25551 1    I: 77650 1
12,3550     C: 02710 0    I: 45145 0    C: 02720 0    C: 24701 1    C: 02703 1    I: 77650 1    C: 02710 0    I: 40220 0
12,3560     C: 02710 0    C: 00001 0    I: 77600 1    C: 25564 1    I: 63375 0    C: 02655 0    C: 02744 1    I: 77624 1
12,3570     C: 11065 1    I: 71200 0    C: 24764 1    C: 11044 1    I: 41225 1    C: 02742 1    C: 02740 0    I: 41366 1

12,3600     C: 02766 1    I: 74212 0    C: 02712 1    I: 45325 1    C: 11036 1    C: 02742 1    I: 52361 1    C: 02722 1
12,3610     I: 53512 1    I: 77600 1    C: 25670 1    I: 60325 0    C: 02756 1    C: 00047 1    I: 41325 0    C: 00041 1
12,3620     C: 02740 0    I: 56257 1    C: 20201 0    I: 56225 1    C: 11042 1    C: 00045 0    C: 00031 0    I: 63400 0
12,3630     C: 25674 0    I: 50021 1    C: 11040 0    C: 25674 0    I: 75366 0    C: 02755 1    I: 77614 1    C: 04272 1

12,3640     I: 76561 1    C: 02674 0    I: 63235 0    C: 00001 0    I: 53361 0    C: 00031 0    I: 41572 1    I: 56241 0
12,3650     C: 02722 1    C: 25766 1    I: 40142 1    C: 25654 1    C: 26732 0    C: 02722 1    I: 76435 1    I: 72441 0
12,3660     C: 02674 0    C: 16730 1    C: 02740 0    I: 77624 1    C: 24767 1    I: 77614 1    C: 02634 1    C: 24747 0
12,3670     I: 43001 1    C: 00001 0    C: 02434 0    C: 25752 0    I: 75345 1    C: 24005 1    C: 00031 0    C: 14031 0

12,3700     C: 24007 0    I: 77614 1    C: 04032 1    C: 25640 1    I: 40220 0    C: 02710 0    C: 00001 0    I: 77600 1
12,3710     C: 25711 1    I: 63375 0    C: 02655 0    C: 02744 1    I: 77624 1    C: 11065 1    I: 77600 1    C: 25720 0
12,3720     I: 42405 0    C: 02742 1    I: 75421 1    C: 11036 1    C: 02752 0    I: 65215 1    C: 11032 0    C: 00041 1
12,3730     I: 72405 0    C: 02740 0    I: 77671 1    I: 60325 0    C: 02742 1    C: 00047 1    I: 53725 1    C: 00041 1

12,3740     C: 20174 1    I: 45271 1    I: 50000 1    C: 25747 1    C: 25747 1    I: 77650 1    C: 02710 0    I: 52145 0
12,3750     C: 24020 0    C: 02710 0    I: 77776 1       05644 1    C: 20607 1    C: 04631 1    C: 23146 0    C: 14000 1
12,3760     C: 00000 1    C: 02314 0    C: 31463 1    C: 01400 1    C: 00000 1    C: 10000 0    C: 00000 1    C: 03000 1
12,3770     C: 00000 1    C: 36000 1    C: 00000 1    C: 22000 1    C: 00000 1    C: 03775 1    C: 03776 1  CKSM 65721 0
```

```
GAP:  ASSEMBLE REVISION 210 OF AGC PROGRAM LUMINARY BY NASA 2021112-161      17:11 MAR. 19,1971                PAGE 1634

OCTAL LISTING FOR PARAGRAPH # 074,  WITH PARITY BIT IN BINARY AT THE RIGHT OF EACH WORD, "@" DENOTES UNUSED FIXED MEMORY

ALL VALID WORDS ARE BASIC INSTRUCTIONS EXCEPT THOSE MARKED "I" (INTERPRETIVE OPERATOR WORDS) OR "C" (CONSTANTS)

13,2000     C: 07112 1   C: 06620 0   C: 27446 1   C: 14620 0   C: 16471 1   C: 01352 1   C: 22437 1   C: 16067 1
13,2010     C: 00000 1   C: 00000 1   C: 02302 1   C: 24736 0   C: 77651 0   C: 76237 0   C: 77776 1   C: 53032 0
13,2020     C: 10407 0   C: 05344 1   C: 13710 0   C: 35320 0   C: 12160 0   C: 12124 0   I: 43014 0   C: 01474 1
13,2030     C: 04347 0   C: 26036 0   I: 43014 0   C: 02756 1   C: 26036 0   C: 01476 0   I: 45014 0   C: 01667 1

13,2040     C: 27172 0   I: 71214 0   C: 04307 1   C: 26063 0   C: 01571 0   C: 34041 0   C: 27447 0   I: 45014 0
13,2050     C: 01674 0   C: 26702 0   I: 77614 1   C: 02756 1   C: 26060 0   I: 43014 0   C: 01476 0   C: 01475 0
13,2060     I: 45014 0   C: 01467 0   C: 27172 0   I: 77614 1   C: 01236 1   C: 26670 1   I: 43414 1   C: 01674 0
13,2070     I: 43414 1   C: 04756 1   C: 26073 1   I: 53775 1   C: 01521 0   C: 57605 0   I: 53655 1   C: 01535 0

13,2100     C: 57576 1   C: 25220 0   C: 01527 0   I: 53257 1   C: 57602 1   C: 01543 1   I: 77657 0   C: 57576 1
13,2110     C: 15226 0   C: 01517 0   C: 01234 0   I: 77616 0   I: 53775 1   C: 01521 0   C: 57605 0   I: 53655 1
13,2120     C: 01535 0   C: 57576 1   C: 25716 0   C: 01527 0   I: 53257 1   C: 57602 1   C: 01543 1   I: 77657 0
13,2130     C: 57576 1   C: 01724 1   I: 77616 0   C: 00041 1   I: 57545 1   C: 00043 0   I: 67401 0   C: 00001 0

13,2140     I: 44206 0   C: 24005 1   C: 14005 1   C: 24007 0   C: 24043 0   C: 00041 1   I: 41056 1   C: 52412 1
13,2150     C: 14041 1   C: 00041 1   I: 44142 0   C: 00051 0   C: 14023 0   C: 00045 0   I: 77742 0   C: 34021 0
13,2160     C: 47303 1   I: 43206 1   C: 24005 1   C: 24007 0   C: 00005 1   I: 77634 0   C: 21645 0   C: 25111 1
13,2170     C: 00001 0   I: 77634 0   C: 21645 0   C: 01107 0   I: 77776 1      40110 0      74731 1      10000 0

13,2200        12204 1      53107 1      53111 0      53107 1      06060 1   I: 77650 1   C: 00051 0      31010 1
13,2210        74744 0      55235 0      05506 1   C: 00031 0      06060 1   I: 77775 1   C: 03434 1   C: 01251 0
13,2220     I: 77776 1      32356 0      04607 1   C: 20471 1      12351 0      02227 1      02221 1      05355 1
13,2230     C: 04024 0      51235 1      32354 1      04607 1   C: 20471 1      12351 0      02240 0      02231 0

13,2240        06060 1   I: 43145 0   C: 03442 0   C: 01076 1   C: 00041 1   I: 77711 0   C: 01236 1   C: 26357 1
13,2250     I: 53575 0   C: 00001 0   I: 77676 0   C: 00031 0   I: 53435 0   C: 00007 0   C: 00023 0   I: 53435 0
13,2260     C: 00031 0   C: 00015 0   I: 45135 1   C: 01236 1   C: 26270 0   I: 77775 1   C: 03434 1   C: 01251 0
13,2270     I: 77775 1   C: 01251 0   I: 76505 0   C: 00015 0   I: 77655 1   C: 00007 0   C: 00007 0   I: 77624 1

13,2300     C: 27447 0   I: 77624 1   C: 26363 0   I: 53775 1   C: 00007 0   C: 57176 0   C: 25543 1   C: 00001 0
13,2310     I: 77657 0   C: 57176 0   C: 15535 0   C: 03442 0   C: 01517 0   I: 71214 0   C: 01673 1   C: 01643 1
13,2320     C: 34041 0   C: 27145 1   I: 77624 1   C: 27447 0   I: 77775 1   C: 00017 1   C: 01503 0   C: 15535 0
13,2330     C: 00015 0   C: 25517 0   C: 00025 0   I: 77624 1   C: 27734 1   I: 77776 1      05355 1   C: 04024 0

13,2340        06060 1   I: 62214 1   C: 05070 0   C: 01236 1   C: 26361 1   I: 77624 1   C: 27456 0   I: 77414 0
13,2350     C: 01276 0      34746 0      55462 1      16001 1   C: 01524 0   C: 01521 0   C: 01441 1   C: 27101 1
13,2360     C: 27115 1   C: 26717 1   C: 26772 1   I: 43174 1   C: 00002 0   C: 00063 1   I: 77014 1   C: 04303 0
13,2370     C: 00052 0   C: 00060 1   I: 43414 1   C: 00263 0   I: 77773 1   C: 00001 0   C: 10001 1   I: 77773 1
```

```
OCTAL LISTING FOR PARAGRAPH # 075,  WITH PARITY BIT IN BINARY AT THE RIGHT OF EACH WORD, "@" DENOTES UNUSED FIXED MEMORY

ALL VALID WORDS ARE BASIC INSTRUCTIONS EXCEPT THOSE MARKED "I" (INTERPRETIVE OPERATOR WORDS) OR "C" (CONSTANTS)

13,2400     C: 00007 0    C: 10007 1    I: 77773 1    C: 00015 0    C: 10015 1    I: 77616 0    I: 40220 0    C: 03674 1
13,2410     C: 00001 0    C: 24007 0    C: 02032 1    I: 51406 1    C: 16070 1    C: 24007 0    I: 71414 0    C: 01743 0
13,2420     C: 26421 1    I: 77624 1    C: 51644 0    I: 77656 1    C: 36032 0    C: 26605 0    I: 77624 1    C: 26615 1
13,2430     I: 63545 0    C: 02032 1    I: 63525 0    C: 02034 1    I: 75415 0    I: 76405 1    C: 00011 1    C: 14021 1

13,2440     C: 02036 0    C: 34023 1    C: 26545 1    C: 15120 0    C: 02032 1    C: 14021 1    C: 02034 1    C: 34023 1
13,2450     C: 26545 1    C: 15122 1    C: 02070 1    I: 77625 0    C: 03673 0    C: 35124 0    C: 03674 1    I: 40220 0
13,2460     C: 03674 1    C: 00001 0    C: 34007 1    C: 26605 0    I: 73545 1    C: 01120 0    I: 65275 1    C: 00011 1
13,2470     C: 01120 0    I: 65346 0    C: 01122 1    I: 57356 0    I: 71525 0    C: 01120 0    I: 71525 0    C: 01122 1

13,2500     I: 55475 1    I: 41456 0    C: 36032 0    C: 26615 1    I: 43145 0    C: 24007 0    C: 01743 0    C: 26511 0
13,2510     I: 77746 1    I: 77624 1    C: 55716 1    C: 16032 1    C: 03673 0    I: 74215 1    C: 01124 1    C: 02032 1
13,2520     I: 77772 0    C: 36032 0    C: 03674 1    I: 63545 0    C: 02036 0    I: 44352 0    C: 24005 1    I: 44275 1
13,2530     C: 26544 0    C: 24005 1    I: 75465 1    C: 26540 1    I: 77622 1    C: 03673 0    I: 77616 0    C: 00446 1

13,2540     C: 00305 1    C: 17711 0    C: 05254 1    C: 00155 0    C: 25250 1    I: 77600 1    C: 26547 0    I: 63545 0
13,2550     C: 00023 0    I: 63525 0    C: 00021 1    I: 77615 0    I: 75454 0    C: 26573 1    I: 40065 0    C: 00023 0
13,2560     C: 26600 0    I: 67542 0    C: 00025 0    I: 50125 1    C: 00021 1    C: 26567 1    I: 43545 1    I: 57545 1
13,2570     I: 43244 1    C: 26575 1    C: 24005 1    C: 00025 0    I: 77616 0    I: 52025 1    C: 24005 1    C: 26573 1

13,2600     I: 75345 1    C: 11040 0    C: 00023 0    C: 00025 0    I: 77616 0    I: 43145 0    C: 26542 0    C: 01743 0
13,2610     C: 26613 1    I: 77735 0    C: 24005 1    C: 00011 1    I: 77616 0    I: 71220 1    C: 00051 0    C: 10003 0
13,2620     I: 71214 0    C: 01703 1    C: 26632 1    C: 10001 1    I: 45014 0    C: 00742 0    C: 26630 0    C: 26523 1
13,2630     C: 37673 1    C: 00051 0    I: 77214 0    C: 00702 1    C: 26630 0    C: 02021 0    I: 64446 0    I: 77650 1

13,2640     C: 26630 0       05355 1    C: 00052 0       35010 0       05076 0    C: 02650 0    C: 26063 0       05263 0
13,2650        06060 1    I: 47014 1    C: 04712 1    C: 26711 1    C: 21603 1    C: 00041 1    I: 77624 1    C: 27447 0
13,2660     I: 45014 0    C: 01076 1    C: 26702 0    I: 52014 0    C: 01460 1    C: 26026 1    C: 00003 1    C: 25140 0
13,2670     I: 77414 0    C: 01672 0       05355 1    C: 20032 1       00006 1       32667 1       05301 0    C: 02641 0

13,2700     C: 26063 0       05146 1    I: 43014 0    C: 01472 1    C: 01673 1    I: 43014 0    C: 01676 1    C: 01675 1
13,2710     I: 77616 0    I: 77776 1       05355 1    C: 00002 0       05520 0    C: 00221 0       05146 1    I: 47020 0
13,2720     C: 00051 0    C: 26732 0    I: 45014 0    C: 04063 0    C: 26114 1    I: 43014 0    C: 00303 1    C: 00051 0
13,2730     C: 04223 0    C: 00051 0       03074 1       55500 1       51500 0       31502 1       51500 0       55554 0

13,2740        11500 1       12733 0       06102 1    I: 43034 1    C: 26761 0    C: 04303 0    C: 26754 0    I: 66214 0
13,2750     C: 00263 0    C: 02031 1    C: 00000 1    I: 77616 0    I: 66214 0    C: 00063 1    C: 02031 1    C: 00002 0
13,2760     I: 77616 0       03074 1       55500 1       51500 0       31554 1       51500 0       55502 0       11500 1
13,2770        12762 1       06102 1    I: 47020 0    C: 00051 0    C: 27005 1    I: 45014 0    C: 04064 1    C: 26070 1
```

```
OCTAL LISTING FOR PARAGRAPH # 076,  WITH PARITY BIT IN BINARY AT THE RIGHT OF EACH WORD, "@" DENOTES UNUSED FIXED MEMORY

ALL VALID WORDS ARE BASIC INSTRUCTIONS EXCEPT THOSE MARKED "I" (INTERPRETIVE OPERATOR WORDS) OR "C" (CONSTANTS)

13,3000     I: 43014 0    C: 00303 1    C: 00051 0    C: 04224 1    C: 00051 0       03074 1       55500 1       51500 0
13,3010        31502 1       51500 0       55626 0       11500 1       13006 0       06102 1    I: 47014 1    C: 04307 1
13,3020     C: 27037 0    C: 27026 0    I: 52014 0    C: 04304 1    C: 26754 0    C: 26747 1       03074 1       55500 1
13,3030        51500 0       31626 1       51500 0       55502 0       11500 1       13027 0       06102 1    I: 77201 1

13,3040     C: 00001 0    C: 02021 0    I: 41525 0    C: 00041 1    C: 15517 0    C: 27762 1    I: 77624 1    C: 55716 1
13,3050     C: 25535 0    C: 24001 0    C: 14001 0    C: 01517 0    C: 14007 0    C: 27762 1    I: 45014 0    C: 00063 1
13,3060     C: 55716 1    I: 74235 0    C: 01535 0    C: 26001 1    C: 25543 1    C: 24007 0    C: 01521 0    I: 67174 1
13,3070     C: 00002 0    C: 02030 0    C: 35527 1    C: 27215 1       33100 0       54006 0       33505 1       00002 0

13,3100     C: 26063 0    I: 45020 1    C: 00046 0    C: 27447 0    I: 43130 1    C: 02101 0    C: 01474 1    I: 43014 0
13,3110     C: 01467 0    C: 01676 1    I: 77614 1    C: 01633 0    C: 27174 0    I: 45020 1    C: 00046 0    C: 27447 0
13,3120     I: 43130 1    C: 02101 0    C: 01634 1    C: 27107 1    I: 45020 1    C: 00046 0    C: 27447 0    I: 43130 1
13,3130     C: 02101 0    C: 01474 1    I: 43014 0    C: 01676 1    C: 01433 1    C: 27174 0    I: 45020 1    C: 00046 0

13,3140     C: 27447 0    I: 43130 1    C: 02101 0    C: 01634 1    C: 27132 1    I: 66214 0    C: 01467 0    C: 02031 1
13,3150     C: 00000 1    I: 66214 0    C: 00343 0    C: 27156 0    C: 02031 1    C: 00002 0    I: 77220 1    C: 02101 0
13,3160     C: 24007 0    C: 01521 0    C: 35527 1    C: 27720 1    I: 43014 0    C: 01676 1    C: 04062 1    I: 77614 1
13,3170     C: 04020 1    C: 27206 0    I: 77620 0    C: 02101 0    I: 43014 0    C: 04060 0    C: 04062 1    I: 77731 1

13,3200     C: 00053 1    C: 27206 0    I: 52014 0    C: 01714 1    C: 26743 0    C: 27016 0    I: 77745 1    C: 00041 1
13,3210     C: 01115 0    I: 52014 0    C: 01753 1    C: 27315 0    C: 27301 0    I: 77414 0    C: 01752 0    C: 27236 0
13,3220        05355 1    C: 04022 0       05506 1    C: 00236 0       06060 1    I: 77731 1    C: 00053 1    C: 27234 1
13,3230     I: 52014 0    C: 01714 1    C: 26717 1    C: 26772 1    I: 77624 1    C: 51770 0    I: 45001 1    C: 00001 0

13,3240     C: 27720 1    I: 53775 1    C: 01503 0    C: 57576 1    I: 53715 1    C: 01511 0    C: 57576 1    I: 63325 0
13,3250     C: 01517 0    C: 01503 0    I: 64715 0    C: 01511 0    C: 51770 0    I: 76006 0    C: 77765 0    I: 76014 0
13,3260     C: 00303 1    C: 27263 0    C: 77775 1    I: 40001 1    C: 00001 0    C: 27266 0    I: 43014 0    C: 04676 1
13,3270     C: 01667 1    I: 77614 1    C: 01672 0    I: 77535 1    C: 02102 0       30154 1       50120 1       54052 1

13,3300        03460 0    I: 45345 1    C: 01115 0    C: 01517 0    C: 36074 1    C: 27720 1    I: 77624 1    C: 22403 0
13,3310     I: 43345 1    C: 01551 1    C: 01517 0    C: 35517 1    C: 27236 0    I: 43014 0    C: 04752 0    C: 27322 1
13,3320     C: 01632 1    C: 27263 0    I: 73001 1    C: 00013 0    C: 02030 0    I: 51575 1    C: 01535 0    I: 43006 0
13,3330     C: 00262 1    I: 50023 0    C: 53755 0    C: 27336 1    I: 77614 1    C: 00062 0    I: 41345 0    C: 00013 0

13,3340     C: 00043 0    I: 55762 1    C: 51770 0    I: 41366 1    C: 25762 0    I: 40442 1    I: 54345 1    C: 00155 0
13,3350     C: 20220 0    I: 40006 0    C: 27377 1    I: 50021 1    C: 27446 1    C: 27377 1    I: 45345 1    C: 01115 0
13,3360     C: 01517 0    I: 54234 0    C: 21622 1    C: 20211 1    C: 02076 1    I: 51400 1    C: 27403 0    I: 50025 0
13,3370     C: 00015 0    C: 27407 1    I: 75345 1    C: 00015 0    C: 02076 1    C: 36076 0    C: 27407 1    I: 65345 0
```

```
OCTAL LISTING FOR PARAGRAPH # 077,  WITH PARITY BIT IN BINARY AT THE RIGHT OF EACH WORD, "@" DENOTES UNUSED FIXED MEMORY

ALL VALID WORDS ARE BASIC INSTRUCTIONS EXCEPT THOSE MARKED "I" (INTERPRETIVE OPERATOR WORDS) OR "C" (CONSTANTS)

13,3400      C: 27446 1    I: 77650 1    C: 27356 1    I: 77634 0    C: 31765 1    C: 36076 0    C: 27372 1    I: 51545 1
13,3410      C: 02076 1    I: 50025 0    C: 27444 0    C: 27215 1    I: 43014 0    C: 01740 0    C: 23307 1    C: 01707 0
13,3420      C: 23307 1    I: 45345 1    C: 02076 1    C: 00015 0    I: 43040 1    C: 27215 1    C: 04242 1    C: 23307 1
13,3430      I: 45345 1    C: 01115 0    C: 01517 0    I: 77640 0    C: 27263 0    I: 40525 1    C: 02076 1    I: 44322 1

13,3440      I: 52040 1    C: 27263 0    C: 23307 1    C: 00000 1    C: 01400 1    C: 14152 1    C: 00000 1    I: 77776 1
13,3450         30106 0       73521 0       00006 1       13513 1       33520 0       05124 0    I: 77776 1       13500 0
13,3460         40106 1       74736 0       10000 0       03500 1       50120 1       30052 0       55054 0       05355 1
13,3470      C: 04022 0       31054 1       50120 1       54052 1       34736 1       70106 1       00006 1       13516 1

13,3500         33520 0       00004 0       05130 0       10064 1       13500 0    C: 00051 0       43521 0       70106 1
13,3510         54106 1       00003 1       13516 1       34727 1       00004 0       26106 1       06060 1    I: 77616 0
13,3520      C: 27450 0    C: 20100 1    I: 43020 1    C: 02767 0    C: 02716 0    C: 27571 1    I: 77614 1    C: 01711 1
13,3530      C: 27571 1    I: 45145 0    C: 01234 0    C: 27447 0    I: 45014 0    C: 01474 1    C: 26702 0    C: 34041 0

13,3540      C: 27172 0    I: 45174 1    C: 00002 0    C: 27447 0    I: 77014 1    C: 04304 1    C: 27550 1    C: 00000 1
13,3550      I: 53775 1    C: 01220 0    C: 57176 0    C: 01503 0    C: 15535 0    C: 01234 0    C: 25517 0    C: 01226 0
13,3560      I: 45057 1    C: 57176 0    C: 27734 1    I: 66234 1    C: 27005 1    C: 03463 0    C: 00000 1    I: 77650 1
13,3570      C: 47211 0    I: 45145 0    C: 01234 0    C: 27447 0    I: 43014 0    C: 01476 0    C: 04476 0    I: 43014 0

13,3600      C: 01475 0    C: 01674 0    C: 34041 0    C: 27172 0    I: 77650 1    C: 27531 0    I: 43020 1    C: 03744 0
13,3610      C: 04474 1    I: 43234 0    C: 21603 1    C: 11171 0    I: 51021 0    C: 00041 1    C: 27625 0    I: 77624 1
13,3620      C: 27711 0    I: 43234 0    C: 21603 1    C: 11171 0    C: 00041 1    I: 77624 1    C: 27447 0    I: 45014 0
13,3630      C: 01676 1    C: 26066 0    I: 43014 0    C: 01673 1    C: 04475 0    I: 77624 1    C: 27172 0    I: 77214 0

13,3640      C: 04675 1    C: 00001 0    C: 27545 0    C: 00007 0    C: 17553 1    C: 00015 0    C: 03561 0    I: 66134 1
13,3650      C: 02777 1    C: 02776 0    I: 77776 1       00004 0       00006 1       40025 1       20155 1       07300 0
13,3660         31744 1       04631 1    I: 47014 1    C: 04754 0    C: 27701 1    C: 21603 1    I: 44215 1    C: 11171 0
13,3670      C: 01115 0    I: 45044 0    C: 27315 0    C: 27711 0    I: 43234 0    C: 21603 1    C: 11171 0    C: 35115 1

13,3700      C: 27315 0    I: 45345 1    C: 01115 0    C: 01517 0    I: 45246 0    C: 11167 1    I: 52040 1    C: 27215 1
13,3710      C: 27674 1    I: 77414 0    C: 04674 0       25744 1       05571 1    C: 01703 1       06060 1    I: 77616 0
13,3720      I: 77354 0    C: 02030 0    C: 01521 0    I: 53257 1    C: 57605 0    C: 01535 0    C: 01503 0    C: 25535 0
13,3730      C: 01527 0    I: 53257 1    C: 57602 1    C: 01543 1    C: 01511 0    C: 25543 1    C: 24007 0    C: 01521 0

13,3740      C: 15527 0    C: 24007 0    C: 01551 1    C: 01553 0    I: 77616 0    C: 77764 1    C: 77775 1    C: 77766 0
13,3750      C: 77771 0    C: 77775 1    C: 77775 1    C: 00000 1    C: 77763 0    C: 77766 0    C: 77773 1    C: 77770 1
13,3760      C: 77771 0    C: 24000 1    C: 00000 1    C: 74631 0    C: 63145 1    C: 00243 1    C: 32703 1    C: 03654 0
13,3770      C: 21000 1    C: 03654 0    C: 21000 1    C: 04627 0    C: 25200 1    C: 03775 1    C: 03776 1  CKSM 42521 1
```

```
OCTAL LISTING FOR PARAGRAPH # 100,  WITH PARITY BIT IN BINARY AT THE RIGHT OF EACH WORD, "@" DENOTES UNUSED FIXED MEMORY

ALL VALID WORDS ARE BASIC INSTRUCTIONS EXCEPT THOSE MARKED "I" (INTERPRETIVE OPERATOR WORDS) OR "C" (CONSTANTS)

14,2000      C: 26723 0    C: 00450 0    C: 00065 1    C: 01265 1    C: 00302 0    C: 24533 1    C: 00052 0    C: 04047 0
14,2010      C: 15264 0    C: 07253 1    C: 74133 0    C: 45130 1    C: 70034 1    C: 53644 1    C: 15015 1    C: 35262 1
14,2020      C: 67072 0    C: 57521 0    C: 02552 1    C: 27310 0    C: 07210 0    C: 34714 1    C: 67300 0    C: 47414 0
14,2030      C: 13262 0    C: 27671 1    C: 05101 1    C: 34175 0    C: 70717 1    C: 46031 1    C: 62467 0    C: 45023 1

14,2040      C: 10655 0    C: 16340 1    C: 63237 1    C: 45012 0    C: 73711 1    C: 62337 1    C: 07207 0    C: 34100 1
14,2050      C: 61751 0    C: 60311 1    C: 02344 0    C: 11437 1    C: 03243 1    C: 10132 0    C: 62031 1    C: 55616 0
14,2060      C: 70716 0    C: 43617 0    C: 01747 1    C: 01335 0    C: 63532 0    C: 54217 1    C: 12010 0    C: 11614 1
14,2070      C: 76152 0    C: 45651 1    C: 60371 1    C: 57632 1    C: 03370 0    C: 03556 1    C: 76127 1    C: 67425 0

14,2100      C: 72436 0    C: 61577 0    C: 61041 0    C: 46271 1    C: 72303 1    C: 40213 0    C: 62637 1    C: 74356 1
14,2110      C: 70711 1    C: 46567 1    C: 67366 0    C: 44175 1    C: 64424 1    C: 41241 0    C: 07156 1    C: 23036 0
14,2120      C: 63330 1    C: 75735 1    C: 67512 0    C: 62476 0    C: 05227 0    C: 10611 0    C: 64757 0    C: 51701 0
14,2130      C: 71233 0    C: 53334 0    C: 66425 1    C: 76017 0    C: 66546 0    C: 64151 0    C: 73256 1    C: 65757 1

14,2140      C: 14120 1    C: 32444 1    C: 61251 0    C: 56124 0    C: 72307 0    C: 65764 1    C: 74742 0    C: 65735 0
14,2150      C: 70607 1    C: 77742 0    C: 77151 1    C: 74615 0    C: 61600 0    C: 60003 1    C: 60605 1    C: 64345 1
14,2160      C: 77026 0    C: 54200 1    C: 73160 1    C: 42475 1    C: 60430 0    C: 66614 1    C: 00653 1    C: 13072 0
14,2170      C: 04042 0    C: 27232 1    C: 62162 0    C: 44274 0    C: 07322 0    C: 33165 0    C: 03265 0    C: 32741 1

14,2200      C: 63467 1    C: 50064 0    C: 11655 1    C: 11373 0    C: 75477 1    C: 77366 1    C: 70425 0    C: 51217 1
14,2210      C: 07505 0    C: 32504 1    C: 13726 0    C: 15341 0    C: 72157 1    C: 66255 0    C: 11142 0    C: 32737 0
14,2220      C: 64200 1    C: 43016 1    C: 71316 0    C: 64201 0    C: 16400 1    C: 36737 1    C: 01364 1    C: 14350 1
14,2230      C: 75051 1    C: 60001 0    C: 17027 1    C: 31661 1    C: 73321 0    C: 43422 1    C: 77007 0    C: 51442 1

14,2240      C: 11514 1    C: 32502 1    C: 63215 1    C: 47106 0    C: 02140 0    C: 02335 0    C: 12716 1    C: 12356 1
14,2250      C: 13401 0    C: 37404 0    C: 03154 1    C: 15267 0    C: 17403 0    C: 01743 0    C: 75552 1    C: 76050 0
14,2260      C: 05465 0    C: 17001 0    C: 16221 1    C: 27572 1    C: 04420 0    C: 14273 1    C: 06440 1    C: 11323 0
14,2270      C: 07767 0    C: 30366 1    C: 14155 0    C: 23047 0    C: 13176 0    C: 03307 0    C: 13247 1    C: 03342 1

14,2300      C: 01070 1    C: 26607 1    C: 10557 1    C: 32115 0    C: 10404 0    C: 00124 0    C: 65500 1    C: 72703 0
14,2310      C: 00151 1    C: 25431 0    C: 00077 1    C: 37176 0    C: 17777 0    C: 02143 0    C: 07675 1    C: 02702 0
14,2320      C: 03420 1    C: 01470 0    C: 62414 1    C: 50541 1    C: 07506 0    C: 14361 0    C: 01674 0    C: 36075 0
14,2330      C: 15730 1    C: 21775 1    C: 16745 0    C: 13112 1    C: 02620 1    C: 31757 0    C: 73011 0    C: 60052 0

14,2340      C: 15776 0    C: 01237 0    C: 00330 1    C: 35521 1    C: 07573 1    C: 21256 0    C: 16004 1    I: 77624 1
14,2350      C: 10557 1    I: 70535 0    C: 00013 0    I: 73406 1    I: 71525 0    I: 74206 0    C: 00023 0    I: 74325 0
14,2360      C: 00001 0    C: 00031 0    I: 45445 0    C: 60244 0    I: 65361 0    C: 00031 0    I: 53361 0    C: 00023 0
14,2370      I: 77626 0    C: 50252 1    C: 24007 0    C: 02767 0    I: 77414 0    C: 04753 1    C: 30406 0       35005 1
```

OCTAL LISTING FOR PARAGRAPH # 101, WITH PARITY BIT IN BINARY AT THE RIGHT OF EACH WORD, "@" DENOTES UNUSED FIXED MEMORY

ALL VALID WORDS ARE BASIC INSTRUCTIONS EXCEPT THOSE MARKED "I" (INTERPRETIVE OPERATOR WORDS) OR "C" (CONSTANTS)

```
14,2400        54003 0        06060 1     I: 45034 1     C: 21603 1     C: 16607 1     C: 03575 0     I: 77776 1        35007 0
14,2410        54003 0        04607 1     C: 16140 0     I: 77620 0     C: 02745 0     I: 41345 0     C: 03564 0     C: 30454 1
14,2420     I: 71406 0     I: 73525 1     I: 41525 0     C: 03564 0     I: 65356 1     I: 41346 0     C: 00003 1     I: 47315 0
14,2430     C: 03773 1     C: 03765 0     I: 74372 1     I: 77626 0     C: 63746 1     I: 77605 1     I: 51361 1     C: 03773 1

14,2440     C: 00031 0     C: 14031 0     I: 74561 0     C: 03765 0     I: 53455 0     C: 00031 0     C: 34031 1     C: 47665 1
14,2450     C: 00031 0     I: 77650 1     C: 02745 0     C: 02525 1     C: 12525 0     I: 77620 0     C: 02746 0     C: 35242 0
14,2460     C: 26406 1     I: 70545 1     C: 01122 1     C: 16711 1     C: 01124 1     C: 16713 0     C: 01120 0     C: 02707 0
14,2470     I: 77776 1        32514 0        04607 1     C: 20471 1        16001 1        12477 0        12471 0        06060 1

14,2500     I: 72545 0     C: 02711 1     C: 15122 1     C: 02713 0     C: 15124 1     C: 02707 0     C: 15120 0     C: 01242 1
14,2510     I: 77624 1     C: 26457 0     I: 77650 1     C: 02746 0     C: 01531 1     I: 77620 0     C: 02745 0     C: 37562 1
14,2520     C: 33646 0     I: 77745 1     C: 03562 0     C: 34041 0     C: 27115 1     I: 61131 0     C: 00052 0     C: 00000 1
14,2530     C: 30552 0     I: 74375 0     C: 02723 0     C: 30001 0     I: 52372 0     C: 00001 0     I: 77656 1     C: 26723 0

14,2540     C: 00001 0     I: 57456 1     C: 16707 0     C: 30005 1     I: 77624 1     C: 30604 0     C: 14017 1     C: 30613 0
14,2550     C: 34023 1     C: 30577 1     I: 74375 0     C: 02723 0     C: 30007 0     I: 53445 1     C: 02715 0     C: 26715 0
14,2560     C: 02723 0     I: 53361 0     C: 30001 0     C: 00001 0     I: 57456 1     C: 26707 0     C: 00001 0     I: 57456 1
14,2570     C: 16723 0     C: 30003 1     I: 77624 1     C: 30604 0     C: 14023 0     C: 30613 0     C: 00017 1     I: 77745 1

14,2600     C: 30615 0     C: 00021 1     I: 77650 1     C: 02745 0     I: 70471 1     C: 00045 0     I: 43336 0     C: 30617 1
14,2610     I: 70546 1     I: 77616 0     C: 07760 1     C: 14473 1     C: 04000 0     C: 00000 1     C: 00343 0     C: 21616 0
14,2620        04636 0        55745 1        06060 1     I: 45014 0     C: 01465 1     C: 47522 1     I: 77624 1     C: 20030 0
14,2630     I: 71201 1     C: 00001 0     C: 24007 0     C: 26756 1     C: 02665 0     I: 63361 0     C: 24005 1     C: 02701 0

14,2640     I: 74370 0     C: 00344 1     C: 24005 1     I: 77655 1     I: 53505 1     C: 01732 0     C: 02731 0     I: 66331 0
14,2650     C: 00051 0     C: 00006 1     C: 00052 0     C: 00006 1     I: 52100 1     C: 30657 0     C: 30774 0     I: 50373 0
14,2660     C: 30347 1     C: 02731 0     I: 50025 0     C: 30773 1     C: 30654 0     I: 77754 1     C: 00046 0     I: 52104 0
14,2670     C: 30672 1     C: 30654 0     I: 50373 0     C: 47430 0     C: 02731 0     I: 50025 0     C: 30773 1     C: 30667 0

14,2700     I: 47773 1     C: 30347 1     C: 47430 0     I: 51025 1     C: 30771 0     C: 30667 0     I: 45173 0     C: 30347 1
14,2710     C: 30746 1     I: 77614 1     C: 01710 0     C: 30654 0     I: 45173 0     C: 47430 0     C: 30746 1     I: 77614 1
14,2720     C: 01710 0     C: 30667 0     I: 77614 1     C: 01605 0     C: 30741 0     I: 65120 1     C: 02755 1     C: 02756 1
14,2730     I: 47773 1     C: 30347 1     C: 47430 0     I: 43006 0     C: 01545 1     C: 30725 1     I: 45345 1     I: 77644 1

14,2740     C: 30667 0     I: 67130 1     C: 02755 1     C: 02756 1     I: 77650 1     C: 30667 0     I: 51321 0     C: 02707 0
14,2750     C: 00017 1     I: 77654 0     C: 30765 0     I: 75240 0     C: 30765 0     C: 00160 0     I: 75240 0     C: 30765 0
14,2760     C: 00162 1     I: 43040 1     C: 30765 0     C: 01630 0     C: 00052 0     I: 77614 1     C: 01430 1     C: 00052 0
14,2770     C: 05110 1     C: 35052 0     C: 05110 1     C: 35052 0     I: 77414 0     C: 01745 0     C: 31000 0        03021 1
```

```
OCTAL LISTING FOR PARAGRAPH # 102,  WITH PARITY BIT IN BINARY AT THE RIGHT OF EACH WORD, "@" DENOTES UNUSED FIXED MEMORY

ALL VALID WORDS ARE BASIC INSTRUCTIONS EXCEPT THOSE MARKED "I" (INTERPRETIVE OPERATOR WORDS) OR "C" (CONSTANTS)

14,3000      I: 73150 1    C: 02755 1    C: 02756 1    I: 47775 1    C: 02731 0    C: 30347 1    I: 47715 1    C: 02731 0
14,3010      C: 47430 0    I: 77625 0    I: 66044 1    C: 31017 0    C: 02756 1    I: 77734 1    C: 02755 1    I: 77776 1
14,3020         25745 0       31745 0       04613 1    I: 77620 0    C: 02746 0    I: 77776 1       05355 1    C: 04024 0
14,3030         05520 0    C: 00222 0       34752 0       04607 1    C: 20635 0       06001 0       03046 0       44737 1

14,3040         70154 0       10000 0       13071 0       05506 1    C: 00222 0       13071 0       06060 1    I: 43234 0
14,3050      C: 21603 1    C: 31173 0    I: 77624 1    C: 30515 0    I: 77776 1       04607 1    C: 30620 0       03061 0
14,3060         03071 1       05571 1    C: 00405 0       34777 1       04607 1    C: 20471 1       06001 0       03071 1
14,3070         03030 1       34746 0       55757 1       06060 1    I: 77776 1       05355 1    C: 04024 0       06060 1

14,3100      I: 77624 1    C: 31603 0    I: 77776 1       04607 1    C: 16000 0       04607 1    C: 17731 1       05705 0
14,3110         11757 1       13113 0       03156 0       05355 1    C: 04024 0       06060 1    I: 45145 0    C: 03562 0
14,3120      C: 16607 1    I: 53521 1    C: 01732 0    C: 26715 0    C: 03554 0    I: 53521 1    C: 01732 0    C: 26707 0
14,3130      C: 02761 0    C: 24007 0    C: 02767 0    C: 34015 1    C: 31265 1    I: 45014 0    C: 00354 0    C: 31145 0

14,3140      C: 47424 0    I: 77624 1    C: 31234 0    I: 77614 1    C: 01273 0    I: 77776 1       35745 1       04607 1
14,3150      C: 20635 0       06001 0       03030 1       06060 1    I: 77650 1    C: 02746 0       06060 1    I: 77775 1
14,3160      C: 02767 0    C: 02761 0    I: 45145 0    C: 03562 0    C: 16607 1    C: 03554 0    I: 52131 0    C: 02760 1
14,3170      C: 00001 0    C: 31074 0    C: 00002 0    C: 06240 1    I: 45020 1    C: 02746 0    C: 47232 1    I: 43014 0

14,3200      C: 01260 1    C: 01662 1    I: 77776 1       33233 0       04607 1    C: 20444 1       33264 1       04607 1
14,3210      C: 17310 0       04607 1    C: 17735 0       05705 0       05355 1    C: 04024 0       06060 1    I: 75160 1
14,3220      C: 03606 1    C: 01731 0    I: 77624 1    C: 26374 0    I: 43014 0    C: 01273 0    C: 01462 0    I: 77624 1
14,3230      C: 31566 0    I: 77650 1    C: 31145 0    C: 04024 0    I: 45020 1    C: 02745 0    C: 47232 1    I: 77776 1

14,3240         33263 0       04607 1    C: 20471 1       06001 0       03246 1       03260 0       05355 1    C: 00214 0
14,3250         33264 1       04607 1    C: 17310 0       04607 1    C: 17735 0       05705 0       05355 1    C: 04024 0
14,3260         06060 1    I: 77650 1    C: 02745 0    C: 01535 0    C: 02737 0    I: 50375 0    C: 02707 0    C: 02715 0
14,3270      I: 65552 0    C: 24025 0    C: 00007 0    I: 72441 0    C: 00015 0    I: 45326 1    C: 00025 0    I: 77634 0

14,3300      C: 21622 1    C: 01045 1    I: 77414 0    C: 00074 1       33315 0       04607 1    C: 20471 1       06001 0
14,3310         13313 1       05520 0    C: 00014 1       06060 1    I: 77616 0    C: 01405 1    I: 77624 1    C: 42707 1
14,3320      I: 66234 1    C: 31370 1    C: 00051 0    C: 00001 0    I: 40370 1    C: 00003 1    C: 00005 1    I: 70543 1
14,3330      C: 00325 0    I: 70523 1    C: 00005 1    I: 51425 0    I: 45206 1    C: 31367 1    I: 71240 1    C: 31355 0

14,3340      I: 51025 1    C: 31370 1    C: 31355 0    I: 77776 1       05355 1    C: 04024 0       06060 1    I: 77624 1
14,3350      C: 31542 0    I: 77624 1    C: 31566 0    I: 77650 1    C: 31357 1    I: 77700 0    C: 31327 0    I: 75160 1
14,3360      C: 02642 0    C: 01731 0    I: 77624 1    C: 26374 0    I: 77650 1    C: 32316 1    C: 00056 1    C: 37722 1
14,3370         00004 0       30032 0       50120 1       54001 1       30033 1       50120 1       54002 1       30034 0
```

```
OCTAL LISTING FOR PARAGRAPH # 103,  WITH PARITY BIT IN BINARY AT THE RIGHT OF EACH WORD, "@" DENOTES UNUSED FIXED MEMORY

ALL VALID WORDS ARE BASIC INSTRUCTIONS EXCEPT THOSE MARKED "I" (INTERPRETIVE OPERATOR WORDS) OR "C" (CONSTANTS)

14,3400        50120 1        54003 0        00003 1        06102 1        04607 1     C: 33634 0        34752 0        04607 1
14,3410     C: 20635 0        06001 0        13436 1        05355 1     C: 04024 0        34746 0        54321 0        54322 0
14,3420        54323 1        35001 0        04607 1     C: 20441 1        33541 1        04607 1     C: 20441 1        06060 1
14,3430     I: 77624 1     C: 31542 0     I: 77776 1        05355 1     C: 04024 0        13406 1        05355 1     C: 00014 1

14,3440        06060 1     I: 77624 1     C: 31566 0     I: 40331 1     C: 02760 1     C: 00000 1     C: 00001 0     I: 77776 1
14,3450        05355 1     C: 04024 0        04607 1     C: 16000 0        04607 1     C: 17731 1        05705 0        11757 1
14,3460        13466 1        06060 1     I: 77775 1     C: 02767 0     C: 02761 0     I: 77776 1        05355 1     C: 04024 0
14,3470        11757 1        13505 0        05355 1     C: 04024 0        06060 1     I: 45145 0     C: 03562 0     C: 16607 1

14,3500     C: 03554 0     I: 77776 1        34744 1        55757 1        13450 1        05355 1     C: 04024 0        06060 1
14,3510     I: 45145 0     C: 03562 0     C: 15607 1     C: 24015 0     C: 03554 0     C: 24007 0     C: 02761 0     C: 26707 0
14,3520     C: 02767 0     C: 36715 1     C: 31265 1     I: 77414 0     C: 00314 1     C: 31527 0        03406 0     I: 77624 1
14,3530     C: 47424 0     I: 75160 1     C: 02664 1     C: 01731 0     I: 77624 1     C: 26374 0     I: 77414 0     C: 01462 0

14,3540        06001 0     C: 12200 0     I: 77776 1        31301 1        00006 1        13552 1        34770 0        04607 1
14,3550     C: 01736 1        13543 1        04607 1     C: 16765 1        04607 1     C: 17735 0        05705 0        04607 1
14,3560     C: 17175 1        04607 1     C: 17735 0        05705 0        06060 1     I: 77616 0     I: 77776 1        30025 0
14,3570        55074 1        44746 1        54037 1        54040 1        54041 0        06060 1     I: 77775 1     C: 24007 0

14,3600     C: 01472 1     I: 43414 1     C: 01060 0     I: 77420 1     C: 03665 1        34741 1        70105 1        00006 1
14,3610        13613 1        04607 1     C: 32402 0        51757 0        31755 1        00006 1        73712 1        64735 1
14,3620        55235 0        33713 1        04607 1     C: 20471 1        06001 0        13627 0        13621 0        05520 0
14,3630     C: 00124 0        31235 1        77765 0        00006 1        74734 1        54001 1        00006 1        63655 1

14,3640        65652 0        00006 1        13655 0        35007 0        54003 0        50001 0        31403 1        54001 1
14,3650        35005 1        54003 0        34730 1        56001 0        13665 0        33714 0        04607 1     C: 20471 1
14,3660        06001 0        13663 0        13655 0        00006 1        31345 1        50120 1        52011 0        06060 1
14,3670     I: 77624 1     C: 10557 1     I: 45034 1     C: 21603 1     C: 16607 1     I: 53521 1     C: 01732 0     C: 03773 1

14,3700     I: 77776 1        04607 1     C: 54125 0        37765 1        71235 0        00006 1        13621 0        06060 1
14,3710     I: 77650 1     C: 03665 1     C: 05253 0     C: 00306 1     C: 01527 0     I: 75160 1     C: 02664 1     C: 02642 0
14,3720     I: 77624 1     C: 26374 0     I: 77624 1     C: 47522 1     I: 77624 1     C: 20030 0     I: 77624 1     C: 47336 1
14,3730     I: 77414 0     C: 04355 0     C: 31744 1        35001 0        04607 1     C: 20471 1        06001 0        13741 1

14,3740        13733 1        05355 1     C: 04024 0        06060 1     I: 77624 1     C: 31542 0     I: 77624 1     C: 31566 0
14,3750     I: 77624 1     C: 33020 0     I: 77650 1     C: 33200 0        00004 0        52071 0        34346 1        05063 1
14,3760     C: 03572 1     C: 60102 1        52071 0        00003 1        52006 0        00006 1        34724 1        52155 1
14,3770        10000 0        34746 0        16100 1        13774 1        00006 1        44724 0        16076 1  CKSM  62426 0
```

```
OCTAL LISTING FOR PARAGRAPH # 10+,  WITH PARITY BIT IN BINARY AT THE RIGHT OF EACH WORD, "@" DENOTES UNUSED FIXED MEMORY

ALL VALID WORDS ARE BASIC INSTRUCTIONS EXCEPT THOSE MARKED "I" (INTERPRETIVE OPERATOR WORDS) OR "C" (CONSTANTS)

15,2000     C: 00040 0    C: 36540 0    C: 00002 0    C: 00000 1    I: 77131 1    C: 00052 0    C: 00001 0    C: 00034 0
15,2010     I: 71214 0    C: 00274 0    C: 32161 0    C: 33572 1    C: 00001 0    C: 20766 1    C: 00010 0    I: 77634 0
15,2020     C: 21606 1    C: 34011 0    C: 32141 1    C: 23773 0    C: 00007 0    I: 77634 0    C: 21606 1    C: 34013 1
15,2030     C: 32141 1    I: 77624 1    C: 47656 1    C: 32715 0    C: 00002 0    C: 34766 1    C: 47526 0    I: 71214 0

15,2040     C: 04713 0    C: 15320 1    C: 00011 1    I: 43225 0    C: 00013 0    C: 32157 0    C: 03564 0    I: 51025 1
15,2050     C: 32151 0    C: 32135 1    I: 45345 1    C: 03564 0    C: 32153 1    I: 45040 1    C: 32135 1    C: 30413 1
15,2060     I: 72441 0    C: 02715 0    C: 03566 1    I: 45246 0    C: 32155 1    I: 71240 1    C: 16275 0    C: 03572 1
15,2070     I: 77615 0    C: 03564 0    C: 37564 1    C: 30413 1    I: 72441 0    C: 02715 0    C: 03570 0    I: 71240 1

15,2100     C: 32105 1    C: 03566 1    I: 52044 0    C: 32120 0    C: 32110 0    I: 50145 1    C: 03566 1    C: 32120 0
15,2110     I: 65225 1    C: 03570 0    C: 03570 0    I: 77671 1    I: 77605 1    C: 03572 1    C: 37572 0    C: 32132 0
15,2120     I: 65246 1    C: 03570 0    I: 44246 1    I: 43044 0    C: 32132 0    C: 00014 1    C: 32135 1    I: 57545 1
15,2130     C: 03572 1    C: 03572 1    I: 61145 0    C: 03570 0    C: 32062 1    I: 77776 1       25573 1       04607 1

15,2140     C: 16320 1    I: 71406 0    I: 73525 1    I: 65361 0    C: 03525 0    I: 52361 1    C: 03533 1    I: 43456 1
15,2150     C: 36314 1    C: 31461 0    C: 02104 0    C: 10417 1    C: 00002 0    C: 33372 1    C: 37777 1    C: 37775 0
15,2160     C: 00055 1    C: 20264 0       11770 1       12165 0       15263 1       05175 1    C: 02162 0       37734 0
15,2170        05063 1    C: 02003 0    C: 52064 1       34727 1       00006 1       71767 1       61766 1       55764 1

15,2200        15263 1       04607 1    C: 33757 1       34741 1       70076 1       10000 0       02211 1       36266 0
15,2210        02212 1       34744 1       55144 0       34744 1       04607 1    C: 20725 0       06001 0       12224 0
15,2220        02213 0       05355 1    C: 00014 1       05146 1       31144 1       76266 1       50000 1       02230 1
15,2230        12236 0       12310 0       12243 1       06060 1    I: 77650 1    C: 32321 0       34732 0       54003 0

15,2240        00006 1       31427 1       12245 1       00006 1       34746 0       53045 0       35005 1       54003 0
15,2250        32325 1       04607 1    C: 20471 1       06001 0       02256 1       02250 1       53045 0       00006 1
15,2260        62262 0       12264 1       00006 1       30025 0       53775 1       31144 1       74743 1       10000 0
15,2270        02274 1       06060 1    I: 77650 1    C: 32355 0       06060 1    I: 45145 0    C: 02775 0    C: 42740 1

15,2300     I: 77624 1    C: 42707 1    I: 77776 1       35001 0       04607 1    C: 20471 1       06001 0       12326 0
15,2310        06060 1    I: 77650 1    C: 32300 0       06060 1    I: 77624 1    C: 31316 1    I: 43014 0    C: 01462 0
15,2320     C: 01273 0    I: 77624 1    C: 31023 1    I: 77776 1       06001 0    C: 01442 1       32354 1       04607 1
15,2330     C: 20635 0       16001 1       12313 0       06060 1    I: 64375 1    C: 03607 0    C: 01732 0    I: 77656 1

15,2340     C: 26665 0    C: 03615 0    I: 53521 1    C: 01732 0    C: 26673 1    C: 03623 0    I: 53521 1    C: 01732 0
15,2350     C: 36701 1    C: 31174 1    I: 77650 1    C: 32323 1    C: 00013 0    I: 43014 0    C: 01463 1    C: 00662 0
15,2360     I: 77201 1    C: 00001 0    C: 02021 0    I: 41525 0    C: 02775 0    C: 36027 1    C: 55716 1    I: 77742 0
15,2370     C: 16032 1    C: 02775 0    I: 77624 1    C: 30455 0    I: 53575 0    C: 02032 1    C: 37607 1    C: 11014 1
```

```
OCTAL LISTING FOR PARAGRAPH # 105,  WITH PARITY BIT IN BINARY AT THE RIGHT OF EACH WORD, "@" DENOTES UNUSED FIXED MEMORY

ALL VALID WORDS ARE BASIC INSTRUCTIONS EXCEPT THOSE MARKED "I" (INTERPRETIVE OPERATOR WORDS) OR "C" (CONSTANTS)

15,2400     I: 77650 1   C: 32300 0      40077 0      74730 0      10000 0      12574 1      32606 0      04607 1
15,2410     C: 20471 1      06001 0      12414 0      12402 1      06060 1   I: 45034 1   C: 21603 1   C: 16607 1
15,2420     I: 53521 1   C: 01732 0   I: 77624 1   C: 47640 0   C: 02731 0   I: 77776 1      34744 1      54734 0
15,2430        35007 0      54003 0      50734 1      31403 1      54001 1      35005 1      54003 0      34730 1

15,2440        56001 0      55745 1      50120 1      52011 0      06060 1   I: 77624 1   C: 10557 1   I: 50375 0
15,2450     C: 02731 0   C: 03765 0   I: 65552 0   C: 00031 0   I: 51025 1   C: 32611 0   C: 32533 0   I: 45345 1
15,2460     C: 00031 0   C: 32613 1   I: 71240 1   C: 32552 1   C: 00031 0   I: 42405 0   C: 23773 0   C: 24031 0
15,2470     C: 03765 0   I: 53435 0   C: 24005 1   I: 47206 0   C: 03765 0   I: 77676 0   I: 63256 0   C: 03765 0

15,2500     I: 53435 0   C: 02731 0   I: 50206 0   C: 00001 0   I: 65552 0   C: 24033 1   I: 77641 1   I: 71244 0
15,2510     C: 32515 1   C: 32157 0   I: 77625 0   C: 00033 1   C: 00033 1   I: 70535 0   C: 02746 0   I: 41415 1
15,2520     C: 00033 1   I: 77634 0   C: 21624 1   C: 15241 1   C: 00031 0   I: 77615 0   I: 77634 0   C: 21624 1
15,2530     C: 01242 1   I: 77776 1      12556 1   I: 77776 1      24734 1      40734 0      64750 1      00006 1

15,2540        62542 0      12430 0      05571 1   C: 00404 1      34777 1      04607 1   C: 20471 1      16001 1
15,2550        12574 1      12402 1   I: 77776 1      34746 0      55240 1      55241 0      32607 1      04607 1
15,2560     C: 20471 1      16001 1      12564 0      12402 1      34750 1      70734 0      00006 1      74736 0
15,2570        47765 0      71235 0      60001 0      55235 0      06060 1   I: 77414 0   C: 04713 0   C: 03665 1

15,2600        04607 1   C: 16000 0      04607 1   C: 17731 1      05705 0      13073 1   C: 00306 1   C: 01517 0
15,2610     C: 02525 1   C: 12525 0   C: 00026 0   C: 30131 1   C: 12525 0      33016 0      54321 0      40000 0
15,2620        54322 0      33017 1      54323 1      06060 1   I: 45014 0   C: 01662 1   C: 32722 1   I: 66370 0
15,2630     C: 00022 1   C: 00051 0   C: 00006 1   I: 77744 0   C: 00050 1   I: 45173 0   C: 54000 0   C: 47665 1

15,2640     C: 06707 1   I: 77775 1   C: 02731 0   I: 73744 1   C: 00047 1   C: 75040 1   I: 71152 1   C: 00047 1
15,2650     I: 63047 1   C: 54000 0   C: 00002 0   C: 06665 1   I: 45100 1   C: 32635 0   C: 47336 1   I: 74575 0
15,2660     C: 02715 0   C: 36723 1   C: 32722 1   I: 74575 0   C: 02715 0   I: 53455 0   C: 02723 0   C: 02761 0
15,2670     I: 77641 1   C: 02222 1   I: 65552 0   C: 01045 1   I: 77776 1      05520 0   C: 00014 1      33015 0

15,2700        04607 1   C: 20471 1      06001 0      12706 0      05506 1   C: 00014 1      05355 1   C: 04024 0
15,2710        06060 1   I: 77775 1   C: 02761 0   C: 02222 1   I: 77776 1      34742 1      70074 0      10000 0
15,2720        12615 0      13535 0   I: 77220 1   C: 02745 0   C: 24007 0   C: 02707 0   I: 77776 1      05355 1
15,2730     C: 04024 0      06060 1   I: 77624 1   C: 31542 0   I: 77776 1      33014 1      55736 0      37737 0

15,2740        55074 1      04607 1   C: 15751 0      05355 1   C: 04024 0      04607 1   C: 77543 0      06060 1
15,2750     I: 77776 1      34771 1      05175 1   C: 02755 1      05146 1      04665 0   C: 77543 0      35014 1
15,2760        05076 0   C: 02764 0   C: 32065 0      05263 0      04607 1   C: 15333 0      25736 1      06060 1
15,2770     I: 53375 0   C: 00325 0   C: 02707 0   C: 02707 0   I: 50135 0   C: 02737 0   C: 32750 1   I: 53575 0
```

```
OCTAL LISTING FOR PARAGRAPH # 106,  WITH PARITY BIT IN BINARY AT THE RIGHT OF EACH WORD, "@" DENOTES UNUSED FIXED MEMORY

ALL VALID WORDS ARE BASIC INSTRUCTIONS EXCEPT THOSE MARKED "I" (INTERPRETIVE OPERATOR WORDS) OR "C" (CONSTANTS)

15,3000     C: 02707 0   C: 36731 1   C: 47522 1   I: 77624 1   C: 47663 1   C: 02715 0   I: 77776 1      05355 1
15,3010     C: 04024 0      06060 1   I: 77650 1   C: 02745 0   C: 77753 0   C: 01404 0   C: 07357 1   C: 06211 0
15,3020     I: 71220 1   C: 02745 0   C: 00322 1   I: 65325 0   C: 00324 1   C: 00323 0   I: 77666 1   C: 24766 0
15,3030     C: 24005 1   I: 77624 1   C: 47656 1   C: 26707 0   C: 24003 1   I: 77624 1   C: 47665 1   C: 36715 1

15,3040     C: 47522 1   I: 77624 1   C: 20030 0   I: 77775 1   C: 02665 0   C: 24007 0   C: 02673 1   C: 34015 1
15,3050     C: 47424 0   I: 77624 1   C: 47232 1   I: 77776 1      33063 1      04607 1   C: 17310 0      04607 1
15,3060     C: 17735 0      05705 0      13011 0   C: 02737 0      34746 0      13067 1      34744 1      55757 1
15,3070        05355 1   C: 04024 0      12402 1      31757 0      00006 1      13106 1      05355 1   C: 04024 0

15,3100        06060 1   I: 45145 0   C: 03562 0   C: 16607 1   C: 37254 0   C: 33120 1      06060 1   I: 77775 1
15,3110     C: 02767 0   C: 02761 0   I: 45145 0   C: 03562 0   C: 16607 1   C: 03246 1   I: 77776 1      13066 0
15,3120     I: 77131 1   C: 00052 0   C: 00006 1   C: 00014 1   I: 64373 1   C: 74515 0   C: 03607 0   I: 77656 1
15,3130     C: 12723 1   I: 77773 1   C: 75002 1   C: 10023 1   I: 43104 0   C: 33124 0   C: 04315 1   C: 33145 1

15,3140     I: 77624 1   C: 31265 1   I: 77614 1   C: 00354 0   C: 33225 1   I: 77624 1   C: 47424 0   I: 77624 1
15,3150     C: 47232 1   I: 77776 1      34743 0      70104 0      10000 0      13164 0      33273 1      04607 1
15,3160     C: 20471 1      06001 0      13164 0      13226 0      06060 1   I: 40175 0   C: 02740 0   C: 33170 1
15,3170     C: 02750 1   I: 40141 1   C: 30617 1   C: 31715 0   I: 52131 0   C: 02746 0   C: 33200 0   C: 33053 1

15,3200     I: 77776 1      05355 1   C: 04024 0      06060 1   I: 75160 1   C: 03606 1   C: 01731 0   I: 45014 0
15,3210     C: 01462 0   C: 26374 0   I: 77776 1      11144 0      13216 0      13226 0      34743 0      70104 0
15,3220        10000 0      13543 1      06060 1   I: 77624 1   C: 33470 1   I: 77776 1      35745 1      04607 1
15,3230     C: 20635 0      16001 1      13543 1      44743 1      61144 1      00006 1      13240 0      16001 1

15,3240        05355 1   C: 04024 0      06060 1   I: 45175 0   C: 02222 1   C: 47653 1   I: 43105 1   C: 01732 0
15,3250     C: 01463 1   I: 51515 1   C: 02021 0   I: 45561 1   C: 75745 0   I: 47014 1   C: 00662 0   C: 21603 1
15,3260     I: 77624 1   C: 30455 0   C: 01220 0   I: 65352 0   C: 01242 1   I: 77606 1   C: 35234 1   C: 51644 0
15,3270     C: 02021 0   I: 77776 1      16001 1   C: 01535 0      04607 1   C: 33634 0      05520 0   C: 00222 0

15,3300        36266 0      55144 0      34744 1      04607 1   C: 20725 0      06001 0      13313 1      13302 1
15,3310        05355 1   C: 00014 1      05146 1      31144 1      76266 1      50000 1      13317 0      13332 1
15,3320        13373 1      13302 1      06060 1   I: 75160 1   C: 01731 0   C: 03606 1   I: 77624 1   C: 26374 0
15,3330     I: 77650 1   C: 33372 1      06060 1   I: 77745 1   C: 03442 0   C: 01045 1   I: 77776 1      32325 1

15,3340        04607 1   C: 20471 1      16001 1      13345 1      13337 1      06060 1   I: 65234 1   C: 21603 1
15,3350     C: 01045 1   I: 65254 1   C: 33362 0   I: 51025 1   C: 01045 1   C: 33362 0   I: 45545 1   C: 74335 1
15,3360     C: 36775 1   C: 33364 0   I: 45545 1   C: 75002 1   C: 34041 0   C: 27115 1   I: 53575 0   C: 00001 0
15,3370     C: 37607 1   C: 11014 1   I: 77776 1      34746 0      55144 0      55145 1      34730 1      70077 0
```

```
OCTAL LISTING FOR PARAGRAPH # 107,  WITH PARITY BIT IN BINARY AT THE RIGHT OF EACH WORD, "@" DENOTES UNUSED FIXED MEMORY

ALL VALID WORDS ARE BASIC INSTRUCTIONS EXCEPT THOSE MARKED "I" (INTERPRETIVE OPERATOR WORDS) OR "C" (CONSTANTS)

15,3400       10000 0       34736 1       27145 1       34744 1       70102 0       10000 0       34741 1       27145 1
15,3410       34741 1       55143 1       33633 1       04607 1    C: 20471 1       16001 1       13420 0       13412 1
15,3420       34730 1       70077 0       10000 0       13523 1       34744 1       70102 0       10000 0       13527 0
15,3430       34743 0       71144 0       10000 0       13527 0       05571 1    C: 00701 1       34777 1       04607 1

15,3440    C: 20471 1       16001 1       13412 1       13412 1    I: 40220 0    C: 02746 0    C: 00001 0    I: 77634 0
15,3450    C: 21603 1    C: 27562 0    C: 03246 1    I: 41525 0    C: 03562 0    I: 77624 1    C: 55716 1    C: 27246 1
15,3460    C: 03254 1    I: 65201 1    C: 00001 0    C: 03562 0    I: 45006 0    C: 55716 1    C: 37254 0    C: 02746 0
15,3470    I: 45020 1    C: 02746 0    C: 47522 1    I: 40234 0    C: 21603 1    C: 00001 0    C: 37562 1    C: 20030 0

15,3500    I: 61375 1    C: 02673 1    C: 01732 0    I: 65256 0    C: 03562 0    I: 45006 0    C: 51644 0    C: 26230 1
15,3510    C: 02701 0    I: 53575 1    C: 01732 0    I: 41525 0    C: 03562 0    I: 77624 1    C: 51644 0    C: 02236 1
15,3520    I: 77614 1    C: 03036 1    C: 02746 0       06060 1    I: 77624 1    C: 33470 1    I: 77776 1       05506 1
15,3530    C: 00205 0       34744 1       71144 0       10000 0       12615 0       05355 1    C: 04024 0       34744 1

15,3540       70102 0       10000 0       13557 1       05355 1    C: 04024 0       05520 0    C: 00205 0       36266 0
15,3550       71144 0       50000 1       13553 0       13557 1       13600 0       13616 1       13617 0       06060 1
15,3560    I: 77775 1    C: 02230 1    C: 27246 1    C: 02236 1    C: 37254 0    C: 47522 1    I: 77624 1    C: 20030 0
15,3570    I: 77775 1    C: 02673 1    C: 26761 0    C: 02701 0    C: 36767 1    C: 33444 0    I: 77650 1    C: 33120 1

15,3600       06060 1    I: 53575 0    C: 02021 0    C: 27246 1    C: 02236 1    C: 37254 0    C: 47522 1    I: 77624 1
15,3610    C: 20030 0    I: 45175 0    C: 02222 1    C: 47653 1    I: 77650 1    C: 33572 1       13064 1       06060 1
15,3620    I: 53575 0    C: 02021 0    C: 03246 1    C: 27254 1    C: 02222 1    I: 77624 1    C: 47653 1    C: 36761 1
15,3630    C: 33444 0    I: 77776 1       13066 0    C: 01206 1       41277 0       74734 1       10000 0       13643 1

15,3640       05571 1    C: 00210 1       06001 0       05506 1    C: 00007 0       04622 0    I: 54201 0    C: 00001 0
15,3650    C: 20617 0    I: 56371 1    C: 01707 0    C: 32001 1    C: 00031 0    I: 77170 1    C: 00000 1    C: 00000 1
15,3660    I: 77614 1    C: 00274 0    I: 77745 1    C: 12004 0    C: 00027 1    I: 40745 0    C: 00031 0    C: 12030 1
15,3670    I: 42661 0    C: 20212 1    C: 12026 0    I: 40756 1    C: 12024 1    I: 62015 1    C: 00027 1    C: 77771 0

15,3700    C: 00027 1    I: 77614 1    C: 00054 0    C: 33665 1    I: 40745 0    C: 00031 0    C: 67752 0    I: 42661 0
15,3710    C: 20207 0    C: 67744 1    I: 77625 0    C: 00027 1    C: 10021 0    I: 63135 0    C: 00050 1    C: 77775 1
15,3720    I: 53015 0    C: 32003 0    C: 33752 1    I: 77644 1    C: 33662 0    I: 45345 1    C: 00021 1    C: 00025 0
15,3730    I: 65355 1    C: 00021 1    I: 65356 1    C: 00021 1    I: 55546 0    I: 53521 1    C: 12002 0    C: 02723 0

15,3740    I: 65345 0    C: 12004 0    C: 00023 0    I: 65356 1    C: 00023 0    I: 55546 0    I: 53521 1    C: 12002 0
15,3750    C: 02715 0    I: 77616 0    I: 77745 1    C: 12004 0    C: 00027 1    I: 77650 1    C: 33704 1       34730 1
15,3760       70077 0       10000 0       03773 1       31277 1       74734 1       00006 1       13770 0       44741 0
15,3770       63776 1       05740 1       06001 0       05506 1    C: 00007 0       14622 1    C: 00220 1  CKSM 66676 0
```

```
OCTAL LISTING FOR PARAGRAPH # 110,  WITH PARITY BIT IN BINARY AT THE RIGHT OF EACH WORD, "@" DENOTES UNUSED FIXED MEMORY

ALL VALID WORDS ARE BASIC INSTRUCTIONS EXCEPT THOSE MARKED "I" (INTERPRETIVE OPERATOR WORDS) OR "C" (CONSTANTS)

16,2000       00006 1     00031 0     40000 0     74346 0     00006 1     12012 1     41300 1     74737 1
16,2010       10000 0     12212 0     41774 0     74742 0     27774 0     12164 1     34733 1     00006 1
16,2020       02030 0     10000 0     12033 1     40106 1     74744 0     10000 0     00002 0     44744 0
16,2030       70106 1     54106 1     12043 0     40106 1     74744 0     26106 1     00002 0     22016 0

16,2040       00006 1     22012 1     02000 0     30111 0     74742 0     00006 1     12160 0     04665 0
16,2050    C: 40154 0     34746 0     55524 1     55525 0     55526 0     55421 0     55422 0     55423 1
16,2060       55430 0     55431 1     55432 1     55536 1     55537 0     55540 0     55541 1     55424 0
16,2070       55425 1     55501 0     55503 1     55544 1     55545 0     55510 0     55512 1     55502 0

16,2100       55630 1     55632 0     55631 0     55633 1     55460 0     55461 1     55766 0     55767 1
16,2110       55770 1     42206 0     71774 0     55774 0     00006 1     30033 1     53441 0     30034 0
16,2120       55442 0     41774 0     74731 1     27774 0     34742 1     55534 0     55535 1     34724 1
16,2130       54031 1     55466 0     55470 1     34746 0     55467 1     55471 0     55465 0     55472 0

16,2140       55473 1     55474 0     44354 0     55756 0     34743 0     55433 0     55434 1     55435 0
16,2150       00006 1     32211 1     53263 0     37750 1     54030 0     15272 1  C: 02037 1  C: 34106 1
16,2160       04665 0  C: 36655 1     04665 0  C: 35447 0     00006 1     32157 0     53263 0     34746 0
16,2170       55472 0     55473 1     55474 0     00006 1     01005 0     00006 1     01006 0     42207 1

16,2200       00006 1     03012 1     44743 1     70106 1     54106 1     12153 0  C: 03021 1  C: 07400 1
16,2210    C: 02217 1  C: 34106 1     00006 1     32216 0     52006 0  C: 02227 1  C: 40106 1     37750 1
16,2220       26030 0     22016 0     00006 1     22012 1     11756 0     05626 0  C: 32000 0     02000 0
16,2230       30032 0     55747 0     30033 1     55750 0     30034 0     55751 1     31634 1     00006 1

16,2240       21637 0     02262 0     55634 0     31635 0     00006 1     21640 0     02262 0     55635 1
16,2250       31636 0     00006 1     21641 1     02262 0     55636 1     00006 1     27445 1     00006 1
16,2260       27457 1     12653 1     10000 0     64744 1     00002 0     40000 0     00002 0     00006 1
16,2270       71740 1     21427 0     00006 1     31427 1     53743 1     11426 1     12300 1     12310 0

16,2300       62321 0     00006 1     62310 1     11426 1     34724 1     00002 0     44724 0     00002 0
16,2310       53427 0     00006 1     11747 0     00002 0     54007 1     00002 0     50000 1     44725 1
16,2320       00002 0  C: 77147 0     31736 1     00006 1     71530 1     55744 0     31747 1     54001 1
16,2330       00006 1     21440 1     23440 0     55736 0     33621 1     55747 0     41744 C     00006 1

16,2340       74727 0     27430 0     31745 0     61544 0     00006 1     77757 1     27431 1     31746 0
16,2350       61545 1     00006 1     77757 1     27432 1     31750 1     54001 1     00006 1     21441 0
16,2360       23441 1     55737 1     00006 1     71414 0     61736 1     53427 0     02272 1     00006 1
16,2370       61421 1     27430 0     02314 0     55430 0     00006 1     31743 0     21447 0     41454 1
```

```
OCTAL LISTING FOR PARAGRAPH # 111,  WITH PARITY BIT IN BINARY AT THE RIGHT OF EACH WORD, "@" DENOTES UNUSED FIXED MEMORY

ALL VALID WORDS ARE BASIC INSTRUCTIONS EXCEPT THOSE MARKED "I" (INTERPRETIVE OPERATOR WORDS) OR "C" (CONSTANTS)

16,2400        00006 1     73621 0     21447 0     31751 0     54001 1     00006 1     21442 0     55740 1
16,2410        23442 1     31415 0     00006 1     71737 1     53427 0     31417 1     02267 0     00006 1
16,2420        61422 1     27431 1     02314 0     55431 1     00006 1     31743 0     21451 1     41455 0
16,2430        00006 1     73621 0     21451 1     31416 0     00006 1     71737 1     53427 0     31420 0

16,2440        02267 0     00006 1     61423 0     27432 1     02314 0     55432 1     00006 1     31743 0
16,2450        21453 0     41456 0     00006 1     73621 0     21453 0     30111 0     74730 0     00006 1
16,2460        12466 0     00006 1     31405 1     53750 0     31403 1     12472 0     00006 1     31410 0
16,2470        53750 0     31406 1     55751 1     11430 0     12476 1     12513 0     61751 0     00006 1

16,2500        62513 1     22007 0     23430 1     34746 0     00006 1     11433 0     27421 0     02314 0
16,2510        55421 0     31747 1     55433 0     25433 1     31744 1     27421 0     02314 0     55421 0
16,2520        11431 1     12523 0     12550 1     61751 0     00006 1     62550 0     22007 0     23431 0
16,2530        34746 0     00006 1     11434 1     55736 0     27422 0     02314 0     55422 0     31747 1

16,2540        57434 0     61750 1     57736 1     00006 1     74747 0     00006 1     11736 0     27536 1
16,2550        25434 0     31745 0     61544 0     27422 0     02314 0     55422 0     11432 1     12561 0
16,2560        12606 1     61751 0     00006 1     62606 0     22007 0     23432 0     34746 0     00006 1
16,2570        11435 0     55737 1     27423 1     02314 0     55423 1     31747 1     57435 1     61750 1

16,2600        57737 0     00006 1     74747 0     00006 1     11737 1     27540 0     25435 1     31746 0
16,2610        61545 1     27423 1     02314 0     55423 1     40111 1     74735 0     10000 0     12630 1
16,2620        55424 0     55425 1     55544 1     55545 0     55536 1     55540 0     12673 0  C: 00074 1
16,2630        31510 1     00006 1     74757 1     21537 0     31536 0     55424 0     00006 1     73617 0

16,2640        55544 1     31512 0     00006 1     74757 1     21541 1     31540 1     55425 1     00006 1
16,2650        73617 0     55545 0     12673 0     34740 0     71774 0     10000 0     03737 1     52011 0
16,2660        53753 0     32672 0     56017 1     22012 1     53755 0     32671 0     52016 1     53757 1
16,2670        15277 1  C: 02673 1     13642 0     11631 0     12714 0     12720 1     11633 1     12716 1

16,2700        12730 0     00006 1     27766 0     00006 1     27767 1     00006 1     27770 1     34731 0
16,2710        71774 0     00006 1     12740 1     02744 1     55631 0     12676 0     55633 1     12701 1
16,2720        55501 0     55510 0     45000 0     00006 1     03012 1     34726 0     55631 0     12676 0
16,2730        55503 1     55512 1     45011 0     00006 1     03012 1     34726 0     55633 1     12701 1

16,2740        41774 0     74731 1     27774 0     13625 1     00006 1     00031 0     40000 0     73614 0
16,2750        00006 1     13020 1     00006 1     74736 0     50000 1     33573 0     55743 1     36263 0
16,2760        03552 0     46263 1     61742 1     00006 1     13017 0     44747 0     61743 0     00006 1
16,2770        63006 1     41742 0     64742 1     00006 1     63017 1     05571 1  C: 02001 1     34744 1
```

```
OCTAL LISTING FOR PARAGRAPH # 112,  WITH PARITY BIT IN BINARY AT THE RIGHT OF EACH WORD, "@" DENOTES UNUSED FIXED MEMORY

ALL VALID WORDS ARE BASIC INSTRUCTIONS EXCEPT THOSE MARKED "1" (INTERPRETIVE OPERATOR WORDS) OR "C" (CONSTANTS)

16,3000        23774 1      00006 1      06001 0      55774 0      34746 0      13020 1      34744 1      23774 1
16,3010        00006 1      06001 0      55774 0      74744 0      64742 1      27743 1      12757 1      31740 0
16,3020        55472 0      34730 1      00006 1      02031 1      00006 1      13034 1      30111 0      74734 1
16,3030        00006 1      13067 1      00004 0      13145 0      34726 0      70111 1      00006 1      13067 1

16,3040        34746 0      55464 1      30032 0      55634 0      44743 1      00004 0      70106 1      54106 1
16,3050        00003 1      00006 1      00031 0      40000 0      75745 0      57460 1      10000 0      13443 0
16,3060        31460 1      00006 1      13443 0      41460 0      66263 0      55524 1      13351 1      00006 1
16,3070        00031 0      55443 1      74726 1      00006 1      13220 0      34731 0      70111 1      00006 1

16,3100        13464 0      34734 0      71774 0      00006 1      13116 0      34730 1      00006 1      02031 1
16,3110        00006 1      13215 0      45005 0      71774 0      55774 0      13215 0      31774 1      74733 0
16,3120        00006 1      13123 0      13215 0      31774 1      74732 1      00006 1      13132 0      13105 1
16,3130     C: 74777 0   C: 00056 1      00004 0      34730 1      00006 1      02031 1      00006 1      13143 0

16,3140        30032 0      55634 0      03145 1      04665 0   C: 40154 0      44731 1      70111 1      54111 1
16,3150        00003 1      13464 0      55464 1      55446 1      55447 0      55450 0      55451 1      55452 1
16,3160        55453 0      55454 1      55455 0      55456 0      54042 0      54044 0      33130 0      71774 0
16,3170        55774 0      03176 1      34731 0      26111 1      00003 1      13443 0      22044 1      30042 1

16,3200        53463 0      34746 0      54043 1      54042 0      54044 0      00004 0      00006 1      23265 1
16,3210        06040 0      33620 0      00006 1      05013 0      01265 1      34746 0      54043 1      13227 1
16,3220        41774 0      74734 1      27774 0      34731 0      70111 1      00006 1      13152 0      30032 0
16,3230        55634 0      10043 1      13235 1      13235 1      13235 1      60000 1      60000 1      63131 1

16,3240        00006 1      70043 1      30001 0      00006 1      71444 0      57454 0      40000 0      61454 0
16,3250        55736 0      03176 1      00003 1      41454 1      61421 1      55427 0      11736 0      13262 0
16,3260        13270 0      13262 0      61476 0      00006 1      63270 1      34762 0      55445 1      03301 0
16,3270        31774 1      74733 0      00006 1      13275 0      03301 0      31446 0      55751 1      55464 1

16,3300        03470 1      30032 0      55634 0      34746 0      55446 1      55447 0      55464 1      11427 0
16,3310        03313 0      03313 0      03313 0      55736 0      61476 0      00006 1      63326 0      31445 0
16,3320        00006 1      63326 0      41774 0      74733 0      27774 0      13331 1      44733 0      71774 0
16,3330        55774 0      41427 0      00006 1      71550 1      20001 1      02314 0      00006 1      77737 1

16,3340        55524 1      31736 1      61475 0      00006 1      63347 1      36263 0      13356 0      31524 0
16,3350        27524 1      34740 0      70101 0      10000 0      34744 1      64742 1      55742 0      34744 1
16,3360        54001 1      11524 1      13367 1      13443 0      13366 0      13443 0      22007 0      64744 1
16,3370        55736 0      23743 0      03532 0      46263 1      61742 1      00006 1      13400 1      44743 1
```

```
OCTAL LISTING FOR PARAGRAPH # 113,  WITH PARITY BIT IN BINARY AT THE RIGHT OF EACH WORD, "@" DENOTES UNUSED FIXED MEMORY

ALL VALID WORDS ARE BASIC INSTRUCTIONS EXCEPT THOSE MARKED "I" (INTERPRETIVE OPERATOR WORDS) OR "C" (CONSTANTS)

16,3400       64742 1      55521 1      31740 0      05750 0      41736 0      63613 0      00006 1      63625 0
16,3410       63573 0      00006 1      63417 0      27736 0      51743 0      33622 1      55524 1      31736 1
16,3420       22007 0      00004 0      53471 0      04665 0   C: 37143 0      44731 1      71774 0      55774 0
16,3430       03432 1      13625 1      30101 1      54001 1      34740 0      00006 1      06001 0      54101 0

16,3440       00003 1      00002 0      03432 1      05747 0      34746 0      55524 1      13625 1      30033 1
16,3450       00006 1      21635 1      00006 1      71414 0      57751 0      30032 0      00006 1      21634 0
16,3460       61274 1      27751 1      57464 0      00002 0      03447 0      41642 1      61421 1      55427 0
16,3470       44744 0      55505 1      30111 0      74730 0      00006 1      13506 0      00004 0      04665 0

16,3500    C: 43667 1      31524 0      00006 1      13442 1      00003 1      13351 1      34746 0      55500 1
16,3510       00004 0      04655 0   C: 37304 1      00003 1      41740 1      63531 0      00006 1      63351 0
16,3520       11524 1      13523 1      13443 0      63530 1      00006 1      63351 0      36263 0      13356 0
16,3530    C: 77377 1   C: 75117 1      36263 0      55741 0      51742 1      33564 0      51743 0      73555 0

16,3540       55740 1      71260 0      10000 0      13545 1      00002 0      11741 0      13552 1      05571 1
16,3550    C: 02003 0      13443 0      55742 0      13533 0      12777 0   C: 00252 1   C: 00125 1   C: 00140 1
16,3560    C: 00006 1   C: 00220 1   C: 00011 1   C: 00151 1   C: 00146 1   C: 00226 1   C: 00231 1   C: 00151 1
16,3570    C: 00132 1   C: 00245 1   C: 00377 1   C: 77445 1   C: 00004 0   C: 00002 0   C: 07776 0   C: 00005 1

16,3600    C: 00011 1   C: 00012 1   C: 07776 0   C: 00003 1   C: 00010 0   C: 00007 0   C: 07776 0   C: 07776 0
16,3610    C: 07776 0   C: 07776 0   C: 07776 0   C: 00360 1   C: 07400 1   C: 00266 0   C: 74631 0   C: 06315 0
16,3620    C: 00600 1   C: 00632 0   C: 77751 1   C: 00026 0   C: 02740 0      41644 1      61423 0      02314 0
16,3630       55437 1      41643 0      61422 1      02314 0      55436 0      00006 1      33641 1      52006 0

16,3640    C: 02124 1   C: 36106 0      34743 0      55743 1      60000 1      54002 1      51743 0      11524 1
16,3650       13652 1      13671 0      63732 1      00006 1      63710 1      51743 0      11524 1      33732 1
16,3660       13662 1      43732 0      51743 0      27524 1      51743 0      11524 1      43616 1      13671 0
16,3670       33616 0      00006 1      51743 0      71521 1      30001 0      51743 0      55736 0      00006 1

16,3700       74733 0      00006 1      63733 0      50002 0      27513 0      11743 1      13643 1      13717 1
16,3710       34746 0      51743 0      57524 0      00006 1      74751 1      30001 0      13671 0      31737 0
16,3720       61740 0      00006 1      71532 0      55746 1      41740 1      61737 0      00006 1      71531 0
16,3730       55745 1      12322 1   C: 77537 0      40000 0      24002 0      13703 1   C: 07400 1      41501 0

16,3740       00006 1      71507 0      23510 1      41503 1      00006 1      71511 1      23512 0      11501 0
16,3750       34733 1      13753 1      34734 0      54066 0      11503 1      34731 0      13760 1      34732 0
16,3760       26066 0      43736 1      00006 1      02012 0      60066 1      00006 1      01012 0      44740 1
16,3770       71774 0      55774 0      00002 0   C: 03773 1   C: 03774 0 CKSM 20576 1         @            @
```

```
OCTAL LISTING FOR PARAGRAPH # 114,  WITH PARITY BIT IN BINARY AT THE RIGHT OF EACH WORD, "@" DENOTES UNUSED FIXED MEMORY

ALL VALID WORDS ARE BASIC INSTRUCTIONS EXCEPT THOSE MARKED "1" (INTERPRETIVE OPERATOR WORDS) OR "C" (CONSTANTS)

17,2000        54002 1      00006 1      00004 0      54001 1      74337 0      40000 0      64737 0      74337 0
17,2010        55270 1      67767 0      00006 1      62001 1      30002 0      00006 1      05013 0      40001 1
17,2020        55267 1      04700 1      55266 0      34741 1      00006 1      02013 1      00006 1      12050 1
17,2030        12031 0      00006 1      00004 0      61267 0      64727 1      64727 1      56001 0      32053 0

17,2040        61270 0      00006 1      60001 0      00006 1      62050 0      62054 1      00006 1      62030 0
17,2050        22002 0      31266 1      52005 0   C: 00440 1   C: 77754 1      10031 1      00002 0      05701 1
17,2060        05701 1      34724 1      22007 0      53471 0      53467 1      23465 1      54031 1      67746 0
17,2070        54000 0      12075 0      34724 1      54031 1      12115 1      00006 1      23265 1      22070 0

17,2100        06040 0      00006 1      23265 1      22070 0      34726 0      00006 1      05013 0      31466 1
17,2110        67746 0      54000 0      12115 1      34724 1      55466 0      50001 0      15747 1      22016 0
17,2120        00006 1      22012 1      02055 0      15272 1      34730 1      00006 1      02031 1      10000 0
17,2130        12135 0      40111 1      74731 1      00006 1      12136 0      02655 0      11630 1      12636 1

17,2140        12623 0      34746 0      55630 1      53437 1      03200 0      53427 0      34736 1      00006 1
17,2150        02031 1      00006 1      12200 0      34735 1      00006 1      02031 1      00006 1      12201 1
17,2160        34737 0      70111 1      10000 0      12200 0      55473 1      55474 0      40111 1      74735 0
17,2170        00006 1      12176 1      30106 0      74730 0      10000 0      34743 0      55500 1      12232 1

17,2200        34744 1      64742 1      55743 1      67766 1      55500 1      30111 0      74732 1      10000 0
17,2210        12352 0      30111 0      74733 0      10000 0      34744 1      64743 0      55742 0      03225 1
17,2220        11740 1      12224 0      05571 1   C: 02002 1      35770 1      71740 1      55473 1      45770 0
17,2230        71740 1      55474 0      34730 1      00006 1      02031 1      10000 0      12710 1      34726 0

17,2240        70111 1      00006 1      12354 0      00004 0      04665 0   C: 40154 0      34746 0      55450 0
17,2250        55452 1      00063 1      00006 1      00031 0      55736 0      11461 1      12300 1      31736 1
17,2260        74744 0      00006 1      12304 0      31736 1      74743 1      00006 1      12310 0      31736 1
17,2270        74740 1      00006 1      12314 1      31736 1      74737 1      00006 1      12316 0      13112 1

17,2300        41736 0      72351 0      55461 1      13112 1      33136 0      55525 0      43136 1      12320 0
17,2310        43136 1      55525 0      33136 0      12320 0      33136 0      12317 1      43136 1      55525 0
17,2320        55526 0      32350 0      55477 0      34744 1      55461 1      55505 1      30111 0      74730 0
17,2330        00006 1      12341 1      51505 0      11525 0      34767 0      12337 0      44767 1      51505 0

17,2340        55525 0      30111 0      74733 0      10000 0      34744 1      64743 0      55742 0      12756 0
17,2350     C: 02325 1   C: 00063 1      34742 1      12216 1      55632 0      44744 0      55630 1      34726 0
17,2360        71443 1      00006 1      12377 1      34731 0      70111 1      00006 1      12710 1      44734 1
17,2370        71774 0      55774 0      12374 1   C: 00056 1      34746 0      55462 1      55463 0      11462 1
```

```
OCTAL LISTING FOR PARAGRAPH # 115,  WITH PARITY BIT IN BINARY AT THE RIGHT OF EACH WORD, "@" DENOTES UNUSED FIXED MEMORY

ALL VALID WORDS ARE BASIC INSTRUCTIONS EXCEPT THOSE MARKED "I" (INTERPRETIVE OPERATOR WORDS) OR "C" (CONSTANTS)

17,2400          12403 0      12403 0      12403 0      60000 1      60000 1      62373 1      00006 1      71462 1
17,2410          30001 0      00006 1      71444 0      57455 1      40000 0      61455 1      55740 1      11463 0
17,2420          12423 1      12423 1      12423 1      60000 1      60000 1      62373 1      00006 1      71463 0
17,2430          30001 0      00006 1      71444 0      57456 1      40000 0      61456 1      55741 0      41455 0

17,2440          61422 1      55436 0      41456 0      61423 0      55437 1      53437 1      03200 0      53427 0
17,2450          00004 0      04665 0   C: 40154 0      00003 1      11740 1      02460 1      02460 1      02460 1
17,2460          61476 0      00006 1      62464 0      12502 0      11741 0      02470 0      02470 0      02470 0
17,2470          61476 0      00006 1      62474 1      12502 0      31774 1      74732 1      00006 1      12501 0

17,2500          12504 0      12710 1      34762 0      55457 1      34746 0      55450 0      55451 1      55452 1
17,2510          55453 0      11426 1      12515 0      12515 0      12515 0      61476 0      00006 1      62533 0
17,2520          11427 0      12524 1      12524 1      12524 1      61476 0      00006 1      62530 0      12544 1
17,2530          34746 0      55427 0      12544 1      11427 0      02537 1      02537 1      02537 1      61476 0

17,2540          00006 1      62553 0      34746 0      55426 1      31457 0      00006 1      62553 0      41774 0
17,2550          74732 1      27774 0      02556 0      44732 1      71774 0      55774 0      32672 0      55477 0
17,2560          34744 1      55505 1      34742 1      55742 0      51505 0      51534 1      12567 0      34742 1
17,2570          51505 0      55534 0      13034 1      51505 0      11426 1      34746 0      12600 1      34744 1

17,2600          51505 0      63755 0      50000 1      41570 0      00006 1      51505 0      71426 1      54002 1
17,2610          20001 1      60002 0      54000 0      12615 0      30002 0      51505 0      55525 0      12756 0
17,2620          34746 0      12615 0   C: 02561 1      34727 1      70111 1      10000 0      12141 0      11502 0
17,2630          12632 0      12141 0      00006 1      00005 1      10000 0      12641 1      00006 1      32654 1

17,2640          52006 0      11632 0      12644 1      12141 0      00004 0      04665 0   C: 43260 1      00003 1
17,2650          34746 0      55632 0      12141 0   C: 03027 1   C: 42106 0      30033 1      00006 1      21635 1
17,2660          55736 0      00006 1      71415 1      55751 1      30034 0      00006 1      21636 1      55737 1
17,2670          00006 1      71417 0      61275 0      61751 0      57450 1      31736 1      00006 1      71416 1

17,2700          55751 1      31737 0      00006 1      71420 1      61276 0      61751 0      57452 0      00002 0
17,2710          31452 0      22000 1      31450 1      03200 0      53751 1      33142 0      55477 0      34744 1
17,2720          55505 1      51505 0      51534 1      12724 0      34742 1      51505 0      55534 0      13034 1
17,2730          51505 0      31750 1      55751 1      51505 0      31426 0      55427 0      30111 0      74730 0

17,2740          10000 0      12744 0      03304 0      12756 0      40111 1      74727 0      10000 0      55630 1
17,2750          00004 0      04665 0   C: 43667 1      00003 1      34742 1      55742 0      30101 1      74730 0
17,2760          00006 1      12772 0      40106 1      74730 0      00006 1      12772 0      30111 0      74735 0
17,2770          00006 1      13112 1      34743 0      54001 1      51505 0      11525 0      13003 0      13026 1
```

```
OCTAL LISTING FOR PARAGRAPH # 116,  WITH PARITY BIT IN BINARY AT THE RIGHT OF EACH WORD, "@" DENOTES UNUSED FIXED MEMORY

ALL VALID WORDS ARE BASIC INSTRUCTIONS EXCEPT THOSE MARKED "I" (INTERPRETIVE OPERATOR WORDS) OR "C" (CONSTANTS)

17,3000       13002 1      13026 1      22007 0      64744 1      55736 0      31505 0      60001 0      55743 1
17,3010       31736 1      63137 1      00006 1      63037 0      03225 1      51505 0      33134 1      54001 1
17,3020       31740 0      00004 0      50001 0      05750 0      00003 1      13100 1      51505 0      33134 1
17,3030       00004 0      50000 1      05747 0      00003 1      11505 1      01477 1      13270 0      41736 0

17,3040       63136 0      00006 1      63061 0      27736 0      51505 0      11525 0      33136 0      13051 1
17,3050       43136 1      51505 0      55525 0      11500 1      13060 0      00006 1      00004 0      74744 0
17,3060       55742 0      03225 1      51505 0      33134 1      00004 0      55471 0      31740 0      51471 1
17,3070       05750 0      31736 1      55470 1      03143 1      00003 1      34746 0      51505 0      55534 0

17,3100       46266 1      61742 1      00006 1      63106 0      34743 0      13107 0      34744 1      51505 0
17,3110       55522 1      13034 1      34746 0      55525 0      55526 0      34742 1      00004 0      57534 1
17,3120       00006 1      13123 0      05753 0      34742 1      57535 0      00003 1      00006 1      13270 0
17,3130       00004 0      05764 1      00003 1      13270 0   C: 00004 0   C: 00015 0   C: 00026 0   C: 77417 0

17,3140    C: 00600 1   C: 00266 0   C: 02720 0      41470 1      60031 0      00006 1      63163 0      23465 1
17,3150       53467 1      53471 0      54031 1      23465 1      00006 1      23265 1      06040 0      34726 0
17,3160       00036 1      05013 0      01265 1      61466 1      00006 1      63174 0      23467 0      53471 0
17,3170       00006 1      60031 0      53467 1      00002 0      40000 0      64745 0      55470 1      00002 0

17,3200       23737 0      00006 1      71626 0      57737 0      00006 1      71627 1      54001 1      61737 0
17,3210       55736 0      13215 0      50000 1      44725 1      55736 0      41737 1      60001 0      54007 1
17,3220       13223 0      50000 1      44725 1      23736 1      00002 0      51743 0      33257 1      51742 1
17,3230       73263 1      55740 1      71257 1      10000 0      13236 1      00002 0      36266 0      55742 0

17,3240       51743 0      33257 1      51742 1      73263 1      55740 1      71257 1      00006 1      13235 1
17,3250       11742 0      13237 0      51505 0      55525 0      05571 1   C: 02004 1      13026 1   C: 00110 1
17,3260    C: 00022 1   C: 00204 1   C: 00041 1   C: 00125 1   C: 00252 1   C: 00146 1   C: 00231 1   C: 00377 1
17,3270       33272 0      07775 0   C: 03273 1      53753 0      52011 0      53755 0      56017 1      22002 0

17,3300       34726 0      53757 1      52016 1      15274 1      00006 1      23744 1      51505 0      33755 0
17,3310       55745 1      31427 1      00006 1      63320 0      31745 0      55743 1      33757 1      13330 0
17,3320       41751 1      55751 1      41427 0      55427 0      34744 1      27745 1      55743 1      43757 0
17,3330       55737 1      31751 0      00006 1      74740 1      10000 0      13717 1      13340 1      13663 0

17,3340       34730 1      00006 1      70001 1      55751 1      31427 1      00006 1      74741 0      00006 1
17,3350       13352 1      13725 0      23427 1      31427 1      00006 1      70000 0      00006 1      74730 0
17,3360       55736 0      11751 1      13365 0      13365 0      13365 0      63760 0      00006 1      51745 0
17,3370       61600 0      00006 1      63377 1      34743 0      27743 1      34742 1      13402 0      11500 1
```

```
OCTAL LISTING FOR PARAGRAPH # 117,  WITH PARITY BIT IN BINARY AT THE RIGHT OF EACH WORD, "@" DENOTES UNUSED FIXED MEMORY

ALL VALID WORDS ARE BASIC INSTRUCTIONS EXCEPT THOSE MARKED "I" (INTERPRETIVE OPERATOR WORDS) OR "C" (CONSTANTS)

17,3400        13402 0     13373 1     55742 0     41736 0     00006 1     51743 0     71566 1     51745 0
17,3410        61600 0     00006 1     61751 0     55740 1     00006 1     63575 0     51745 0     31572 0
17,3420        00006 1     71736 0     61751 0     51745 0     61602 1     00006 1     63461 1     51505 0
17,3430        41525 0     00006 1     71737 1     00006 1     63455 0     11554 0     13447 1     41740 1

17,3440        51745 0     61604 1     00006 1     63455 0     03561 0     31740 0     13615 1     51745 0
17,3450        41600 1     60000 1     61740 0     00006 1     63457 1     34746 0     13521 0     03561 0
17,3460        13602 1     54001 1     11737 1     13467 0     05701 1     44743 1     27743 1     30001 0
17,3470        00006 1     51743 0     71575 0     20001 1     20001 1     53747 0     51743 0     31567 1

17,3500        00006 1     71427 0     55741 0     00006 1     73767 0     61746 0     67767 0     00006 1
17,3510        63536 1     31741 1     00006 1     73770 0     61746 0     63761 1     00006 1     63546 0
17,3520        34732 0     00006 1     71737 1     51505 0     55525 0     00006 1     51505 0     71546 0
17,3530        30001 0     00006 1     63535 1     34742 1     55742 0     01744 1     43766 1     61741 1

17,3540        53747 0     00006 1     11746 1     00006 1     74727 0     13656 0     00006 1     33772 0
17,3550        21747 0     31741 1     63762 1     53747 0     00006 1     11746 1     00006 1     74727 0
17,3560        13521 0     41737 1     55737 1     31427 1     00006 1     51743 0     71566 1     55741 0
17,3570        63773 1     00006 1     63574 1     13520 1     00002 0     03561 0     31740 0     61554 1

17,3600        00006 1     63615 0     41555 1     61741 1     00006 1     63610 0     31741 1     13521 0
17,3610        11427 0     34737 0     13521 0     05701 1     13521 0     00006 1     51745 0     61604 1
17,3620        00006 1     51743 0     71574 1     20001 1     20001 1     53747 0     31741 1     63773 1
17,3630        00006 1     70000 0     00006 1     61746 0     00006 1     63520 0     31746 0     67767 0

17,3640        00006 1     63651 0     33763 0     53747 0     00006 1     11746 1     61741 1     63764 1
17,3650        13521 0     43765 1     53747 0     00006 1     11746 1     61741 1     63775 1     00006 1
17,3660        63455 0     63774 0     13521 0     43776 0     27427 0     00006 1     63707 1     03745 1
17,3670        31427 1     00006 1     51743 0     71570 0     67762 0     00006 1     63700 0     13520 1

17,3700        00006 1     13520 1     64731 0     20001 1     20001 1     20001 1     13656 0     03747 0
17,3710        11737 1     34744 1     13714 1     37770 0     27743 1     41427 0     13671 0     03745 1
17,3720        33776 1     61427 1     54000 0     13671 0     13520 1     03745 1     51745 0     41600 1
17,3730        61751 0     00006 1     74732 1     57427 1     00006 1     70000 0     00006 1     51745 0

17,3740        71570 0     61427 1     00006 1     63455 0     13520 1     41737 1     55737 1     34742 1
17,3750        55742 0     34726 0     55740 1     00002 0  C: 77757 1  C: 00000 1  C: 00020 0  C: 14400 0
17,3760     C: 75673 1  C: 77750 0  C: 00632 0  C: 01463 1  C: 00232 1  C: 77462 1  C: 77631 0  C: 77145 1
17,3770     C: 75462 0  C: 00007 0  C: 25605 0  C: 76631 1  C: 00122 0  C: 77655 1  C: 04476 0  CKSM 44350 1
```

```
OCTAL LISTING FOR PARAGRAPH # 120,  WITH PARITY BIT IN BINARY AT THE RIGHT OF EACH WORD, "@" DENOTES UNUSED FIXED MEMORY

ALL VALID WORDS ARE BASIC INSTRUCTIONS EXCEPT THOSE MARKED "I" (INTERPRETIVE OPERATOR WORDS) OR "C" (CONSTANTS)

20,2000      C: 01150 1     C: 01046 1     C: 10117 1     C: 01174 1        32114 1        70111 1        55340 0        40106 1
20,2010         74730 0        10000 0        34727 1        27340 0        31340 1        74346 0        00006 1        12034 0
20,2020         31340 1        72113 1        55340 0        32112 1        04607 1     C: 20345 1        15474 1        12037 0
20,2030         12014 1        34742 1        05466 0        15146 0        34730 1        27340 0        12021 1        00004 0

20,2040         44730 0        70106 1        54001 1        41340 0        74727 0        10000 0        34730 1        60001 0
20,2050         54106 1        41340 0        74346 0        10000 0        44730 0        62114 1        71340 0        54001 1
20,2060         42114 0        70111 1        60001 0        54111 1        74730 0        10000 0        31327 0        61326 1
20,2070         55243 1        30111 0        74732 1        00006 1        12101 1        44726 1        70075 1        54075 1

20,2100         12104 1        40075 1        74726 1        26075 1        30111 0        76266 1        60000 1        55322 1
20,2110         04626 1     C: 02214 1     C: 01056 0     C: 33133 0     C: 13133 1        30111 0        74740 1        00006 1
20,2120         12122 0        12130 0        30111 0        74741 0        00006 1        12141 0        32153 1        12131 1
20,2130         32152 0        55343 0        00006 1        22070 0        37736 1        05063 1     C: 03603 1     C: 42106 0

20,2140         00070 0        32151 0        12131 1        00006 1        22070 0        02154 0        32153 1        55343 0
20,2150         12134 1     C: 00155 0     C: 03434 1     C: 00554 0        35006 1        56003 1        54001 1        30032 0
20,2160         55634 0        30033 1        55635 1        30034 0        55636 1        12171 0        35006 1        56003 1
20,2170         54001 1        34746 0        55642 1        55643 0        55644 1        55637 0        55640 0        55641 1

20,2200         55274 0        55275 1        55276 1        22003 1        00002 0        00006 1        22071 1        02166 1
20,2210         22003 1        55536 1        55537 0        55540 0        55541 1        55424 0        55425 1        55544 1
20,2220         55545 0        22003 1        40111 1        74735 0        26111 1        02116 0        00071 1        31774 1
20,2230         54001 1        34741 1        00006 1        06001 0        55774 0        74741 0        10000 0        12336 1

20,2240         40074 0        74726 1        00006 1        12257 1        30074 1        74741 0        10000 0        12266 0
20,2250         41450 0        55761 1        41452 1        55762 1        41464 1        57760 1        12456 0        41422 0
20,2260         55761 1        41423 1        55762 1        41421 0        57760 1        12456 0        00006 1        22061 0
20,2270         30322 1        00006 1        20033 0        55760 0        00006 1        71415 1        57761 0        30323 0

20,2300         00006 1        20034 1        55762 1        00006 1        71417 0        61761 0        02451 0        55761 1
20,2310         31760 1        00006 1        71416 1        57762 0        00006 1        71420 1        61762 0        02451 0
20,2320         55762 1        31760 1        00006 1        71414 0        57760 1        30321 1        00006 1        20032 1
20,2330         61760 1        02451 0        55760 0        00006 1        22061 0        12456 0        31774 1        76263 1

20,2340         00006 1        12376 0        74742 0        00006 1        12367 0        44737 1        00006 1        03012 1
20,2350         44746 1        55760 0        55761 1        55762 1        55763 0        55764 1        55765 0        54050 0
20,2360         54051 1        54052 1        46263 1        71774 0        64743 0        55774 0        12456 0        34737 0
20,2370         00006 1        05012 1        46263 1        71774 0        55774 0        12456 0        34737 0        00006 1
```

```
OCTAL LISTING FOR PARAGRAPH # 121,  WITH PARITY BIT IN BINARY AT THE RIGHT OF EACH WORD, "@" DENOTES UNUSED FIXED MEMORY

ALL VALID WORDS ARE BASIC INSTRUCTIONS EXCEPT THOSE MARKED "I" (INTERPRETIVE OPERATOR WORDS) OR "C" (CONSTANTS)

20,2400      02012 0     10000 0     12407 1     41774 0     74742 0     27774 0     12456 0     34743 0
20,2410      54063 0     42450 0     00006 1     50063 1     71760 0     54001 1     10000 0     32446 0
20,2420      12422 0     42446 1     60001 0     54061 1     12430 0     50000 1     32446 0     54001 1
20,2430      50063 1     41763 0     60001 0     50063 1     26050 0     50063 1     23763 1     10063 0

20,2440      12410 1     37761 0     00006 1     05014 1     12456 0  C: 77177 0  C: 37200 1  C: 00600 1
20,2450   C: 03146 1     54007 1     00002 0     50000 1     44725 1     00002 0     00006 1     32462 0
20,2460      52006 0  C: 02016 1  C: 34106 1     35006 1     54003 0     04636 0     54117 1     30111 0
20,2470      74730 0     54157 0     10000 0     41327 1     61243 0     55326 0     00004 0     30106 0

20,2500      74730 0     00006 1     12526 0     44724 0     55475 1     35745 1     54154 0     41326 0
20,2510      61400 1     00006 1     62517 0     41326 0     62001 1     00006 1     62544 0     27326 0
20,2520      22007 0     10157 0     31327 0     61326 1     53244 0     12544 1     44733 0     55475 1
20,2530      36263 0     54154 0     41326 0     62002 1     00006 1     62517 0     41326 0     62003 0

20,2540      61400 1     00006 1     62544 0     12517 1     00003 1     10157 0     13063 0     34743 0
20,2550      54155 1     44743 1     26154 0     31326 1     50154 1     63042 1     54156 1     00006 1
20,2560      50154 1     33024 1     00006 1     10156 1     50154 1     63041 1     50155 0     55530 1
20,2570      10155 1     12550 1     12574 1     12673 0     22007 0     41532 0     61531 1     00006 1

20,2600      62624 0     00006 1     11531 0     54155 1     63062 0     00006 1     62611 0     43062 1
20,2610      54155 1     30155 0     00006 1     73056 0     63060 1     55627 1     44724 0     60155 0
20,2620      00006 1     71627 1     55626 0     12647 1     00006 1     11532 0     54155 1     40155 1
20,2630      63062 0     00006 1     62635 0     33062 0     54155 1     30155 0     00006 1     73056 0

20,2640      63061 0     55626 0     40155 1     64726 0     00006 1     71626 0     55627 1     41626 0
20,2650      00006 1     71531 0     55533 1     31627 0     00006 1     71532 0     61533 0     00006 1
20,2660      74727 0     55533 1     10154 0     34746 0     55502 0     13206 1     44743 1     54154 0
20,2670      44744 0     54155 1     12553 1     31245 0     00006 1     71243 1     02760 1  C: 03057 0

20,2700      00006 1     71527 1     00004 0     54154 0     00006 1     71532 0     02760 1  C: 02000 0
20,2710      55511 1     30154 1     00006 1     71531 0     02760 1  C: 02000 0     55507 0     00006 1
20,2720      73055 0     55504 0     31511 0     00006 1     73055 0     55506 1     11510 0     31507 1
20,2730      12732 1     41507 0     55510 0     11512 1     31511 0     12737 1     41511 1     55512 1

20,2740      40111 1     74727 0     00006 1     13664 1     41262 1     63744 0     00006 1     12751 1
20,2750      13664 1     11632 0     12755 0     04665 0  C: 43260 1     10157 0     13647 0     13207 0
20,2760      54161 0     54160 1     50002 0     30000 1     24002 0     50000 1     30000 1     00006 1
20,2770      13017 0     54162 0     10000 0     64744 1     12776 1     64744 1     56161 1     00006 1
```

```
OCTAL LISTING FOR PARAGRAPH # 122, WITH PARITY BIT IN BINARY AT THE RIGHT OF EACH WORD, "@" DENOTES UNUSED FIXED MEMORY

ALL VALID WORDS ARE BASIC INSTRUCTIONS EXCEPT THOSE MARKED "1" (INTERPRETIVE OPERATOR WORDS) OR "C" (CONSTANTS)

20,3000        63002 0       40000 0       60161 1       00006 1       63011 1       30160 0       00006 1       10162 0
20,3010        00002 0       10160 1       10162 0       13017 0       10162 0       34726 0       00002 0       34724 1
20,3020        00002 0    C: 00502 0    C: 36554 0    C: 00165 0    C: 22103 0    C: 00027 1    C: 32731 0    C: 00016 0
20,3030     C: 24420 1    C: 00153 0    C: 07111 1    C: 00072 1    C: 24103 0    C: 00135 0    C: 11511 1    C: 06147 0

20,3040     C: 75512 0    C: 00000 1    C: 01363 0    C: 00455 0    C: 76036 0    C: 00562 0    C: 75643 1    C: 00001 0
20,3050     C: 77616 0    C: 05154 1    C: 00052 0    C: 00231 1    C: 77174 0    C: 23146 0    C: 13241 1    C: 00337 0
20,3060     C: 26501 1    C: 51276 0    C: 62362 1       34744 1       54160 1       34744 1       54161 0       50160 0
20,3070        33170 1       00006 1       71326 0       00006 1       71327 1       50160 0       63171 0       54154 0

20,3100        13104 0       54161 0       00006 1       26160 1       50160 0       33173 1       00006 1       50161 1
20,3110        71326 0       50160 0       63175 1       00006 1       50161 1       71326 0       26154 0       10161 0
20,3120        13101 0       10160 1       13131 0    C: 00000 1    C: 20354 1       30154 1       54155 1       34750 1
20,3130        13064 1       33170 1       22007 0       02760 1    C: 01243 0       55530 1       34724 1       55550 1

20,3140        55570 0       55571 1       55610 0       55611 1       00006 1       33124 0       00006 1       10155 1
20,3150        00004 0       55531 0       55532 0       33061 0       55626 0       33060 1       55627 1       31243 0
20,3160        00006 1       70154 0       00006 1       71245 1       02760 1    C: 00155 0       55511 1       12716 1
20,3170     C: 00167 1    C: 06176 1    C: 77650 1    C: 72260 0    C: 76637 1    C: 02167 0    C: 00645 0    C: 06335 1

20,3200     C: 04256 1    C: 30163 0    C: 64072 0    C: 53632 0    C: 15133 1    C: 71777 0       55632 0       31343 1
20,3210        00006 1       74730 0       54001 1       60000 1       54115 0       41343 0       60001 0       54114 1
20,3220        00004 0       31540 1       54001 1       31536 0       04665 0    C: 37200 1       53543 0       00003 1
20,3230        30111 0       74735 0       10000 0       34744 1       54116 0       61502 1       10000 0       33741 0

20,3240        54151 0       00006 1       13246 0       10116 0       33740 1       54152 0       31530 0       64734 0
20,3250        54157 0       31530 0       03656 1       00004 0       55550 1       55551 0       44734 1       00006 1
20,3260        71550 1       00006 1       10157 0       55556 1       55557 0       34724 1       55552 0       55553 1
20,3270        00003 1       22007 0       10116 0       53543 0       34746 0       54154 0       54163 1       50154 1

20,3300        11542 1       64744 1       13305 0       64744 1       24163 0       54162 0       40163 1       54164 0
20,3310        31343 1       54143 0       54144 1       30162 1       63742 0       00006 1       63410 1       10151 0
20,3320        13350 0       31343 1       50164 1       26144 1       50163 0       54145 0       33205 0       60162 1
20,3330        00006 1       63334 0       40115 0       13343 1       40162 0       60000 1       60000 1       64727 1

20,3340        60000 1       00006 1       71343 0       50163 0       54143 0       30114 0       50164 1       54146 0
20,3350        30162 1       00006 1       74731 1       60162 1       03656 1       50164 1       54130 1       34724 1
20,3360        50163 0       54127 1       30162 1       61533 0       61533 0       64734 0       54000 0       13434 0
20,3370        30162 1       00006 1       74727 0       61533 0       54157 0       64735 1       56157 1       03656 1
```

```
OCTAL LISTING FOR PARAGRAPH # 123,  WITH PARITY BIT IN BINARY AT THE RIGHT OF EACH WORO, "@" OENOTES UNUSED FIXED MEMORY

ALL VALIO WOROS ARE BASIC INSTRUCTIONS EXCEPT THOSE MARKED "I" (INTERPRETIVE OPERATOR WORDS) OR "C" (CONSTANTS)

20,3400        00006 1     74727 0     54160 1     33407 1     54161 0     44735 0     13711 1     13441 1
20,3410        54001 1     34724 1     54127 1     54130 1     10151 0     13434 0     33743 1     60001 0
20,3420        00006 1     63431 1     30115 1     50164 1     54146 0     60000 1     50163 0     54145 0
20,3430        13434 0     31343 1     54146 0     54145 0     30162 1     61533 0     61533 0     54157 0

20,3440        03702 1     50164 1     54134 0     30160 0     50164 1     54126 0     30162 1     61533 0
20,3450        64734 0     54000 0     13454 0     34724 1     63742 0     54157 0     03702 1     50164 1
20,3460        54132 0     30160 0     50164 1     54124 1     40162 0     61533 0     61533 0     03670 0
20,3470        50163 0     54133 1     54001 1     30160 0     50163 0     54125 0     40162 0     61533 0

20,3500        54157 0     63742 0     00006 1     63721 0     03676 0     50163 0     54131 0     30160 0
20,3510        50163 0     54123 0     50154 1     33747 0     71257 1     00006 1     13523 1     30124 0
20,3520        54126 0     30132 1     54134 0     50154 1     33745 1     71257 1     00006 1     13534 1
20,3530        30123 1     54125 0     30131 1     54133 1     40146 0     60143 1     60151 1     54147 1

20,3540        40145 0     60144 0     60151 1     54150 1     00004 0     10154 0     13570 1     30122 0
20,3550        55546 0     34311 0     05547 1  C: 00123 1  C: 01566 0     00003 1     52144 1     52136 1
20,3560        52146 0     52140 0     52150 1     52142 1     34744 1     54154 0     34746 0     13276 0
20,3570        30122 0     55547 1     34311 0     05547 1  C: 00123 1  C: 01606 0     52152 0     53555 1

20,3600        31343 1     55560 1     55561 0     61554 1     55563 1     55562 0     34746 0     55564 0
20,3610        55565 1     11554 0     13630 0     52136 1     53601 0     52140 0     53603 1     52142 1
20,3620        53605 1     52144 1     53621 1     52146 0     53623 0     52150 1     53625 0     13650 0
20,3630        31343 1     55600 1     55601 0     55620 0     55621 1     61554 1     55602 0     55603 1

20,3640        55622 1     55623 0     34746 0     55604 0     55605 1     55624 1     55625 0     00004 0
20,3650        40111 1     74742 0     26111 1     00003 1     30117 0     04631 1     54165 1     34734 0
20,3660        22007 0     00006 1     10165 1     00002 0     34746 0     55502 0     55632 0     12755 0
20,3670        22007 0     22122 0     54157 0     63742 0     00006 1     63716 1     30157 1     00006 1

20,3700        50164 1     70130 1     64734 0     56157 1     00006 1     22161 1     03656 1     54160 1
20,3710        44734 1     00006 1     70160 1     00006 1     10157 0     00161 1     43742 1     54157 0
20,3720        13677 0     10163 1     34743 0     67770 0     54122 1     60154 1     50000 1     33746 1
20,3730        71257 1     00006 1     13736 1     43742 1     54157 0     13504 1     30001 0     13505 0

20,3740     C: 00110 1  C: 00443 1  C: 77377 1  C: 00356 1  C: 02217 1  C: 00110 1  C: 00022 1  C: 00204 1
20,3750     C: 00041 1  C: 03751 1  C: 03752 1  CKSM 74113 1     @           @           @           @
20,3760          @           @           @           @           @           @           @           @
20,3770          @           @           @           @           @           @           @           @
```

```
OCTAL LISTING FOR PARAGRAPH # 124,  WITH PARITY BIT IN BINARY AT THE RIGHT OF EACH WORD, "@" DENOTES UNUSED FIXED MEMORY

ALL VALID WORDS ARE BASIC INSTRUCTIONS EXCEPT THOSE MARKED "I" (INTERPRETIVE OPERATOR WORDS) OR "C" (CONSTANTS)

21,2000    C: 01507 1   C: 00466 0   C: 01034 1   C: 01115 0   C: 05101 1   C: 26305 0   I: 53575 0   I: 77656 1
21,2010    I: 72441 0   C: 01740 0   I: 51136 1   C: 42017 1   I: 43215 0   C: 05243 1   C: 05243 1   C: 02244 1
21,2020    I: 43414 1   C: 02675 1   I: 53575 0   C: 02314 0   I: 77676 0   C: 00023 0   I: 53435 0   C: 02322 0
21,2030    C: 00015 0   I: 53435 0   C: 00023 0   C: 24007 0   C: 00001 0   I: 76521 0   C: 00007 0   C: 03434 1

21,2040    I: 43414 1   C: 02475 0      40103 1      74740 1      10000 0      15263 1      11055 1      12054 0
21,2050       00006 1      34746 0      52754 0      12060 1      55722 0      36010 0      05175 1   C: 02042 0
21,2060       34744 1      70107 0      00006 1      12067 0      34740 0      54001 1      04577 0      34743 0
21,2070       70107 0      00006 1      12076 0      34742 1      54001 1      04577 0      30105 0      74734 1

21,2100       00006 1      12170 1      41010 0      62147 1      00006 1      12170 1      34744 1      70374 0
21,2110       10000 0      12170 1      00006 1      00030 1      40000 0      54001 1      74741 0      10000 0
21,2120       12136 0      41010 0      62146 0      00006 1      12170 1      30001 0      74744 0      10000 0
21,2130       12133 0      12170 1      02150 1      44746 1      12137 1      02150 1      34743 0      54002 1

21,2140       00004 0      00006 1      32145 0      52006 0   C: 03417 0   C: 12067 0   C: 00106 0   C: 00107 1
21,2150       40774 1      61010 1      00006 1      12164 1      40105 1      74734 1      10000 0      12164 1
21,2160       30103 0      74740 1      10000 0      00002 0      04355 0      04450 1      04626 1   C: 21062 0
21,2170       23722 1      40025 1      53055 1      40103 1      74732 1      10000 0      12654 0      00006 1

21,2200       41702 1      53721 0      00006 1      31527 0      20001 1      20001 1      21721 0      00006 1
21,2210       41704 1      53723 1      00006 1      31531 1      20001 1      20001 1      21723 1      00006 1
21,2220       41706 0      53725 1      00006 1      31533 0      20001 1      20001 1      21725 1      41234 1
21,2230       60025 0      64727 1      64727 1      57717 1      31157 0      60037 0      00006 1      72000 1

21,2240       21721 0      31160 1      60040 0      00006 1      72000 1      21723 1      31161 0      60041 1
21,2250       00006 1      72000 1      21725 1      31676 1      00006 1      71717 0      21721 0      31677 0
21,2260       00006 1      71717 0      21723 1      31700 1      00006 1      71717 0      21725 1      31714 1
21,2270       00006 1      71720 1      53727 0      31714 1      00006 1      71721 0      54001 1      34746 0

21,2300       21727 0      31715 0      00006 1      71722 0      21727 0      31716 0      00006 1      71724 0
21,2310       21727 0      31713 0      00006 1      71717 0      21727 0      00006 1      31727 1      52064 1
21,2320       00006 1      31712 1      20064 1      31717 1      00006 1      74741 0      30001 0      00006 1
21,2330       70063 0      53731 1      00006 1      31710 0      21731 1      40075 1      74727 0      10000 0

21,2340       12626 0      34743 0      00006 1      02012 0      00006 1      12653 1      00006 1      05014 1
21,2350       00006 1      31727 1      20001 1      20001 1      20001 1      00006 1      72004 0      56001 0
21,2360       60000 1      54002 1      34746 0      26001 1      64726 0      54001 1      12371 1      60001 0
21,2370       40000 0      55060 1      34742 1      00006 1      05014 1      35745 1      05226 1      44743 1
```

```
OCTAL LISTING FOR PARAGRAPH # 125,  WITH PARITY BIT IN BINARY AT THE RIGHT OF EACH WORD, "@" DENOTES UNUSED FIXED MEMORY

ALL VALID WORDS ARE BASIC INSTRUCTIONS EXCEPT THOSE MARKED "I" (INTERPRETIVE OPERATOR WORDS) OR "C" (CONSTANTS)

21,2400        00006 1     03014 1     31731 0     00006 1     72005 1     54001 1     34746 0     52064 1
21,2410        31730 1     00006 1     72005 1     20064 1     52064 1     20001 1     20001 1     54000 0
21,2420        12424 0     74724 0     64726 0     12430 0     10000 0     64744 1     12430 0     34746 0
21,2430        56060 1     34742 1     00006 1     05014 1     02513 1     34733 1     54062 1     32001 1

21,2440        22070 0     02673 1     22071 1     00006 1     10062 1     00006 1     72003 1     56001 0
21,2450        60000 1     54002 1     12454 1     26001 1     41733 0     26001 1     32002 1     02673 1
21,2460        64745 0     54054 1     27733 0     32001 1     22072 1     02673 1     22073 0     00006 1
21,2470        10062 1     00006 1     72003 1     56001 0     60000 1     54002 1     12500 1     26001 1

21,2500        41732 1     26001 1     32002 1     02673 1     64745 0     54053 0     27732 1     35011 1
21,2510        00006 1     05014 1     05263 0     40074 0     74743 1     00006 1     12615 0     41716 1
21,2520        00006 1     71720 1     52066 0     31714 1     00006 1     71724 0     20066 0     31714 1
21,2530        00006 1     71725 1     54001 1     34746 0     20066 0     00006 1     31723 0     52064 1

21,2540        35006 1     54003 0     31420 0     00006 1     70065 0     52071 0     41417 0     00006 1
21,2550        70063 0     20071 0     31420 0     00006 1     70066 0     54062 1     41417 0     00006 1
21,2560        70064 1     60062 0     54001 1     34746 0     20071 0     31417 1     00006 1     70065 0
21,2570        52073 1     31420 0     00006 1     70063 0     20073 1     31417 1     00006 1     70066 0

21,2600        54062 1     31420 0     00006 1     70064 1     60062 0     54001 1     34746 0     20073 1
21,2610        24006 1     00006 1     30071 1     53735 0     00002 0     54070 1     54071 0     00006 1
21,2620        31723 0     52073 1     00006 1     31704 0     20073 1     12611 1     02513 1     40075 1
21,2630        74727 0     26075 1     34735 1     00006 1     05012 1     44746 1     55732 1     55733 0

21,2640        34741 1     05175 1  C: 02644 0     12512 1     34743 0     00006 1     05012 1     41300 1
21,2650        74735 0     27300 1     05263 0     02513 1     44727 0     70075 1     54075 1     34735 1
21,2660        71300 1     10000 0     34743 0     64735 1     40000 0     00006 1     03012 1     44735 0
21,2670        71300 1     55300 1     12512 1     54061 1     34746 0     00006 1     10061 1     10000 0

21,2700        22061 0     12703 0     12705 0     30001 0     00002 0     40061 1     00002 0  I: 45020 1
21,2710     C: 02746 0  C: 47522 1  I: 77624 1  C: 20030 0  I: 66370 0  C: 00022 1  C: 00051 0  C: 00006 1
21,2720     I: 61373 1  C: 02707 0  C: 01732 0  I: 77656 1  C: 06707 1  I: 77700 0  C: 42720 1  I: 75160 1
21,2730     C: 03606 1  C: 02642 0  I: 77624 1  C: 26374 0  I: 77624 1  C: 47336 1  I: 77650 1  C: 02746 0

21,2740     I: 77620 0  C: 02746 0  C: 34041 0  C: 27136 0  I: 53575 0  C: 00001 0  C: 27607 0  C: 00007 0
21,2750     I: 53435 0  C: 00001 0  C: 27615 0  C: 03607 0  I: 53435 0  C: 03615 0  C: 37623 1  C: 02746 0
21,2760     I: 43020 1  C: 03744 0  C: 04634 1  C: 27621 1     31304 1     00006 1     12771 0     04626 1
21,2770     C: 17760 0     00006 1     30134 1     53305 1     30006 1     74750 0     27305 1     30167 1
```

```
OCTAL LISTING FOR PARAGRAPH # 126,  WITH PARITY BIT IN BINARY AT THE RIGHT OF EACH WORD, "@" DENOTES UNUSED FIXED MEMORY

ALL VALID WORDS ARE BASIC INSTRUCTIONS EXCEPT THOSE MARKED "I" (INTERPRETIVE OPERATOR WORDS) OR "C" (CONSTANTS)

21,3000        77746 1      55306 1      33006 1      54003 0      04626 1   C: 44004 0   C: 03275 1      44740 1
21,3010        70077 0      54077 0      44736 0      70106 1      54106 1      44744 0      70076 1      54076 1
21,3020        46017 0      70074 0      54074 0      40031 1      70075 1      54075 1      00002 0      37770 0
21,3030        55630 1      34742 1      55534 0      55535 1      34743 0      55632 0      55631 0      55633 1

21,3040        30021 1      60000 1      55505 1      34743 0      13046 1      34745 0      55747 0      51747 1
21,3050        31536 0      00006 1      74743 1      00006 1      13060 0      50000 1      44725 1      56001 0
21,3060        11747 0      50000 1      31436 1      53743 1      51747 1      31504 1      55740 1      00006 1
21,3070        13526 1      51747 1      31450 1      00006 1      71740 1      23736 1      00006 1      74740 1

21,3100        53737 1      00006 1      74740 1      27737 1      41743 1      00006 1      74727 0      00006 1
21,3110        71743 1      61740 0      00006 1      63130 0      00006 1      40001 1      61740 0      00006 1
21,3120        11740 1      57745 0      30001 0      22007 0      00006 1      11740 1      57746 0      13133 1
21,3130        34724 1      54001 1      53746 1      31742 1      00006 1      74734 1      53742 0      00006 1

21,3140        31742 1      53751 1      31743 0      00006 1      63150 0      00006 1      31746 0      13152 0
21,3150        00005 1      41746 1      21751 1      11750 0      13160 1      13157 0      13162 0      11751 1
21,3160        34744 1      13163 1      44744 0      55744 0      11744 0      13177 1      13170 0      13174 1
21,3170        55741 0      55742 0      13177 1   C: 65252 1      00006 1      41742 0      53742 0      00006 1

21,3200        31746 0      21742 0      31745 0      00006 1      73173 0      53746 1      30001 0      00006 1
21,3210        73173 0      27746 1      54001 1      13215 0      27745 1      00006 1      31742 1      21746 1
21,3220        31745 0      00006 1      71743 1      21737 1      31746 0      00006 1      71743 1      27737 1
21,3230        54001 1      13233 1      27736 0      31741 1      00006 1      71740 1      53751 1      31742 1

21,3240        00006 1      71740 1      27751 1      54001 1      13246 0      27750 0      11744 0      13454 0
21,3250        13516 1      13253 1      13516 1      00006 1      41742 0      53742 0      13454 0   C: 23146 0
21,3260        34744 1      55502 0      34743 0      22002 0      22071 1      13267 0      34746 0      54066 0
21,3270        50066 1      31507 1      00006 1      63343 0      54063 0      50066 1      41536 1      00006 1

21,3300        13343 1      54002 1      00006 1      73257 0      60002 0      54001 1      13313 1      40000 0
21,3310        50066 1      57501 1      13347 0      00006 1      63321 1      40000 0      54062 1      44744 0
21,3320        13323 1      54062 1      34744 1      50066 1      55501 0      30063 1      00006 1      74731 1
21,3330        60062 0      00006 1      63347 1      40062 1      00006 1      73370 1      00006 1      10063 0

21,3340        00006 1      13343 1      13355 0      34746 0      50066 1      55501 0      13357 1      36010 0
21,3350        50066 1      55631 0      34746 0      55502 0      13357 1      50066 1      55631 0      10066 0
21,3360        13266 1      52073 1      52063 0      04665 0   C: 35737 1      52063 0      52073 1      00071 1
21,3370     C: 00240 1      11750 0      13410 0      13375 1      13401 0      31751 0      00006 1      63401 1
```

```
OCTAL LISTING FOR PARAGRAPH # 127,  WITH PARITY BIT IN BINARY AT THE RIGHT OF EACH WORD, "@" DENOTES UNUSED FIXED MEMORY

ALL VALID WORDS ARE BASIC INSTRUCTIONS EXCEPT THOSE MARKED "I" (INTERPRETIVE OPERATOR WORDS) OR "C" (CONSTANTS)

21,3400        13404 0      34746 0      55740 1      00002 0      57750 1      57751 0      34750 1      13411 1
21,3410        34746 0      55740 1      35745 1      55743 1      13423 0      31750 1      13437 0      37767 0
21,3420        27743 1      00006 1      63415 1      41750 0      51743 0      64726 0      00006 1      63417 0
21,3430        51743 0      34726 0      57746 0      00006 1      31751 0      00006 1      11746 1      00006 1

21,3440        23751 0      00006 1      74727 0      55746 1      74730 0      10000 0      33564 0      63562 0
21,3450        03566 1      03566 1      03566 1      01751 0      03371 1      57741 1      00006 1      71741 0
21,3460        53742 0      00006 1      70001 1      27742 0      54001 1      13467 0      27741 0      31743 0
21,3470        00006 1      74727 0      27740 1      00006 1      13513 1      51740 0      34726 0      57741 1

21,3500        00006 1      71741 0      21737 1      57741 1      00006 1      71742 0      27737 1      54001 1
21,3510        13512 0      27736 0      13516 1      00006 1      31742 1      21737 1      11736 0      13523 1
21,3520        13522 0      13525 1      11737 1      34744 1      13526 1      44744 0      54001 1      51747 1
21,3530        57501 1      00006 1      70001 1      10001 1      13551 1      13546 1      13540 1      13546 1

21,3540        51747 1      55510 0      51747 1      43563 0      00006 1      03012 1      41774 0      74740 1
21,3550        27774 0      11747 0      13045 1      31505 0      54021 0      00006 1      33561 0      52006 0
21,3560     C: 03270 1   C: 36106 0   C: 26501 1   C: 01400 1   C: 11276 1   C: 06000 1      55745 1      54021 0
21,3570        31746 0      22007 0      00006 1      11745 1      60021 1      00002 0      34746 0      55536 1

21,3600        55540 0      55424 0      55425 1      04607 1   C: 40465 1      05146 1   C: 00632 0      34727 1
21,3610        51505 0      55525 0      11744 0      13633 0      13636 0      51505 0      41525 0      10000 0
21,3620        00002 0      13623 1      13623 1      51505 0      33645 0      51505 0      55767 1      34746 0
21,3630        51505 0      55525 0      00002 0      51505 0      31525 1      13617 0      51505 0      11767 1

21,3640        13642 0      00002 0      13627 0      00002 0   C: 00004 0   C: 00012 1   C: 00012 1      44744 0
21,3650        55744 0      31427 1      13656 0      34744 1      55744 0      41427 0      22000 1      40111 1
21,3660        74735 0      10000 0      34760 1      60001 0      00006 1      63675 0      13612 0      51505 0
21,3670        11525 0      13653 0      13674 0      13647 0      55744 0      31427 1      00006 1      74757 1

21,3700        10000 0      13720 0      13704 0      13607 1      31427 1      61751 0      00006 1      71411 0
21,3710        00006 1      13726 0      00006 1      63722 0      31427 1      63606 1      00006 1      63726 1
21,3720        44727 0      13610 1      43606 0      61427 1      00006 1      63607 0      34746 0      13610 1
21,3730     C: 03730 0   C: 03731 1 CKSM 41612 1         @            @            @            @            @

21,3740           @            @            @            @            @            @            @            @
21,3750           @            @            @            @            @            @            @            @
21,3760           @            @            @            @            @            @            @            @
21,3770           @            @            @            @            @            @            @            @
```

```
OCTAL LISTING FOR PARAGRAPH # 130,  WITH PARITY BIT IN BINARY AT THE RIGHT OF EACH WORD, "@" OENOTES UNUSED FIXED MEMORY

ALL VALID WOROS ARE BASIC INSTRUCTIONS EXCEPT THOSE MARKED "I" (INTERPRETIVE OPERATOR WORDS) OR "C" (CONSTANTS)

22,2000      C: 27533 1    C: 07571 0    C: 25004 1    C: 06702 1       06060 1    I: 77634 0    C: 44403 0    C: 03276 1
22,2010      I: 51535 0    C: 00324 1    I: 51025 1    C: 04403 1    C: 44724 0    I: 72364 0    C: 03245 1    C: 03276 1
22,2020      I: 77624 1    C: 44410 1    I: 72364 0    C: 02221 1    C: 00322 1    I: 77624 1    C: 44410 1    I: 45160 1
22,2030      C: 03245 1    C: 44326 0    I: 45575 1    C: 50460 0    I: 77626 0    C: 50466 0    I: 77626 0    C: 74474 0

22,2040      I: 75160 1    C: 03302 0    C: 02221 1    I: 77624 1    C: 44312 1    I: 45575 1    C: 51541 0    I: 77626 0
22,2050      C: 51547 0    I: 77626 0    C: 75555 0    I: 45001 1    C: 00023 0    C: 44335 1    I: 45575 1    C: 50460 0
22,2060      I: 77626 0    C: 50466 0    I: 77626 0    C: 74474 0    I: 45345 1    C: 03305 1    C: 02224 1    I: 45325 1
22,2070      C: 02226 0    C: 03307 0    I: 45325 1    C: 03315 0    C: 02234 0    I: 77666 1    C: 03325 0    I: 43345 1

22,2100      C: 02222 1    C: 02242 1    I: 43225 0    C: 06475 1    C: 02232 0    C: 03333 1    I: 77726 1    C: 03335 1
22,2110      I: 51025 1    C: 04363 0    C: 44117 0    I: 77751 1    C: 00322 1    C: 37235 1    C: 44742 0    I: 45345 1
22,2120      C: 03335 1    C: 04365 0    I: 77244 0    C: 44131 1    C: 03325 0    I: 77656 1    C: 03270 1    I: 77650 1
22,2130      C: 44744 0    I: 53375 0    C: 02222 1    C: 03303 1    I: 77762 1    C: 27303 1    C: 02230 1    I: 74455 0

22,2140      C: 03311 1    C: 27311 1    C: 02236 1    I: 74455 0    C: 03317 1    C: 03317 1    I: 70545 1    C: 03333 1
22,2150      I: 45325 1    C: 06503 1    C: 03333 1    I: 65204 1    C: 31765 1    C: 03323 0    I: 56225 1    C: 00001 0
22,2160      C: 00003 1    I: 65366 1    C: 03313 0    I: 56225 1    C: 00001 0    C: 00003 1    I: 65366 1    C: 03303 1
22,2170      I: 56225 1    C: 00001 0    C: 00003 1    I: 55566 1    I: 77656 1    C: 03270 1    I: 45345 1    C: 03270 1

22,2200      C: 03272 0    I: 71240 1    C: 44211 0    C: 03270 1    I: 50025 0    C: 03274 0    C: 44266 0    I: 77650 1
22,2210      C: 44242 0    I: 45345 1    C: 03272 0    C: 03274 0    I: 77640 0    C: 44266 0    I: 51145 0    C: 03327 1
22,2220      C: 44224 0    I: 57575 1    C: 03270 1    C: 03270 1    I: 51145 0    C: 03305 1    C: 44232 1    I: 57545 1
22,2230      C: 03270 1    C: 03270 1    I: 51145 0    C: 03315 0    C: 44744 0    I: 57545 1    C: 03274 0    C: 03274 0

22,2240      I: 77650 1    C: 44744 0    I: 51145 0    C: 03325 0    C: 44250 0    I: 57575 1    C: 03270 1    C: 03270 1
22,2250      I: 51145 0    C: 03305 1    C: 44256 0    I: 57545 1    C: 03272 0    C: 03272 0    I: 51145 0    C: 03307 0
22,2260      C: 44744 0    I: 57545 1    C: 03274 0    C: 03274 0    I: 77650 1    C: 44744 0    I: 51145 0    C: 03331 0
22,2270      C: 44274 0    I: 57575 1    C: 03270 1    C: 03270 1    I: 51145 0    C: 03307 0    C: 44302 0    I: 57545 1

22,2300      C: 03270 1    C: 03270 1    I: 51145 0    C: 03315 0    C: 44744 0    I: 57545 1    C: 03272 0    C: 03272 0
22,2310      I: 77650 1    C: 44744 0    I: 76601 1    C: 00001 0    C: 00001 0    I: 62703 1    C: 77776 1    C: 00007 0
22,2320      I: 62703 1    C: 77776 1    C: 00015 0    I: 41503 1    C: 77776 1    I: 77616 0    I: 76601 1    C: 00001 0
22,2330      C: 00001 0    I: 62713 0    C: 00007 0    C: 00015 0    I: 77606 1    I: 77776 1       50120 1       52013 1

22,2340         50120 1       52017 0       50120 1       52013 1       50120 1       52015 1       50120 1       52005 0
22,2350         50120 1       52015 1       50120 1       52003 0       50120 1       52007 1       50120 1       52003 0
22,2360         06060 1    I: 77616 0    C: 00013 0    C: 13563 0    C: 17070 0    C: 34343 1    C: 15666 0    C: 20443 0
22,2370      C: 33555 1    C: 01106 1    C: 67777 1    C: 77777 0    C: 04000 0    C: 00000 1    C: 00216 1    C: 36323 0
```

```
OCTAL LISTING FOR PARAGRAPH # 131,  WITH PARITY BIT IN BINARY AT THE RIGHT OF EACH WORD, "@" DENOTES UNUSED FIXED MEMORY

ALL VALID WORDS ARE BASIC INSTRUCTIONS EXCEPT THOSE MARKED "I" (INTERPRETIVE OPERATOR WORDS) OR "C" (CONSTANTS)

22,2400     C: 17773 1   C: 00057 0   C: 14344 1      30034 0      54156 1      00006 1      30033 1      16517 0
22,2410     I: 66370 0   C: 00003 1   C: 00051 0   C: 00001 0   C: 00010 0   I: 77601 0   C: 00001 0   I: 47133 0
22,2420     C: 00013 0   C: 21606 1   C: 00013 0   I: 65356 1   C: 00013 0   I: 41546 0   I: 71300 1   C: 44417 0
22,2430     C: 00007 0   I: 72405 0   C: 00013 0   C: 10001 1   I: 41345 0   C: 00005 1   C: 00001 0   I: 41325 0

22,2440     C: 00007 0   C: 00011 1   I: 72405 0   C: 00003 1   I: 72421 0   C: 00015 0   C: 10003 0   I: 41345 0
22,2450     C: 00003 1   C: 00005 1   I: 41325 0   C: 00007 0   C: 00011 1   I: 72405 0   C: 00001 0   I: 72415 1
22,2460     C: 00017 1   C: 10005 0   I: 77745 1   C: 00011 1   C: 10007 1   I: 77745 1   C: 00013 0   I: 72405 0
22,2470     C: 00003 1   C: 10011 0   I: 41345 0   C: 00013 0   C: 00001 0   I: 72476 1   C: 10013 1   I: 41345 0

22,2500     C: 00005 1   C: 00013 0   I: 72476 1   C: 10015 1   I: 77745 1   I: 72405 0   C: 00011 1   I: 41325 0
22,2510     C: 00007 0   C: 00001 0   I: 72415 1   I: 77626 0   C: 67760 1   I: 77745 1   I: 72405 0   C: 00011 1
22,2520     I: 41325 0   C: 00007 0   C: 00003 1   I: 72425 1   I: 77626 0   C: 67756 1   I: 77616 0   I: 41401 1
22,2530     C: 00001 0   I: 65356 1   I: 41546 0   I: 65302 0   I: 41021 1   C: 06503 1   C: 31765 1   I: 77725 1

22,2540     C: 03270 1   I: 41316 0   C: 00005 1   I: 52415 0   C: 00003 1   I: 77604 0   C: 31765 1   C: 16222 1
22,2550     C: 03272 0   I: 41316 0   C: 00005 1   I: 52415 0   C: 00003 1   I: 77604 0   C: 31765 1   C: 16232 0
22,2560     C: 03274 0   I: 41316 0   C: 00005 1   I: 52415 0   C: 00003 1   I: 77604 0   C: 31765 1   C: 02242 1
22,2570     I: 41345 0   C: 03270 1   C: 03272 0   I: 72405 0   C: 00005 1   I: 41325 0   C: 03274 0   C: 00001 0

22,2600     I: 43206 1   C: 00007 0   I: 41112 0   C: 31765 1   C: 16230 1   I: 62421 1   I: 77604 0   C: 31765 1
22,2610     C: 16224 1   C: 03270 1   I: 41205 0   C: 03274 0   C: 00005 1   I: 65352 0   C: 03272 0   I: 41405 0
22,2620     C: 00001 0   I: 62415 0   C: 00007 0   I: 77604 0   C: 31765 1   C: 16226 0   I: 62421 1   I: 77604 0
22,2630     C: 31765 1   C: 16236 1   C: 03272 0   I: 41205 0   C: 03274 0   C: 00005 1   I: 65352 0   C: 03270 1

22,2640     I: 41405 0   C: 00001 0   I: 62415 0   C: 00007 0   I: 77604 0   C: 31765 1   C: 16240 0   I: 62421 1
22,2650     I: 77604 0   C: 31765 1   C: 02234 0   I: 77616 0   I: 67543 1   C: 00007 0   I: 71406 0   I: 41152 1
22,2660     C: 31765 1   C: 00051 0   I: 57543 1   C: 00015 0   I: 67471 1   C: 00051 0   I: 51123 0   C: 00001 0
22,2670     C: 44702 1   I: 57545 1   I: 43244 1   C: 44677 1   C: 06503 1   I: 77650 1   C: 44701 1   I: 77625 0

22,2700     C: 06503 1   I: 77606 1   I: 57543 1   C: 00013 0   I: 67471 1   C: 00051 0   I: 51123 0   C: 00011 1
22,2710     C: 44722 0   I: 57545 1   I: 43244 1   C: 44717 0   C: 06503 1   I: 77650 1   C: 44723 1   I: 52025 1
22,2720     C: 06503 1   C: 44723 1   I: 77745 1   I: 43466 1   I: 77776 1      05571 1   C: 00401 1      12732 1
22,2730        04607 1   C: 40154 0      04607 1   C: 40166 1      34743 0      00004 0      05205 0   C: 03234 1

22,2740     C: 44066 1      15146 0   I: 77776 1      12732 1   I: 77614 1   C: 01074 0   I: 70740 0   C: 01322 0
22,2750     C: 04772 1   I: 45002 1   C: 44527 1   I: 74343 0   C: 04772 1   C: 03270 1   C: 17325 0   C: 03335 1
22,2760     I: 55605 1   C: 05002 0   C: 04772 1   I: 77661 0   C: 20606 0   C: 03333 1   I: 77614 1   C: 01035 0
22,2770     C: 45010 1   C: 00221 0   C: 24255 0   C: 00554 0   C: 02660 0   C: 02660 0   C: 13301 1   C: 16161 0
```

```
OCTAL LISTING FOR PARAGRAPH # 132,  WITH PARITY BIT IN BINARY AT THE RIGHT OF EACH WORD, "@" DENOTES UNUSED FIXED MEMORY

ALL VALID WORDS ARE BASIC INSTRUCTIONS EXCEPT THOSE MARKED "I" (INTERPRETIVE OPERATOR WORDS) OR "C" (CONSTANTS)

22,3000     C: 30707 1   C: 00003 1   C: 04000 0      04607 1   C: 54274 1      10000 0      12730 0      06060 1
22,3010     I: 75160 1   C: 03245 1   C: 02221 1   I: 77624 1   C: 44312 1   I: 45575 1   C: 50515 0   I: 77626 0
22,3020     C: 50523 0   I: 77626 0   C: 74531 0   I: 45160 1   C: 03245 1   C: 44654 0   I: 77634 0   C: 21630 1
22,3030     C: 03303 1   I: 77414 0   C: 01215 0   C: 45122 1      34743 0      55261 1      51261 0      31675 1

22,3040        00006 1      51261 0      21702 1      00006 1      73121 1      10000 0      64744 1      13051 1
22,3050        40000 0      51261 0      55637 0      51261 0      31702 0      51261 0      57675 1      51261 0
22,3060        55634 0      11261 1      13035 0      00003 1      03075 0      13170 0      34744 1      00004 0
22,3070        05205 0   C: 03213 1   C: 44066 1      00003 1      15146 0      00006 1      40025 1      53707 1

22,3100        00006 1      31733 1      21707 1      11706 0      00002 0      13107 0      13117 1      11707 1
22,3110        00002 0      13113 0      40000 0      63166 0      00006 1      63117 0      24002 0      24002 0
22,3120        00002 0   C: 03146 1   I: 77776 1      00006 1      30025 0      21733 0      00006 1      43166 1
22,3130        21733 0      00004 0      34743 0      55700 0      60000 1      55701 1      50000 1      31724 1

22,3140        51700 1      55642 1      00006 1      63145 1      40000 0      00006 1      73167 0      00006 1
22,3150        51701 0      71724 0      00006 1      51700 1      11530 1      51700 1      55274 0      11700 0
22,3160        13133 1      30025 0      63166 0      57705 1      13034 1   C: 00000 1   C: 00144 0   C: 75777 1
22,3170        40025 1      61705 1      10000 0      64744 1      13177 1      64726 0      40000 0      00004 0

22,3200        05205 0   C: 03206 0   C: 44066 1      33166 0      27705 0      15146 0      37735 1      05076 0
22,3210     C: 03003 1   C: 44066 1      05263 0      34746 0      55641 1      55644 1      55276 1      55640 0
22,3220        55643 0      55275 1      30323 0      55636 1      30322 1      55635 1      30321 1      55634 0
22,3230        34746 0      55642 1      55637 0      55274 0      31306 0      54063 0      34746 0      53305 1

22,3240        05107 1      05263 0   C: 20000 0   C: 00000 1      06060 1   I: 52014 0   C: 03712 0   C: 45467 0
22,3250     C: 45251 0   I: 77776 1      34743 0      55050 1      34744 1      55051 0      33320 0      04607 1
22,3260     C: 20323 1      05474 0      03264 1      03256 0      34741 1      05205 0   C: 03432 1   C: 44064 0
22,3270        00003 1      33322 1      54003 0      34746 0      55530 1      35012 1      05076 0   C: 03323 0

22,3300     C: 44064 0      00003 1      36266 0      71530 1      10000 0      03312 1      34770 0      04607 1
22,3310     C: 01736 1      03302 0      33321 1      04607 1   C: 20323 1      05565 1      05565 1      03271 0
22,3320     C: 01014 0   C: 04054 1   C: 02131 0      06060 1   I: 77634 0   C: 21603 1   C: 00041 1   C: 02176 0
22,3330     I: 77776 1      41051 0      64744 1      00006 1      13360 0      06060 1   I: 77624 1   C: 27101 1

22,3340     I: 77775 1   C: 00001 0   C: 26200 1   C: 00007 0   C: 02206 1   I: 77743 1   C: 73774 1   C: 00037 0
22,3350     I: 77743 1   C: 72407 1   C: 02172 1   I: 46135 1   C: 00050 1   C: 45371 0   I: 77650 1   C: 45375 1
22,3360        06060 1   I: 77624 1   C: 27115 1   I: 77650 1   C: 45340 1   C: 00001 0   C: 11530 1   C: 00002 0
22,3370     C: 31230 1   I: 43145 0   C: 06336 1   C: 03635 1   C: 45401 0   I: 51575 1   C: 02021 0   I: 77614 1
```

```
OCTAL LISTING FOR PARAGRAPH # 133,  WITH PARITY BIT IN BINARY AT THE RIGHT OF EACH WORD, "@" DENOTES UNUSED FIXED MEMORY

ALL VALID WORDS ARE BASIC INSTRUCTIONS EXCEPT THOSE MARKED "I" (INTERPRETIVE OPERATOR WORDS) OR "C" (CONSTANTS)

22,3400     C: 03475 1   C: 36174 0   C: 45553 0   I: 45234 0   C: 21603 1   C: 02176 0   C: 02176 0   I: 53145 1
22,3410     C: 02134 0   C: 45422 1   I: 43345 1   C: 02134 0   C: 02176 0   C: 02134 0   I: 77776 1      34744 1
22,3420        55530 1      05146 1   I: 43345 1   C: 02132 0   C: 02176 0   C: 02132 0   I: 77776 1      34743 0
22,3430        55530 1      05146 1      34740 0      71043 0      10000 0      03443 1      37734 0      05063 1

22,3440     C: 05474 0   C: 04062 1      05263 0      34770 0      05205 0   C: 03432 1   C: 44064 0      36266 0
22,3450        71530 1      50000 1      03453 0      05263 0      03462 1      34770 0      54001 1      34746 0
22,3460        21532 0      05263 0      34770 0      54001 1      34746 0      21534 0      05263 0   I: 77776 1
22,3470        35012 1      05076 0   C: 03505 1   C: 44064 0      00003 1      10067 1      05113 1      33321 1

22,3500        04607 1   C: 20323 1      05565 1      05565 1      03477 0      06060 1   I: 52175 0   C: 01220 0
22,3510     C: 45511 0   C: 26200 1   C: 01226 0   C: 02206 1   I: 52014 0   C: 04304 1   C: 45520 1   C: 45531 1
22,3520     I: 71214 0   C: 03475 1   C: 04001 1   C: 14037 0   C: 05366 1   C: 26172 1   C: 02021 0   I: 52046 1
22,3530     C: 45540 1   I: 71214 0   C: 03675 0   C: 04003 0   C: 14037 0   C: 05370 0   C: 16172 1   C: 06336 1

22,3540     C: 36174 0   C: 45553 0   I: 77776 1      34740 0      71043 0      00006 1      15474 1      34770 0
22,3550        04607 1   C: 01736 1      03505 1   I: 44001 0   C: 00001 0   C: 00051 0   I: 77214 0   C: 03755 0
22,3560     C: 45567 1   C: 02200 1   I: 77752 1   C: 26200 1   C: 02206 1   I: 77752 1   C: 02206 1   I: 77624 1
22,3570     C: 57364 1   I: 77624 1   C: 57432 0   I: 77625 0   C: 02174 1   I: 64414 1   C: 03755 0   C: 45600 0

22,3600     I: 77624 1   C: 45640 1   C: 16113 0   C: 00017 1   I: 77625 0   C: 02174 1   C: 00161 1   I: 64414 1
22,3610     C: 03755 0   C: 45612 0   I: 77624 1   C: 45640 1   C: 16115 0   C: 00161 1   I: 51025 1   C: 02172 1
22,3620     C: 45624 0   I: 52145 0   C: 06505 1   C: 45630 0   I: 45145 0   C: 00017 1   C: 57470 0   I: 77676 0
22,3630     C: 16134 0   C: 02172 1   I: 45015 1   C: 02174 1   C: 57473 0   I: 77676 0   C: 36132 1   C: 00051 0

22,3640     I: 51025 1   C: 05650 1   C: 45645 1   I: 43415 0   C: 05650 1   I: 43545 1   C: 05650 1   C: 01065 0
22,3650     C: 05603 1   C: 00021 1   C: 14161 1   C: 01440 0   C: 00000 1   C: 14000 1   C: 00000 1   C: 30000 1
22,3660     C: 00000 1   C: 77534 0   C: 45074 0      31234 0      55074 1      05506 1   C: 00036 1      04607 1
22,3670     C: 17275 1      44734 1      00006 1      03011 1      05331 0   C: 00005 1   C: 05022 1   C: 20000 0

22,3700        06060 1   I: 77614 1   C: 03664 0   I: 45014 0   C: 03267 1   C: 27522 1   I: 77414 0   C: 03671 1
22,3710        04626 1   C: 10144 1   I: 51575 1   C: 02643 1   C: 24045 0   C: 02651 1   I: 41446 1   I: 50025 0
22,3720     C: 00045 0   C: 45724 1   I: 45545 1   C: 77732 1   I: 51575 1   C: 02657 1   I: 45206 1   C: 00045 0
22,3730     I: 71240 1   C: 45734 0   I: 77626 0   C: 77732 1   I: 66145 1   C: 00045 0   C: 00044 1   I: 62101 0

22,3740     C: 00047 1   C: 00002 0   I: 53775 1   C: 02643 1   C: 20201 0   C: 26643 1   C: 02651 1   I: 77657 0
22,3750     C: 20201 0   C: 26651 1   C: 02657 1   I: 66057 0   C: 20201 0   C: 00045 0   C: 02657 1   I: 54150 1
22,3760     C: 02102 0   C: 00045 0   I: 77660 1   C: 00045 0   I: 70130 1   C: 02102 0   C: 00045 0   I: 40270 0
22,3770     C: 00044 1   C: 00003 1   I: 77650 1   C: 46652 1   C: 03774 0   C: 03775 1 CKSM 06555 1        @
```

```
OCTAL LISTING FOR PARAGRAPH # 134,  WITH PARITY BIT IN BINARY AT THE RIGHT OF EACH WORD, "@" DENOTES UNUSED FIXED MEMORY

ALL VALID WORDS ARE BASIC INSTRUCTIONS EXCEPT THOSE MARKED "I" (INTERPRETIVE OPERATOR WORDS) OR "C" (CONSTANTS)

23,2000        04636 0     55112 0     34743 0     55051 0     36263 0     55050 1     32037 1     04607 1
23,2010     C: 20345 1     15474 1     12017 1     12006 1     34742 1     05466 0     05146 1     31051 1
23,2020        74743 1     10000 0     12026 0     05506 1  C: 00012 1     12034 0     05520 0  C: 00012 1
23,2030        05506 1  C: 00264 1     05506 1  C: 00126 1     00003 1     31112 1     14631 0  C: 01014 0

23,2040     C: 77757 1  I: 47135 0  C: 03753 0  C: 21606 1  I: 41401 1  C: 00001 0  I: 57556 0  C: 14043 0
23,2050     I: 41546 0  I: 47135 0  C: 03754 1  C: 21606 1  I: 71406 0  I: 72405 0  C: 00001 0  C: 14045 0
23,2060     I: 41356 1  I: 77752 1  C: 24041 1  C: 00041 1  I: 77616 0  C: 14025 0  C: 00155 0  I: 40234 0
23,2070     C: 21606 1  C: 00001 0  I: 73406 1  I: 77676 0  C: 14043 0  I: 41546 0  I: 47135 0  C: 00026 0

23,2100     C: 21606 1  I: 77650 1  C: 46054 1     35001 0     04607 1  C: 20471 1     15474 1     12111 0
23,2110        12103 0     05506 1  C: 00124 0     04607 1  C: 54125 0     15474 1     04636 0     55142 0
23,2120        05506 1  C: 00024 1     02152 0     04636 0     55142 0     05520 0  C: 00024 1     34727 1
23,2130        55073 0     05355 1  C: 04022 0     34741 1     00006 1     02033 0     10000 0     12152 1

23,2140        04607 1  C: 53072 1     04607 1  C: 17733 0     12145 1     04607 1  C: 53074 1     04607 1
23,2150     C: 17733 0     12152 1     34740 0     70075 1     00006 1     12312 1     06060 1  I: 77775 1
23,2160     C: 06477 0  C: 03765 0  I: 43234 0  C: 21603 1  C: 15712 1  C: 34041 0  C: 51337 1  I: 77775 1
23,2170     C: 01101 0  C: 03773 1  I: 45034 1  C: 46320 1  C: 56032 0  C: 00322 1  I: 77776 1     34740 0

23,2200        70075 1     00006 1     12312 1     04607 1  C: 54267 0     10000 0     02300 0     06060 1
23,2210     I: 45175 0  C: 01101 0  C: 47640 0  I: 45345 1  C: 00162 1  C: 06316 0  I: 77440 1  C: 46234 0
23,2220        35006 1     54003 0     00004 0     00006 1     30322 1     53635 1     30323 0     55636 1
23,2230        00003 1     35007 0     54003 0     02257 0  I: 77776 1     00004 0     04665 0  C: 40154 0

23,2240        04665 0  C: 40141 1     05520 0  C: 00124 0     05506 1  C: 00114 0     04607 1  C: 54125 0
23,2250        00004 0     04665 0  C: 40115 0     05355 1  C: 04022 0     05520 0  C: 00114 0     30075 0
23,2260        74733 0     10000 0     02303 0     11745 1     02266 1     02303 0     55745 1     32317 0
23,2270        05175 1  C: 02273 0     05146 1     37735 1     05076 0  C: 02131 0  C: 46067 1     05263 0

23,2300        04607 1  C: 54300 0     02257 0     31142 1     14631 0     32314 0     70074 0     00006 1
23,2310        15146 0     02257 0     04626 1  C: 50310 0  C: 00500 1  C: 17350 1  C: 34602 1  C: 01130 1
23,2320        00004 0     35006 1     56003 1     54070 1     31634 1     54154 0     00006 1     31636 0
23,2330        52156 1     30070 0     54003 0     00003 1     16520 1  C: 00302 0  C: 17755 0  I: 53754 1

23,2340     C: 02777 1  C: 57176 0  C: 26744 1  I: 53750 0  C: 02776 0  C: 57176 0  C: 02655 0  I: 45020 1
23,2350     C: 03463 0  C: 46365 0  C: 37671 0  C: 25704 0  I: 41401 1  C: 00003 1  I: 65225 1  C: 03671 1
23,2360     C: 00001 0  I: 45206 1  C: 03671 1  I: 52006 0  C: 03463 0  I: 41545 0  C: 06336 1  I: 63130 0
23,2370     C: 00047 1  C: 00002 0  I: 46135 1  C: 00050 1  C: 46400 1  I: 51575 1  C: 02021 0  I: 77725 1
```

OCTAL LISTING FOR PARAGRAPH # 135, WITH PARITY BIT IN BINARY AT THE RIGHT OF EACH WORD, "@" DENOTES UNUSED FIXED MEMORY

ALL VALID WORDS ARE BASIC INSTRUCTIONS EXCEPT THOSE MARKED "I" (INTERPRETIVE OPERATOR WORDS) OR "C" (CONSTANTS)

```
23,2400      I: 43545 1    I: 77620 0    C: 03463 0    C: 37574 0    C: 27115 1    I: 77624 1    C: 46417 1    I: 77745 1
23,2410      C: 03574 1    C: 34041 0    C: 27101 1    I: 77624 1    C: 46427 1    I: 77650 1    C: 03463 0    I: 43175 0
23,2420      C: 00001 0    C: 01352 1    C: 46433 1    C: 27536 1    C: 00007 0    C: 03544 1    I: 77616 0    I: 43175 0
23,2430      C: 00001 0    C: 01352 1    C: 46423 0    C: 27552 0    C: 00007 0    C: 03560 1    I: 77616 0    I: 53754 1

23,2440      C: 02777 1    C: 57176 0    I: 63350 1    C: 02776 0    I: 63257 1    C: 57176 0    I: 77616 0    I: 53754 1
23,2450      C: 02777 1    C: 57576 1    I: 77616 0    I: 77614 1    C: 06466 0    I: 74345 0    C: 02346 1    C: 02274 1
23,2460      I: 74325 0    C: 02352 1    C: 02606 0    I: 53455 0    I: 45325 1    C: 03474 0    C: 06473 1    I: 52044 0
23,2470      C: 60774 0    C: 71451 1    C: 00017 1    C: 23305 0    C: 10000 0    C: 00000 1    C: 00000 1    C: 00000 1

23,2500      C: 00000 1    C: 00000 1    C: 20000 0    C: 00000 1    C: 00000 1    C: 00000 1    C: 00000 1    C: 00000 1
23,2510      C: 00000 1    C: 00000 1    C: 37777 1    C: 37777 1    I: 77620 0    C: 02767 0    I: 66370 0    C: 00066 1
23,2520      C: 00051 0    C: 00022 1    I: 66374 1    C: 00022 1    C: 00052 0    C: 00006 1    I: 63775 1    C: 03525 0
23,2530      C: 02467 0    C: 12665 1    I: 77775 1    C: 03533 1    I: 52717 1    C: 02555 0    C: 75112 1    C: 12665 1

23,2540      I: 77775 1    C: 03541 1    I: 52717 1    C: 02643 1    C: 75112 1    C: 12665 1    I: 77700 0    C: 46550 0
23,2550      I: 43104 0    C: 46526 1    C: 02706 1    C: 46557 1    I: 77775 1    C: 06505 1    C: 02657 1    I: 77201 1
23,2560      C: 00001 0    C: 02643 1    I: 47036 1    C: 21643 0    I: 47515 0    C: 02651 1    I: 76234 0    C: 21643 0
23,2570      I: 47515 0    C: 02657 1    I: 76234 0    C: 21643 0    I: 77171 0    C: 02707 0    C: 00000 1    C: 02665 0

23,2600      I: 40151 0    C: 02707 0    C: 46603 0    C: 02670 1    I: 77654 0    C: 46614 0    I: 40112 1    C: 46614 0
23,2610      C: 02670 1    I: 52114 1    C: 00001 0    C: 46606 0    I: 61551 1    C: 02665 0    I: 75405 1    C: 02670 1
23,2620      I: 76257 0    C: 57576 1    C: 02665 0    I: 63101 1    C: 00050 1    C: 77775 1    I: 77134 1    C: 02102 0
23,2630      C: 00242 0    I: 40265 1    C: 06475 1    C: 00001 0    C: 03500 1    I: 60351 0    C: 02665 0    C: 00047 1

23,2640      I: 65345 0    C: 00155 0    C: 03547 1    I: 77701 1    C: 00051 0    I: 70460 1    C: 00050 1    I: 41471 0
23,2650      I: 77650 1    C: 45712 1    I: 77731 1    C: 00052 0    C: 00066 1    I: 60775 1    C: 02643 1    C: 75134 0
23,2660      I: 77206 0    C: 02651 1    I: 53303 1    C: 75112 1    I: 77206 0    C: 02657 1    I: 53303 1    C: 75070 1
23,2670      I: 61006 0    C: 46655 0    I: 45575 1    C: 74260 0    I: 45575 1    C: 74266 0    I: 45575 1    C: 74274 0

23,2700      I: 77214 0    C: 02706 1    C: 46705 1    C: 06505 1    C: 03517 1    I: 66374 1    C: 00022 1    C: 00052 0
23,2710      C: 00006 1    I: 77773 1    C: 74252 1    I: 53761 1    C: 00001 0    C: 20201 0    C: 12707 1    I: 77304 0
23,2720      C: 46711 1    C: 02673 1    I: 77732 1    C: 02673 1    I: 77650 1    C: 02767 0    I: 45020 1    C: 02767 0
23,2730      C: 27447 0    I: 74375 0    C: 03503 1    C: 03500 1    C: 26713 0    C: 03511 1    I: 77761 1    C: 03500 1

23,2740      C: 26721 1    C: 03517 1    I: 77761 1    C: 03500 1    C: 02727 1    I: 77776 1       33227 0       55315 0
23,2750         55316 0       34746 0       55317 1       55320 0       05355 1    C: 04022 0       05506 1    C: 00236 0
23,2760         31316 1       55315 0       31320 1       55317 1       06060 1    I: 73150 1    C: 01315 1    C: 01317 0
23,2770      I: 70731 0    C: 00051 0    C: 00006 1    C: 75134 0    I: 60276 1    C: 00052 0    I: 65161 1    C: 02713 0
```

```
OCTAL LISTING FOR PARAGRAPH # 136,  WITH PARITY BIT IN BINARY AT THE RIGHT OF EACH WORD, "@" DENOTES UNUSED FIXED MEMORY

ALL VALID WORDS ARE BASIC INSTRUCTIONS EXCEPT THOSE MARKED "I" (INTERPRETIVE OPERATOR WORDS) OR "C" (CONSTANTS)

23,3000      C: 00051 0    I: 57144 1    C: 00047 1    C: 02102 0    I: 65057 0    C: 57576 1    C: 00051 0    I: 77653 1
23,3010      C: 02467 0    C: 02735 1    I: 57543 1    C: 75134 0    I: 74301 0    C: 00052 0    C: 02721 1    I: 71124 0
23,3020      C: 00051 0    C: 00047 1    I: 53674 1    C: 02102 0    C: 57576 1    I: 52724 1    C: 00051 0    C: 02555 0
23,3030      C: 02743 0    I: 77614 1    C: 02746 0    C: 47053 1    I: 57543 1    C: 75134 0    I: 74301 0    C: 00052 0

23,3040      C: 02727 1    I: 71124 0    C: 00051 0    C: 00047 1    I: 53674 1    C: 02102 0    C: 57576 1    I: 52724 1
23,3050      C: 00051 0    C: 02643 1    C: 02751 0    I: 77624 1    C: 51770 0    I: 77776 1       31315 1       63230 0
23,3060         55316 0       31317 0       67767 0       55320 0       06060 1    I: 66350 1    C: 01315 1    C: 00051 0
23,3070      C: 00006 1    I: 77775 1    C: 02735 1    C: 06467 1    I: 77775 1    C: 02743 0    C: 06555 1    I: 77214 0

23,3100      C: 02746 0    C: 47111 0    C: 02751 0    C: 06643 0    I: 52100 1    C: 47107 1    C: 47117 0    I: 77634 0
23,3110      C: 46754 0    I: 43335 0    C: 01321 0    C: 07232 0    I: 52030 0    C: 47117 0    C: 47104 1    I: 77624 1
23,3120      C: 51770 0    I: 53375 0    C: 01701 0    C: 02701 0    C: 03472 0    I: 47014 1    C: 00707 1    C: 47217 0
23,3130      C: 27026 0    I: 77004 0    C: 57756 1    C: 00000 1    I: 77014 1    C: 04344 0    C: 47140 1    C: 00002 0

23,3140      I: 53775 1    C: 02665 0    C: 57205 1    I: 40055 0    C: 01521 0    C: 47157 1    C: 25521 0    C: 02673 1
23,3150      I: 53257 1    C: 57202 0    C: 01527 0    I: 77600 1    C: 47163 0    C: 35527 1    C: 47172 0    I: 53375 0
23,3160      C: 01535 0    C: 02665 0    C: 01535 0    I: 53375 0    C: 01543 1    C: 02673 1    C: 01543 1    I: 45134 0
23,3170      C: 02030 0    C: 27720 1    I: 77624 1    C: 51770 0    I: 47014 1    C: 00707 1    C: 47222 0    C: 27005 1

23,3200      I: 77624 1    C: 26070 1    I: 77624 1    C: 51770 0    I: 77214 0    C: 02746 0    C: 47211 0    C: 03472 0
23,3210      C: 01701 0    I: 66150 0    C: 02767 0    C: 00052 0    I: 77776 1       04626 1    C: 27460 0    I: 52034 1
23,3220      C: 26761 0    C: 47131 1    I: 45034 1    C: 26732 0    C: 26114 1    I: 77650 1    C: 47202 1    C: 00066 1
23,3230      C: 77771 0    C: 00014 1    I: 71220 1    C: 00051 0    C: 02665 0    I: 65325 0    C: 06505 1    C: 02671 0

23,3240      I: 55476 1    I: 77656 1    C: 14027 1    C: 00027 1    I: 77742 0    C: 14023 0    C: 00033 1    I: 77742 0
23,3250      C: 34021 0    C: 47303 1    C: 16742 1    C: 02667 1    I: 77742 0    C: 14023 0    C: 00027 1    I: 65205 0
23,3260      C: 02671 0    C: 00033 1    I: 45205 1    C: 02665 0    I: 77626 0    C: 43756 1    C: 47303 1    C: 26744 1
23,3270      C: 00027 1    I: 77641 1    C: 02701 0    C: 24021 1    C: 00027 1    I: 77641 1    C: 02673 1    C: 34023 1

23,3300      C: 47303 1    C: 36740 1    C: 00051 0    I: 51545 1    C: 00023 0    I: 50025 0    C: 07517 0    C: 47316 0
23,3310      I: 72545 0    C: 00021 1    I: 75326 1    C: 00023 0    C: 00025 0    I: 77616 0    I: 72545 0    C: 00023 0
23,3320      I: 77736 0    C: 14025 0    C: 00021 1    I: 77640 0    C: 47327 1    I: 43545 1    C: 00025 0    I: 75345 1
23,3330      C: 06503 1    C: 00023 0    I: 77625 0    C: 00025 0    C: 00025 0    I: 77616 0    I: 77601 0    C: 00001 0

23,3340      I: 47375 0    C: 02665 0    C: 02651 1    I: 41456 0    I: 44041 1    C: 02701 0    C: 00051 0    C: 24021 1
23,3350      C: 00001 0    I: 77641 1    C: 02673 1    C: 34023 1    C: 47303 1    C: 26740 0    C: 00001 0    I: 50235 0
23,3360      C: 02665 0    C: 02651 1    I: 77752 1    C: 24021 1    C: 02651 1    I: 77641 1    C: 02665 0    C: 34023 1
23,3370      C: 47303 1    C: 02744 1    I: 45246 0    C: 07521 0    I: 77644 1    C: 47414 0    I: 50375 0    C: 02657 1
```

```
OCTAL LISTING FOR PARAGRAPH # 137,  WITH PARITY BIT IN BINARY AT THE RIGHT OF EACH WORD, "@" DENOTES UNUSED FIXED MEMORY

ALL VALID WORDS ARE BASIC INSTRUCTIONS EXCEPT THOSE MARKED "I" (INTERPRETIVE OPERATOR WORDS) OR "C" (CONSTANTS)

23,3400    C: 00001 0   C: 24021 1   C: 02643 1   I: 45441 1   C: 43754 0   C: 47303 1   C: 26742 1   C: 02740 0
23,3410    I: 77634 0   C: 21630 1   C: 34322 0   C: 00051 0   I: 77776 1      05571 1   C: 00401 1      05506 1
23,3420    C: 00056 1      06060 1   I: 77650 1   C: 47376 0   I: 66370 0   C: 02714 1   C: 00051 0   C: 02700 1
23,3430    I: 77601 0   C: 00001 0   I: 46773 0   C: 02723 0   C: 02731 0   I: 77656 1   C: 06731 1   I: 77773 1

23,3440    C: 02723 0   I: 76433 1   C: 02731 0   C: 06737 1   I: 77700 0   C: 47432 1   I: 66160 0   C: 00006 1
23,3450    C: 00036 1   I: 65370 0   C: 00022 1   C: 00051 0   C: 00006 1   I: 66374 1   C: 00006 1   C: 00052 0
23,3460    C: 00002 0   I: 76720 0   C: 00036 1   C: 00001 0   I: 62757 0   C: 75062 1   C: 00007 0   I: 77757 1
23,3470    C: 75054 1   C: 30031 0   C: 00015 0   I: 53357 0   C: 75046 1   I: 76455 1   C: 00031 0   I: 53520 0

23,3500    C: 00036 1   C: 06707 1   I: 77700 0   C: 47504 0   I: 77704 1   C: 47461 1   I: 77775 1   C: 02665 0
23,3510    C: 26707 0   C: 02673 1   C: 26715 0   C: 02701 0   C: 02723 0   I: 77616 0   C: 05520 0   C: 26075 1
23,3520    C: 05252 1   C: 25253 1   I: 77776 1      03532 0      06060 1   I: 77616 0   I: 77776 1      03540 0
23,3530       06060 1   I: 77616 0      30032 0      54771 1      30033 1      54765 1      30034 0      54767 0

23,3540       00006 1      22142 0      34742 1      76263 1      54143 0      50143 1      30765 0      52155 1
23,3550       52127 1      04704 0   C: 21606 1      00006 1      30155 0      50143 1      52766 1      04704 0
23,3560    C: 01517 0      52155 1      50143 1      52744 1      00006 1      50143 1      30766 0      04704 0
23,3570    C: 01531 1      52127 1      52155 1      50143 1      52736 1      10143 0      13543 1      00142 0

23,3600       00004 0      30032 0      54771 1      30033 1      54765 1      30034 0      54767 0      00004 0
23,3610       00006 1      22061 0      34742 1      76263 1      54062 1      50062 0      30765 0      05024 1
23,3620       00006 1      74727 0      50062 0      52736 1      50062 0      30765 0      05023 0      00006 1
23,3630       74727 0      50062 0      52744 1      10062 1      13613 1      30061 0      00003 1      00000 1

23,3640    I: 77776 1      03532 0      13645 1   I: 77776 1      03540 0      07553 0      46266 1      03667 0
23,3650       06060 1   I: 43575 1   C: 00123 1   I: 77776 1      03532 0      13660 0   I: 77776 1      03540 0
23,3660       07553 0      36266 0      13647 0   I: 77776 1      13645 1   I: 77776 1      13660 0      54142 1
23,3670       00006 1      22145 1      10142 1      40142 1      66266 0      00006 1      50000 1      33756 0

23,3700       52144 1      34744 1      54130 1      00006 1      50143 1      40123 0      13710 0      52131 0
23,3710       52155 1      33754 1      60143 1      54116 0      07130 1      10142 1      52155 1      13722 1
23,3720       00006 1      40155 1      52160 1      36263 0      26116 0      00006 1      50130 0      50143 1
23,3730       30123 1      52155 1      07130 1      52155 1      20160 1      52160 1      20001 1      50130 0

23,3740       50143 1      52123 0      52131 0      10000 0      13707 0      00006 1      26142 1      10142 1
23,3750       13672 0      00145 1      13672 0      00145 1   C: 00735 0   C: 00004 0   C: 00002 0   C: 00000 1
23,3760    C: 00004 0   C: 03761 1   C: 03762 1 CKSM 41037 0         @            @            @            @
23,3770          @            @            @            @            @            @            @            @
```

```
OCTAL LISTING FOR PARAGRAPH # 140,  WITH PARITY BIT IN BINARY AT THE RIGHT OF EACH WORD, "@" DENOTES UNUSED FIXED MEMORY

ALL VALID WORDS ARE BASIC INSTRUCTIONS EXCEPT THOSE MARKED "I" (INTERPRETIVE OPERATOR WORDS) OR "C" (CONSTANTS)

24,2000          05331 0   C: 00004 0   C: 05022 1   C: 26000 0      02751 0      02007 1      02036 0      05506 1
24,2010       C: 00026 0      34744 1      55144 0      34354 1      04607 1   C: 20645 1      06001 0      02021 0
24,2020          02013 1      44744 0      61144 1      00006 1      12040 0      32367 1      04607 1   C: 20471 1
24,2030          06001 0      02033 0      02025 1      06060 1   I: 77650 1   C: 64213 0      05520 0   C: 00026 0

24,2040          04607 1   C: 33757 1      05506 1   C: 00027 1      05506 1   C: 00031 0      05506 1   C: 00010 0
24,2050          05520 0   C: 00037 0      05520 0   C: 00040 0      05520 0   C: 00063 1      05520 0   C: 00126 1
24,2060          05520 0   C: 00041 1      06032 0      05506 1   C: 00005 1      05355 1   C: 04022 0      34746 0
24,2070          55462 1      06060 1   I: 77634 0   C: 21603 1   C: 34041 0   C: 51337 1   I: 77624 1   C: 53626 0

24,2100       I: 77776 1      50154 1      02103 1      02167 0      06060 1   I: 53575 0   C: 00025 0   I: 72441 0
24,2110       C: 00017 1   C: 16216 0   C: 00045 0   I: 51025 1   C: 10372 0   C: 50142 0   I: 77745 1   C: 00045 0
24,2120       C: 16214 1   C: 06505 1   C: 02220 0   I: 43014 0   C: 00345 0   C: 50155 0   C: 04347 0   C: 50147 0
24,2130       I: 51145 0   C: 02216 0   C: 50145 1   I: 77776 1      05355 1   C: 04022 0      32373 1      04607 1

24,2140       C: 20444 1      02156 1   I: 52145 0   C: 10372 0   C: 50120 1   I: 77776 1      06043 0   I: 77776 1
24,2150          05355 1   C: 04022 0      05571 1   C: 00526 0      02156 1   I: 77776 1      05520 0   C: 00005 1
24,2160          32370 1      04607 1   C: 01736 1      02071 0      04607 1   C: 20451 0      02175 0      05355 1
24,2170       C: 04022 0      02751 0      02164 0      04607 1   C: 46116 0      05355 1   C: 05022 1   C: 10000 0

24,2200          37735 1      05137 1      30075 0      74740 1      00006 1      12310 0      34743 0      00006 1
24,2210          02033 0      00006 1      12246 1      46007 1      61010 1      00006 1      12231 1      67767 0
24,2220          00006 1      12231 1      32365 0      04607 1   C: 21572 1      06043 0      02175 0      02175 0
24,2230          05146 1      32364 1      04607 1   C: 20635 0      06043 0      02175 0      02751 0      02244 1

24,2240          03220 1      05506 1   C: 00040 0      02175 0      04355 0      02175 0      40110 0      74730 0
24,2250          00006 1      12263 0      34346 1      70076 1      00006 1      12267 1      05520 0   C: 00037 0
24,2260          05520 0   C: 00040 0      02310 1      32362 1      04607 1   C: 01736 1      02246 0      06060 1
24,2270       I: 77634 0   C: 21603 1   C: 34041 0   C: 50374 1   I: 77776 1      05355 1   C: 04022 0      30074 1

24,2300          74736 0      00006 1      15146 0      30075 0      74740 1      00006 1      12342 1      02756 1
24,2310          32362 1      05175 1   C: 02322 0      30075 0      74740 1      00006 1      15146 0      05355 1
24,2320       C: 40072 0      05146 1      30074 1      74736 0      00006 1      15263 1      30075 0      74740 1
24,2330          00006 1      12337 0      37735 1      05076 0   C: 02713 0   C: 50067 0      05263 0      05223 1

24,2340       C: 02734 0      02322 0      32750 1      05175 1   C: 02346 1      05146 1      30075 0      74740 1
24,2350          10000 0      12355 1      05223 1   C: 02734 0      02346 1      37735 1      05076 0   C: 02267 0
24,2360       C: 50067 0      05263 0   C: 00372 1   C: 00526 0   C: 00201 1   C: 00514 1   C: 00074 1   C: 01441 1
24,2370       C: 00764 1   C: 00070 0   C: 20447 1   C: 04066 0   I: 45020 1   C: 01755 1   C: 27447 0   I: 77624 1
```

```
OCTAL LISTING FOR PARAGRAPH # 141,  WITH PARITY BIT IN BINARY AT THE RIGHT OF EACH WORD, "@" DENOTES UNUSED FIXED MEMORY

ALL VALID WORDS ARE BASIC INSTRUCTIONS EXCEPT THOSE MARKED "I" (INTERPRETIVE OPERATOR WORDS) OR "C" (CONSTANTS)

24,2400     C: 26702 0    I: 43014 0    C: 02756 1    C: 50414 0    C: 01476 0    I: 43014 0    C: 04307 1    C: 50411 0
24,2410     C: 01475 0    I: 77614 1    C: 00747 0    C: 50446 1    I: 77614 1    C: 01474 1    I: 77624 1    C: 27172 0
24,2420     I: 77624 1    C: 51770 0    I: 77624 1    C: 27447 0    I: 43145 0    C: 01571 0    C: 01674 0    I: 77624 1
24,2430     C: 26702 0    C: 34041 0    C: 27172 0    I: 77214 0    C: 04347 0    C: 50274 0    C: 01661 1    I: 77742 0

24,2440     C: 26343 1    C: 01667 1    I: 77742 0    C: 02351 1    I: 77650 1    C: 01755 1    I: 45014 0    C: 01674 0
24,2450     C: 27172 0    I: 77624 1    C: 51770 0    I: 77624 1    C: 27447 0    I: 71214 0    C: 01474 1    C: 01643 1
24,2460     I: 77650 1    C: 50427 0       05331 0    C: 00004 0    C: 05022 1    C: 26000 0       04607 1    C: 33757 1
24,2470        05506 1    C: 00031 0       05506 1    C: 00006 1       05520 0    C: 00010 0       05355 1    C: 04022 0

24,2500        34734 0       70074 0       00006 1       15146 0       34740 0       70075 1       00006 1       12515 0
24,2510        34750 1       55745 1       04607 1    C: 46123 0       02476 0       32526 1       05175 1    C: 02521 0
24,2520        05146 1       35015 0       05076 0    C: 02476 0    C: 50067 0       05263 0    C: 13560 0       05355 1
24,2530     C: 04022 0       34736 1       70074 0       00006 1       15146 0       34740 0       70075 1       00006 1

24,2540        12724 0       34727 1       00006 1       02012 0       00006 1       12167 1       34743 0       00006 1
24,2550        02033 0       00006 1       12554 0       02213 0       40110 0       74730 0       00006 1       12713 1
24,2560        05355 1    C: 00152 1       04607 1    C: 64362 1       50154 1       02566 0       02607 1       02275 0
24,2570        32745 0       04607 1    C: 21572 1       06043 0       02577 0       02570 1       05146 1       05355 1

24,2600     C: 04022 0       32746 0       04607 1    C: 20502 1       06043 0       02607 1       02275 0       05355 1
24,2610     C: 04022 0       02751 0       02627 0       30075 0       74740 1       00006 1       12724 0       04607 1
24,2620     C: 51416 0       50154 1       02623 1       02627 0       04607 1    C: 46116 0       02724 1       40075 1
24,2630        74737 1       00006 1       12713 1       30075 0       74736 0       00006 1       12713 1       37735 1

24,2640        55055 1       06060 1    I: 77650 1    C: 54424 1    I: 77776 1       05355 1    C: 04022 0       12706 0
24,2650     I: 77776 1       34746 0       55746 1       05355 1    C: 04022 0       37736 1       05063 1    C: 02726 0
24,2660     C: 50067 0       06060 1    I: 77735 0    C: 03747 0    I: 50054 0    C: 50662 0    C: 50674 1    I: 77650 1
24,2670     C: 03675 0       44743 1       55746 1       05146 1    I: 77776 1       31746 0       64743 0       00006 1

24,2700        12527 1       06060 1    I: 77624 1    C: 51770 0    I: 77650 1    C: 55430 0       25462 0       02751 0
24,2710        02713 0       34747 1       02720 0       04607 1    C: 01735 1       02751 0       02527 0       34743 0
24,2720        55745 1       04607 1    C: 46123 0       02527 0       32750 1       02311 0       32747 1       04607 1
24,2730     C: 20502 1       02671 0       44744 0       55746 1       05146 1       05355 1    C: 00152 1       04607 1

24,2740     C: 53072 1       04607 1    C: 17733 0       02275 0       02527 0    C: 00525 0    C: 01405 1    C: 01461 0
24,2750     C: 02734 0       40104 0       74735 0       10000 0       24002 0       00002 0       44727 0       00006 1
24,2760        03012 1       34727 1       55073 0       02751 0       02771 1       34746 0       55106 0       55107 1
24,2770        03001 0       34731 0       70110 0       10000 0       03011 1       34726 0       55106 0       44727 0
```

```
OCTAL LISTING FOR PARAGRAPH # 142,  WITH PARITY BIT IN BINARY AT THE RIGHT OF EACH WORD, "@" DENOTES UNUSED FIXED MEMORY

ALL VALID WORDS ARE BASIC INSTRUCTIONS EXCEPT THOSE MARKED "I" (INTERPRETIVE OPERATOR WORDS) OR "C" (CONSTANTS)

24,3000        55107 1        05520 0     C: 00012 1        04607 1     C: 52466 1        03006 1        04607 1     C: 17733 0
24,3010        03044 1        05506 1     C: 00041 1        32366 0        55113 1        36266 0        55456 0        06060 1
24,3020     I: 43234 0     C: 21603 1     C: 11206 0     C: 34041 0     C: 51337 1     I: 77776 1        05506 1     C: 00012 1
24,3030        05520 0     C: 00126 1        06060 1     I: 77624 1     C: 52364 1     I: 77776 1        03065 1        02167 0

24,3040        04607 1     C: 17733 0        03044 1        03053 1        33063 1        04607 1     C: 21572 1        06043 0
24,3050        03060 1        02267 0        05146 1        05520 0     C: 00041 1        02751 0        02310 1        03207 1
24,3060        05355 1     C: 04022 0        03271 0     C: 00503 1     C: 00527 1        06032 0        32366 0        55423 1
24,3070        05506 1     C: 00032 0        05520 0     C: 00041 1        06060 1     I: 77634 0     C: 21603 1     I: 77615 0

24,3100     C: 11204 1     C: 03425 1     C: 34041 0     C: 51337 1     I: 77624 1     C: 52364 1     I: 77776 1        03121 0
24,3110        05146 1        06050 1     C: 52564 1        06060 1     I: 43014 0     C: 00753 0     C: 51131 0     C: 00633 1
24,3120     C: 51126 0        11423 1        03124 0        03173 1        55423 1        06060 1     I: 52145 0     C: 03425 1
24,3130     C: 51077 0     I: 77745 1     C: 03425 1     C: 34041 0     C: 50374 1     I: 77776 1        05506 1     C: 00264 1

24,3140        05520 0     C: 00012 1        05506 1     C: 00126 1        04607 1     C: 52466 1        03147 0        06060 1
24,3150     I: 44234 1     C: 21603 1     C: 03425 1     C: 03427 0     I: 77776 1        00006 1        31427 1        05301 0
24,3160     C: 03163 0     C: 50067 0        05146 1        06050 1     C: 52573 1        06027 1        37735 1        05076 0
24,3170     C: 03011 1     C: 50067 0        05263 0        33202 1        04607 1     C: 21572 1        06043 0        06043 0

24,3200        06043 0        05146 1     C: 00530 1     C: 00000 1     C: 01750 1     C: 00000 1     C: 00062 0        05355 1
24,3210     C: 04022 0        33217 0        04607 1     C: 20326 1        06043 0        02310 1        03211 0     C: 14510 0
24,3220        05506 1     C: 00126 1        00004 0        04665 0     C: 40141 1        00003 1        34727 1        00006 1
24,3230        05012 1        33270 1        04607 1     C: 20635 0        03261 1        03237 1        03264 1        00004 0

24,3240        04514 0     C: 00035 1        03251 1        04665 0     C: 40115 0        00003 1        05520 0     C: 00126 1
24,3250        02241 1        00003 1        33267 1        04607 1     C: 21572 1        03261 1        03252 1        03264 1
24,3260        05146 1        05520 0     C: 00126 1        06043 0        04607 1     C: 46116 0        03226 1     C: 00501 0
24,3270     C: 00205 0        05506 1     C: 00037 0        05520 0     C: 00041 1        34746 0        55733 0        55734 1

24,3300        55735 0        05355 1     C: 04022 0        33336 1        04607 1     C: 20477 1        06043 0        03313 0
24,3310        03317 1        04607 1     C: 55441 0        06050 1     C: 55642 1        06027 1        12065 1        05355 1
24,3320     C: 04022 0        06050 1     C: 55642 1        06027 1        34765 1        04607 1     C: 01736 1        02751 0
24,3330        03333 1        04607 1     C: 46116 0        34746 0        55303 1        03301 0     C: 04120 0     I: 43020 1

24,3340     C: 01755 1     C: 01343 1     C: 51346 1     I: 77614 1     C: 04307 1     C: 51356 0     I: 77624 1     C: 27136 0
24,3350     I: 77775 1     C: 00001 0     C: 26343 1     C: 00007 0     C: 16351 1     C: 00015 0     C: 34041 0     C: 27124 0
24,3360     I: 52375 1     C: 00007 0     C: 02351 1     C: 00017 1     I: 76521 0     C: 01732 0     I: 77776 1        06050 1
24,3370     C: 52573 1        06060 1     C: 25757 0     C: 00001 0     I: 43051 1     C: 02343 1     C: 00350 1     C: 51404 0
```

```
OCTAL LISTING FOR PARAGRAPH # 143,  WITH PARITY BIT IN BINARY AT THE RIGHT OF EACH WORD, "@" DENOTES UNUSED FIXED MEMORY

ALL VALID WORDS ARE BASIC INSTRUCTIONS EXCEPT THOSE MARKED "I" (INTERPRETIVE OPERATOR WORDS) OR "C" (CONSTANTS)

24,3400     C: 00025 0     I: 54204 0     C: 57756 1     C: 20212 1     I: 41056 1     C: 50104 1     I: 76521 0     C: 01732 0
24,3410     C: 15101 0     C: 00045 0     C: 01765 1     I: 77614 1     C: 00231 1     C: 01755 1        04636 0        55737 1
24,3420        06060 1     I: 65545 0     C: 03745 1     I: 50025 0     C: 11440 1     C: 51432 0     I: 77776 1        34744 1
24,3430        54154 0        13435 1     I: 77776 1        34746 0        54154 0        31737 0        04631 1     C: 02525 1

24,3440     C: 12525 0        34744 1        55144 0        34743 0        04607 1     C: 20645 1        06001 0        03451 1
24,3450        03443 1        34746 0        55044 1        55045 0        33631 0        04607 1     C: 20471 1        06001 0
24,3460        03462 1        03454 1        06060 1     I: 53145 1     C: 01045 1     C: 51623 1     C: 34041 0     C: 27447 0
24,3470     I: 43014 0     C: 00304 0     C: 51510 1     C: 01674 0     I: 70535 0     C: 01145 0     I: 43030 0     C: 51501 1

24,3500     C: 01474 1     I: 43014 0     C: 01676 1     C: 01673 1     I: 77624 1     C: 27172 0     I: 77650 1     C: 51532 1
24,3510     I: 77775 1     C: 03676 0     C: 25535 0     C: 03704 1     C: 15543 1     C: 03763 0     C: 01517 0     I: 43014 0
24,3520     C: 01676 1     C: 00263 0     I: 53135 0     C: 01163 1     C: 51527 0     I: 77614 1     C: 00063 1     I: 45014 0
24,3530     C: 01673 1     C: 27145 1     I: 77745 1     C: 00015 0     C: 27763 0     C: 00017 1     C: 27676 0     C: 00025 0

24,3540     C: 03704 1     I: 53646 0     C: 57576 1     C: 27712 0     C: 00001 0     I: 50256 0     C: 00007 0     I: 67471 1
24,3550     C: 03712 0     C: 03714 0     I: 67334 1     C: 01162 0     C: 01145 0     I: 46142 1     C: 51561 1     I: 77650 1
24,3560     C: 51564 1     I: 77614 1     C: 04307 1     C: 51566 0     I: 77614 1     C: 00064 0     I: 67214 1     C: 01663 0
24,3570     C: 00050 1     I: 43054 1     C: 51574 0     C: 01463 1     I: 77775 1     C: 00001 0     C: 16032 1     C: 00015 0

24,3600     I: 45014 0     C: 00662 0     C: 25406 1     I: 77605 1     C: 11633 1     C: 03716 1     I: 77776 1        33630 1
24,3610        04607 1     C: 20471 1        06001 0        06001 0        06060 1     I: 43345 1     C: 03763 0     C: 11627 1
24,3620     C: 01045 1     I: 77634 0     C: 51454 0     I: 52034 1     C: 21603 1     C: 51466 1     C: 00003 1     C: 25140 0
24,3630     C: 01453 1     C: 01442 1     C: 00243 1     C: 32703 1     I: 77776 1        05571 1     C: 01407 0        06060 1

24,3640     I: 77624 1     C: 61072 0     I: 77650 1     C: 75615 1     I: 46020 1     C: 00050 1     C: 51666 0     I: 77624 1
24,3650     C: 51674 0     I: 61375 1     C: 02013 1     C: 00025 0     I: 77772 0     I: 51235 1     C: 00001 0     C: 00001 0
24,3660     I: 77721 0     C: 00025 0     I: 40372 0     C: 00001 0     I: 77650 1     C: 00050 1     I: 77624 1     C: 55743 1
24,3670     I: 77624 1     C: 15765 1     I: 77650 1     C: 51655 0     I: 40220 0     C: 00051 0     C: 00011 1     I: 77770 1

24,3700     C: 00005 1     I: 65345 0     C: 14017 1     C: 14011 1     I: 45006 0     C: 51743 0     I: 71406 0     C: 14041 1
24,3710     I: 77756 0     C: 14043 0     C: 14015 0     I: 41525 0     C: 14007 0     I: 45170 0     C: 00004 0     C: 51743 0
24,3720     C: 14027 1     C: 14013 0     I: 41525 0     C: 14005 1     I: 45170 0     C: 00005 1     C: 51743 0     I: 71406 0
24,3730     I: 77606 1     C: 00025 0     I: 76405 1     C: 00041 1     C: 14035 1     I: 76405 1     C: 00043 0     C: 14037 0

24,3740     I: 41556 1     I: 52076 1     C: 53712 0     I: 54345 1     C: 00007 0     C: 20617 0     I: 72371 1     C: 01707 0
24,3750     C: 00155 0     C: 14017 1     C: 00020 0     I: 77605 1     I: 43257 0     C: 20206 1     I: 67206 1     C: 00017 1
24,3760     I: 41261 1     C: 20212 1     C: 00013 0     I: 43257 0     C: 20213 0     I: 77600 1     C: 51767 0     I: 77616 0
24,3770     I: 77420 1     C: 02711 1        05355 1     C: 04022 0        06060 1     I: 77650 1     C: 02711 1  CKSM 70065 0
```

```
OCTAL LISTING FOR PARAGRAPH # 144,  WITH PARITY BIT IN BINARY AT THE RIGHT OF EACH WORD, "@" DENOTES UNUSED FIXED MEMORY

ALL VALID WORDS ARE BASIC INSTRUCTIONS EXCEPT THOSE MARKED "I" (INTERPRETIVE OPERATOR WORDS) OR "C" (CONSTANTS)

25,2000     C: 47777 0   C: 00001 0   C: 01150 1      02040 1      04607 1   C: 17733 0      25566 0      00004 0
25,2010        30101 1      74732 1      10000 0      12030 1      53101 1      51767 0      53572 1      30110 1
25,2020        00006 1      06033 1      74737 1      00006 1      12030 1      05571 1   C: 00522 1      25566 0
25,2030        41767 1      61765 1      00006 1      12036 1      31767 0      64743 0      55767 1      15146 0

25,2040        34744 1      54133 1      51764 0      32045 1      14613 0   C: 53074 1   C: 53072 1   C: 53070 0
25,2050     C: 53066 1   C: 53064 0   C: 53062 0      02062 1      05223 1   C: 00144 0      44744 0      70110 0
25,2060        54110 0      15263 1      00006 1      23312 0      34744 1      00006 1      05012 1      05223 1
25,2070     C: 00002 0      34746 0      54035 0      54036 0      44744 0      00006 1      03012 1      05223 1

25,2100     C: 01750 1      44730 0      70110 0      54110 0      30035 1      04503 0   C: 57777 1      12112 0
25,2110        34746 0      12113 1      34731 0      56110 1      77762 1      26110 0      04555 0      01312 0
25,2120        02147 1      05223 1   C: 00002 0      34731 0      70110 0      10000 0      34726 0      02232 0
25,2130        34731 0      70110 0      10000 0      44727 0      02235 1      44732 1      70110 0      54110 0

25,2140        74733 0      10000 0      12564 0      44743 1      00006 1      03012 1      15263 1      34743 0
25,2150        00006 1      02012 0      10000 0      00002 0      54112 1      54113 0      34743 0      00006 1
25,2160        05012 1      00002 0      34731 0      70110 0      10000 0      34726 0      02232 0      37761 0
25,2170        02235 1      40110 0      74731 1      10000 0      32223 0      62222 1      02232 0      40110 0

25,2200        74731 1      10000 0      34726 0      02232 0      40110 0      74731 1      10000 0      44727 0
25,2210        02235 1      02224 1      44727 0      70110 0      54110 0      34733 1      70110 0      00006 1
25,2220        13616 1      02573 1   C: 67070 1   C: 61615 1      22110 1      34731 0      00006 1      06001 0
25,2230        54110 0      00002 0      55313 0      34746 0      12237 1      55313 0      34744 1      55314 1

25,2240        00006 1      23312 0      12245 1      05223 1   C: 00062 0      40110 0      77731 1      00006 1
25,2250        12135 0      31313 1      00006 1      51314 0      20035 0      54061 1      00006 1      72276 1
25,2260        54001 1      30110 1      74743 1      56061 0      04503 0   C: 77644 1      10061 1      01312 0
25,2270        11314 1      12273 1      56001 0      53352 0      02277 1      12243 1   C: 22715 1      22002 0

25,2300        34744 1      54062 1      50000 1      31351 1      54061 1      04503 0   C: 77177 0      12326 0
25,2310        30061 0      50062 0      56112 0      40000 0      60061 0      64745 0      50062 0      54053 0
25,2320        10062 1      12301 0      35011 1      00006 1      05014 1      00001 0      10061 1      42306 1
25,2330        12332 0      32306 0      54061 1      12311 1      32363 0      70110 0      10000 0      13532 1

25,2340        00004 0      44730 0      70110 0      64730 1      54110 0      34744 1      05205 0   C: 02361 1
25,2350     C: 52067 1      40110 0      74743 1      10000 0      12357 0      05571 1   C: 00510 0      00003 1
25,2360        14622 1      02062 1      13607 1   C: 02001 1   I: 43020 1   C: 01112 1   C: 00271 0   I: 77624 1
25,2370     C: 47522 1   I: 45175 0   C: 01101 0   C: 47663 1   I: 77624 1   C: 26133 1   I: 77776 1      00004 0
```

```
OCTAL LISTING FOR PARAGRAPH # 145,  WITH PARITY BIT IN BINARY AT THE RIGHT OF EACH WORD, "@" DENOTES UNUSED FIXED MEMORY

ALL VALID WORDS ARE BASIC INSTRUCTIONS EXCEPT THOSE MARKED "I" (INTERPRETIVE OPERATOR WORDS) OR "C" (CONSTANTS)

25,2400         04514 0    C: 01106 1       02405 1       25112 1       02423 0       40104 0       74735 0       00006 1
25,2410         12447 0       02452 0       40104 0       74735 0       00006 1       12447 0       30074 1       74736 0
25,2420         10000 0       02462 0       15146 0       25112 1       40110 0       74733 0       26110 0       74732 1
25,2430         10000 0       12437 1       02147 1       34743 0       05205 0    C: 02564 1    C: 52067 1       31303 0

25,2440         00006 1       12443 1       05146 1       00003 1       25112 1       31112 1       14631 0       34746 0
25,2450         55303 1       12443 1       02224 1       04514 0    C: 01110 0       12462 1       02224 1       34727 1
25,2460         26110 0       12403 0       02224 1       25112 1       12447 0    C: 00074 1       04636 0       55112 0
25,2470         05520 0    C: 00041 1       32465 1       55113 1       00004 0       02531 1    C: 01106 1       12514 1

25,2500         00003 1       00006 1       31107 0       53753 0       06060 1    I: 77624 1    C: 46041 0    C: 01101 0
25,2510      I: 77414 0    C: 00071 1       00004 0       12424 0       02224 1       02531 1    C: 01106 1       12524 1
25,2520         02224 1       34727 1       26110 0       12500 1       02224 1       05571 1    C: 00502 0       06027 1
25,2530         05146 1       50002 0       30000 1       24002 0       00006 1       50000 1       30001 0       52062 1

25,2540         22002 0       34731 0       70110 0       10000 0       14541 1       30061 0       04503 0    C: 66161 1
25,2550         00001 0       30062 0       00006 1       62561 1       64553 0       04503 0    C: 64420 0       00001 0
25,2560         04551 1       62563 0       12555 1    C: 03512 1       40110 0       74727 0       10000 0       02573 1
25,2570         02162 0       05223 1    C: 00062 0       34732 0       70110 0       10000 0       12614 1       10110 0

25,2600         12603 1       12603 1       12620 0       40110 0       74733 0       10000 0       13607 1       11113 1
25,2610         12617 1       42625 0       00006 1       03012 1       05520 0    C: 00271 0       13623 1       55113 1
25,2620         37735 1       05076 0    C: 02626 1    C: 52067 1       12571 1    C: 20002 1       00006 1       30036 1
25,2630         53107 1       06060 1    I: 77201 1    C: 00001 0    C: 01101 0    I: 74214 0    C: 00311 1    C: 52651 1

25,2640      C: 01765 1    I: 63372 1    C: 01757 0    I: 53361 0    C: 13061 1    I: 45056 0    C: 47522 1    I: 77624 1
25,2650      C: 47663 1    C: 14041 1    C: 01110 0    I: 41434 1    C: 21606 1    I: 65356 1    I: 41546 0    I: 65205 0
25,2660      C: 00041 1    C: 00045 0    I: 44205 0    C: 00001 0    I: 77626 0    C: 76667 1    I: 47135 0    C: 01107 0
25,2670      C: 21606 1    I: 71406 0    I: 73525 1    I: 41206 0    C: 00003 1    I: 65352 0    C: 00005 1    I: 41325 0

25,2700      C: 00007 0    C: 00001 0    I: 55552 0    I: 77441 0    C: 00041 1       40154 0       00006 1       73055 0
25,2710         55351 0       40110 0       74731 1       00006 1       12717 0       31107 0       12720 1       41107 1
25,2720         00006 1       73055 0       55352 0       06060 1    I: 41345 0    C: 00003 1    C: 00005 1    I: 65352 0
25,2730      I: 65276 1    C: 00001 0    I: 72405 0    C: 00005 1    I: 43066 0    C: 00311 1    C: 52741 1    I: 77624 1

25,2740      C: 47665 1    I: 77441 0    C: 01101 0       00006 1       43057 1       20155 1       10154 0       34746 0
25,2750         12752 1       34744 1       54155 1       10110 0       12757 1       12757 1       13007 1       10155 1
25,2760         12770 1       40074 0       74740 1       10000 0       12775 1       34727 1       00006 1       05012 1
25,2770         34741 1       00006 1       02033 0       10000 0       13007 1       44733 0       70110 0       00004 0
```

```
OCTAL LISTING FOR PARAGRAPH # 146,  WITH PARITY BIT IN BINARY AT THE RIGHT OF EACH WORD, "@" DENOTES UNUSED FIXED MEMORY

ALL VALID WORDS ARE BASIC INSTRUCTIONS EXCEPT THOSE MARKED "I" (INTERPRETIVE OPERATOR WORDS) OR "C" (CONSTANTS)

25,3000        54110 0       05520 0    C: 00041 1       44743 1       00006 1       03012 1       15146 0       30076 0
25,3010        77733 0       00006 1       13031 1       06060 1    I: 74375 0    C: 01101 0    C: 01765 1    I: 41572 1
25,3020     I: 74375 0    C: 01757 0    C: 13061 1    I: 53362 0    I: 77656 1    C: 15101 0    C: 00045 0    C: 01765 1
25,3030     I: 77776 1       00004 0       40110 0       74732 1       10000 0       02277 1       30076 0       74731 1

25,3040        00006 1       15146 0       11456 0       03053 1       06050 1    C: 52573 1       00003 1       10067 1
25,3050        05113 1       04607 1    C: 51015 1       55456 0       05146 1    C: 21122 0    C: 07777 1    C: 33005 1
25,3060     C: 00310 0    C: 00000 1       03076 0    C: 00017 1       03076 0    C: 00016 0       03076 0    C: 00015 0
25,3070        03076 0    C: 00014 1       03076 0    C: 00012 1       03076 0    C: 00011 1       00004 0       50002 0

25,3100        30000 1       03110 1       34742 1       55105 0       00006 1       30025 0       21105 0       12357 0
25,3110        55077 1       34746 0       55110 1       55100 0       55101 1       55104 1       33136 0       00006 1
25,3120        02033 0       55112 0       43136 1       70110 0       54110 0       43063 0       00006 1       03013 0
25,3130        00006 1       22070 0       31077 0       04665 0    C: 36000 1       00070 0    C: 00230 0    C: 00014 1

25,3140     C: 00016 0    C: 00015 0       40107 0       74733 0       00006 1       15263 1       40107 0       74742 0
25,3150        26107 0       51462 0       33137 1       03110 1       36263 0       55110 1       05263 0       00006 1
25,3160        04007 1       54016 1       00006 1       22012 1       34750 1       00006 1       02013 1       55332 0
25,3170        00006 1       13177 1       30046 0       51332 1       55327 1       11077 1       13203 1       55077 1

25,3200        05571 1    C: 00520 0       05272 0       46266 1       61332 1       00006 1       63273 1       40101 0
25,3210        74732 1       00006 1       13253 1       44750 0       61332 1       00006 1       13267 0       34724 1
25,3220        70046 1       62000 0       54064 1       54001 1       30046 0       60000 1       74744 0       54063 0
25,3230        21101 1       34735 1       54061 1       33136 0       00006 1       02033 0       57112 1       70061 1

25,3240        54001 1       30061 0       71112 0       60001 0       10000 0       13256 1       11110 1       13403 1
25,3250        52064 1       53101 1       03651 0       34746 0       55077 1       03614 1       40110 0       70061 1
25,3260        26110 0       11110 1       13403 1       03651 0       34746 0       55077 1       03621 1       34740 0
25,3270        54061 1       34734 0       03316 0       00006 1       31454 0       53272 0       34732 0       70110 0

25,3300        10000 0       13264 0       40110 0       74736 0       10000 0       13264 0       34741 1       54061 1
25,3310        34744 1       71332 0       54002 1       00006 1       13325 1       34742 1       54001 1       30110 1
25,3320        00006 1       06033 1       70001 1       10000 0       03364 0       34724 1       70046 1       54064 1
25,3330        30046 0       60000 1       74744 0       54063 0       10002 1       13342 0       00006 1       42002 0

25,3340        20064 1       13233 1       30110 1       70001 1       00006 1       13233 1       74742 0       00006 1
25,3350        13357 1       52064 1       20001 1       20001 1       20001 1       52064 1       13233 1       00006 1
25,3360        30064 0       20001 1       20001 1       13340 1       30110 1       00006 1       06001 0       54110 0
25,3370        11110 1       13401 0       05506 1    C: 00120 1       33136 0       00006 1       02033 0       55112 0
```

```
OCTAL LISTING FOR PARAGRAPH # 147,  WITH PARITY BIT IN BINARY AT THE RIGHT OF EACH WORD, "@" DENOTES UNUSED FIXED MEMORY

ALL VALID WORDS ARE BASIC INSTRUCTIONS EXCEPT THOSE MARKED "I" (INTERPRETIVE OPERATOR WORDS) OR "C" (CONSTANTS)

25,3400        13264 0      55110 1      13414 1      55110 1      00006 1      13445 0      67766 1      00006 1
25,3410        13425 0      67770 0      00006 1      13423 0      44750 0      00006 1      03013 0      31077 0
25,3420        04665 0   C: 36000 1      05272 0      33063 1      13420 0      52064 1      53655 1      40110 0
25,3430        74740 1      00006 1      13442 1      11674 1      13443 0      40107 0      74741 0      26107 0

25,3440        03651 0      13414 1      34743 0      55674 1      13440 0      40110 0      74735 0      00006 1
25,3450        13506 0      11675 0      13507 1      40107 0      74736 0      26107 0      11462 1      13461 0
25,3460        34743 0      55462 1      53101 1      53653 1      00006 1      31655 0      53777 0      00006 1
25,3470        31561 1      53755 0      00006 1      31156 1      53460 0      31154 0      55461 1      03651 0

25,3500        34746 0      55077 1      44742 0      70107 0      54107 0      05272 0      34743 0      55675 0
25,3510        13456 1      00004 0      40110 0      74737 1      26110 0      34736 1      00006 1      02033 0
25,3520        00006 1      13532 1      34730 1      00006 1      05012 1      33565 1      05205 0   C: 03563 1
25,3530     C: 52067 1      02357 1      34744 1      05205 0   C: 03616 0   C: 52067 1      02357 1      55077 1

25,3540        05223 1   C: 00144 0      34736 1      00006 1      02033 0      00006 1      13555 0      11077 1
25,3550        13537 1      44730 0      00006 1      03012 1      13623 1      34771 1      05226 1      44730 0
25,3560        00006 1      03012 1      13616 1      34742 1      13537 1   C: 01130 1      04607 1   C: 53511 1
25,3570        04607 1   C: 17733 0      03574 1      13605 0      05571 1   C: 00523 0      13605 0      35007 0

25,3600        54003 0      34724 1      55427 0      44727 0      55430 0      04626 1   C: 21062 0      34736 1
25,3610        70110 0      10000 0      13616 1      13623 1      44746 1      54332 1      34743 0      04626 1
25,3620     C: 17704 1      44746 1      54332 1      34743 0      04626 1   C: 17701 1   I: 45345 1   C: 01765 1
25,3630     C: 13641 0   I: 77644 1   C: 53635 1   I: 43535 0   C: 06505 1   I: 43535 0   C: 13640 1   C: 00001 0

25,3640     C: 26467 0   C: 00000 1   I: 71220 1   C: 03675 0   C: 03755 0   C: 34041 0   C: 27172 0   I: 77650 1
25,3650     C: 03675 0      44740 1      60061 0      10000 0      44744 0      13705 1      14561 0      54065 0
25,3660        34740 0      54001 1      34740 0      70110 0      10000 0      13677 0      30107 1      50065 1
25,3670        74744 0      10000 0      14561 0      00006 1      22066 1      04573 1      00066 1      50065 1

25,3700        44744 0      70107 0      54107 0      30001 0      13673 1      54065 0      34742 1      54001 1
25,3710        34735 1      13663 0   C: 14033 1   C: 00027 1   C: 14007 0   I: 76405 1   C: 00041 1   C: 14027 1
25,3720     C: 00011 1   I: 76405 1   C: 00043 0   C: 14031 0   C: 06505 1   I: 57525 1   C: 00043 0   I: 63325 0
25,3730     C: 00041 1   C: 00033 1   I: 63361 0   C: 14003 1   C: 00011 1   I: 53361 0   C: 14001 0   I: 77772 0

25,3740     C: 24041 1   I: 63361 0   C: 14003 1   C: 00033 1   I: 52361 1   C: 14001 0   I: 65372 1   C: 00007 0
25,3750     I: 74346 0   C: 00011 1   I: 73525 1   C: 00007 0   I: 52361 1   C: 00025 0   I: 77772 0   C: 14033 1
25,3760     C: 00007 0   I: 74356 1   I: 71525 0   C: 00007 0   I: 53361 0   C: 00025 0   I: 57572 0   C: 34025 1
25,3770     C: 00051 0   C: 03771 0   C: 03772 0 CKSM 63543 0          @            @            @            @
```

```
OCTAL LISTING FOR PARAGRAPH # 150,  WITH PARITY BIT IN BINARY AT THE RIGHT OF EACH WORD, "@" DENOTES UNUSED FIXED MEMORY

ALL VALID WORDS ARE BASIC INSTRUCTIONS EXCEPT THOSE MARKED "I" (INTERPRETIVE OPERATOR WORDS) OR "C" (CONSTANTS)

26,2000     C: 17775 1    C: 02052 1    C: 00333 1    C: 10374 0    C: 77665 1    C: 42175 1    C: 22211 0    C: 00636 1
26,2010     C: 77777 0    C: 77767 1    C: 34076 1    C: 30363 1    C: 24760 0    C: 00133 0    C: 02052 1    C: 35250 0
26,2020     C: 37116 0    C: 32631 1    C: 30576 0    C: 10326 1       04607 1    C: 33757 1       36266 0       55050 1
26,2030        34744 1       55051 0       32121 1       04607 1    C: 20471 1       05474 0       02040 1       02032 1

26,2040        06060 1    I: 43234 0    C: 21603 1    C: 14124 0    C: 02176 0    C: 34041 0    C: 27124 0    I: 77775 1
26,2050     C: 00001 0    C: 16200 1    C: 02176 0    C: 34041 0    C: 27136 0    I: 52375 1    C: 02200 1    C: 00001 0
26,2060     I: 47121 0    C: 01732 0    C: 21724 0    C: 03773 1    I: 77776 1       41051 0       64744 1       00006 1
26,2070        12115 1       06060 1    I: 77775 1    C: 06503 1    C: 37765 1    C: 56040 0    C: 00322 1    I: 77776 1

26,2100        04607 1    C: 54300 0       32122 1       04607 1    C: 20471 1       05474 0       02110 0       02040 1
26,2110        05520 0    C: 00124 0       04607 1    C: 54125 0       15474 1       06060 1    I: 52175 0    C: 06477 0
26,2120     C: 54074 0    C: 01014 0    C: 01422 1    C: 00000 1    C: 13560 0       04636 0       55163 0       34737 0
26,2130        70101 0       10000 0       12140 1       06060 1    I: 77624 1    C: 56040 0    C: 00322 1    I: 77776 1

26,2140        05506 1    C: 00013 0       05520 0    C: 00000 1       04607 1    C: 54300 0       32266 1       04607 1
26,2150     C: 20722 1       02254 0       02162 0       02207 0       02214 1       05146 1       46266 1       60133 0
26,2160        02221 1       05146 1       34737 0       70101 0       10000 0       12173 1       06060 1    I: 77624 1
26,2170     C: 56040 0    C: 00322 1    I: 77776 1       04607 1    C: 54300 0       02267 0       10000 0       12146 1

26,2200        02214 1       12204 1       32213 0       55054 0       04607 1    C: 42764 1       12146 1       05520 0
26,2210     C: 00124 0       31163 1       04631 1    C: 02204 0       40101 0       74727 0       10000 0       00002 0
26,2220        16760 1       55054 0       30002 0       54156 1       05355 1    C: 00132 1       34736 1       05466 0
26,2230        00156 0       37735 1       05137 1       34740 0       70075 1       10000 0       12251 1       34736 1

26,2240        70074 0       10000 0       02246 0       05355 1    C: 40112 1       05146 1       05355 1    C: 40072 0
26,2250        05146 1       05506 1    C: 00114 0       01054 1       31010 1       00006 1       12207 1       30101 1
26,2260        74727 0       00006 1       16001 1       06043 0    C: 20100 1    C: 00203 0    C: 01422 1       00006 1
26,2270        00030 1       74733 0       10000 0       00002 0       00006 1       00031 0       74727 0       00002 0

26,2300        04636 0       55337 0       30321 1       54771 1       30322 1       54765 1       30323 0       54767 0
26,2310        06060 1    I: 45001 1    C: 00001 0    C: 47526 0    I: 41345 0    C: 00742 0    C: 00746 1    I: 57552 1
26,2320     I: 65336 1    C: 00740 1    C: 14023 0    C: 00746 1    I: 72405 0    C: 00750 0    C: 34021 0    C: 26545 1
26,2330     I: 41325 0    C: 00740 1    C: 00742 0    I: 41512 1    I: 65205 0    C: 00744 0    I: 65205 0    C: 00736 0

26,2340     C: 00750 0    I: 72405 0    C: 00744 0    I: 45425 0    C: 63756 0    C: 00736 0    I: 72405 0    C: 00750 0
26,2350     I: 45415 0    C: 43754 0    C: 26545 1    I: 55525 0    I: 77634 0    C: 21630 1    C: 02336 0    I: 77776 1
26,2360        31337 1       04631 1    I: 47375 0    C: 03254 1    C: 06503 1    I: 47256 0    C: 03765 0    I: 40056 0
26,2370     C: 54404 0    C: 17270 1    C: 00045 0    I: 50025 0    C: 14423 1    C: 54404 0    I: 77775 1    C: 03270 1
```

```
OCTAL LISTING FOR PARAGRAPH # 151,  WITH PARITY BIT IN BINARY AT THE RIGHT OF EACH WORD, "@" DENOTES UNUSED FIXED MEMORY

ALL VALID WORDS ARE BASIC INSTRUCTIONS EXCEPT THOSE MARKED "I" (INTERPRETIVE OPERATOR WORDS) OR "C" (CONSTANTS)

26,2400      C: 17270 1   C: 06503 1   I: 77650 1   C: 56072 1   I: 52175 0   C: 06503 1   C: 54400 1   C: 15555 0
26,2410      C: 35172 0   C: 14113 1   C: 36326 0   C: 07701 0   C: 35703 0   C: 04343 1   C: 21616 0   C: 03070 0
26,2420      C: 34344 0   C: 00000 1   C: 00001 0   C: 00000 1   I: 77624 1   C: 51770 0   I: 43014 0   C: 04307 1
26,2430      C: 55206 0   C: 02466 1   I: 45014 0   C: 00747 0   C: 54466 1   C: 27447 0   I: 45014 0   C: 01674 0

26,2440      C: 26702 0   I: 77624 1   C: 53642 1   I: 77624 1   C: 51770 0   I: 77624 1   C: 27447 0   I: 43014 0
26,2450      C: 01676 1   C: 02756 1   C: 54456 1   I: 43014 0   C: 01476 0   C: 01475 0   I: 43014 0   C: 01474 1
26,2460      C: 01673 1   I: 45014 0   C: 01472 1   C: 53642 1   I: 77650 1   C: 54516 1   I: 77624 1   C: 27447 0
26,2470      I: 45014 0   C: 01474 1   C: 26702 0   I: 77624 1   C: 53642 1   I: 77624 1   C: 51770 0   I: 77624 1

26,2500      C: 27447 0   I: 43014 0   C: 01676 1   C: 02756 1   C: 54510 1   I: 43014 0   C: 01476 0   C: 01475 0
26,2510      I: 43014 0   C: 01673 1   C: 01674 0   I: 45014 0   C: 01472 1   C: 53642 1   I: 45014 0   C: 02716 0
26,2520      C: 54522 0   C: 55250 0   I: 77414 0   C: 04307 1   C: 54532 1      34746 0      55745 1      04607 1
26,2530      C: 46123 0      06060 1   I: 43174 1   C: 00000 1   C: 04304 1   C: 54540 1   I: 77714 0   C: 00002 0

26,2540      I: 45134 0   C: 03720 1   C: 51770 0   I: 66170 1   C: 00001 0   C: 01353 0   I: 54335 0   C: 01773 0
26,2550      C: 20635 0   I: 77634 0   C: 21643 0   C: 00025 0   I: 77624 1   C: 55332 0   I: 57414 1   C: 00707 1
26,2560      C: 54561 1   C: 27525 0   C: 06505 1   C: 03533 1   C: 17541 1   C: 00045 0   I: 44257 1   C: 56174 0
26,2570      C: 03757 1   I: 77657 0   C: 56574 1   C: 17547 1   C: 00045 0   I: 63501 0   C: 00047 1   I: 53605 1

26,2600      C: 01767 0   C: 20577 0   I: 53657 0   C: 20601 1   C: 57176 0   I: 47057 0   C: 57176 0   C: 21643 0
26,2610      C: 02707 0   I: 76276 0   C: 00025 0   I: 72240 1   C: 54617 0   C: 00025 0   C: 02707 0   I: 77624 1
26,2620      C: 55400 0   I: 45131 0   C: 01354 1   C: 00002 0   C: 51770 0   I: 77624 1   C: 55332 0   I: 53725 1
26,2630      C: 00045 0   C: 57202 0   C: 24045 0   I: 57414 1   C: 00707 1   C: 54636 0   I: 77761 1   C: 00045 0

26,2640      C: 27533 1   C: 01653 0   I: 53257 1   C: 57170 0   C: 01667 1   I: 53715 1   C: 01601 1   C: 57170 0
26,2650      I: 52255 1   C: 01615 1   I: 50315 0   C: 00001 0   C: 00007 0   I: 53606 1   C: 56174 0   I: 57316 1
26,2660      C: 01771 1   C: 02707 0   I: 54335 0   C: 01774 1   C: 20621 0   C: 00031 0   I: 50025 0   C: 02707 0
26,2670      C: 54674 0   I: 77745 1   C: 00031 0   C: 02707 0   I: 60545 0   I: 53725 1   C: 03751 1   C: 56577 1

26,2700      I: 77625 0   I: 77675 0   C: 00045 0   C: 27547 1   C: 00001 0   I: 47235 0   I: 57414 1   C: 00707 1
26,2710      C: 54711 1   I: 77657 0   C: 57200 1   C: 27525 0   C: 06505 1   C: 00025 0   C: 27541 1   C: 03525 0
26,2720      I: 60246 1   C: 00025 0   I: 51575 1   C: 03533 1   I: 71301 0   C: 00027 1   C: 00027 1   I: 50025 0
26,2730      C: 00025 0   C: 54735 1   I: 52150 1   C: 00026 0   C: 54737 0   I: 77750 0   C: 00024 1   I: 53775 1

26,2740      C: 03525 0   C: 20201 0   C: 27525 0   C: 03533 1   I: 77657 0   C: 20201 0   C: 17533 1   C: 03547 1
26,2750      I: 77657 0   C: 20201 0   C: 03547 1   I: 53745 1   C: 00045 0   C: 20200 1   I: 41316 0   C: 02707 0
26,2760      I: 47012 1   C: 21643 0   C: 36707 1   C: 55400 0   I: 77624 1   C: 51770 0   I: 77414 0   C: 04307 1
26,2770      C: 55204 1      33331 0      54006 0      31457 0      54765 1      31460 1      54767 0      31461 0
```

```
OCTAL LISTING FOR PARAGRAPH # 152,  WITH PARITY BIT IN BINARY AT THE RIGHT OF EACH WORD, "@" DENOTES UNUSED FIXED MEMORY

ALL VALID WORDS ARE BASIC INSTRUCTIONS EXCEPT THOSE MARKED "I" (INTERPRETIVE OPERATOR WORDS) OR "C" (CONSTANTS)

26,3000       54771 1       06060 1    I: 45175 0    C: 06503 1    C: 47656 1    I: 76505 0    C: 01732 0    C: 27677 1
26,3010    C: 06501 0    I: 77624 1    C: 47665 1    I: 76505 0    C: 01732 0    C: 27705 0    C: 06477 0    I: 77624 1
26,3020    C: 47655 1    I: 76505 0    C: 01732 0    C: 37713 0    C: 55360 1    I: 77331 0    C: 01354 1    C: 00003 1
26,3030    C: 03724 0    I: 72441 0    C: 03677 1    C: 24023 0    C: 03724 0    I: 72441 0    C: 03713 1    C: 34021 0

26,3040    C: 26545 1    I: 41221 0    C: 03736 0    C: 15440 0    I: 41472 0    I: 52545 1    C: 01701 0    I: 44257 1
26,3050    C: 56176 1    I: 53605 1    C: 03722 0    C: 21601 0    C: 27547 1    C: 03724 0    I: 76435 1    C: 03705 0
26,3060    I: 77656 1    I: 57414 1    C: 00747 0    C: 55064 0    C: 27525 0    C: 06505 1    C: 03533 1    C: 17541 1
26,3070    C: 03722 0    I: 53657 0    C: 20577 0    C: 56176 1    C: 03541 1    I: 77735 0    C: 02011 0    I: 41215 1

26,3100    C: 15435 1    C: 03722 0    I: 41257 1    C: 21601 0    C: 03722 0    I: 53657 0    C: 20577 0    C: 57176 0
26,3110    I: 47057 0    C: 57176 0    C: 21643 0    C: 36707 1    C: 55400 0    I: 77624 1    C: 51770 0    I: 77624 1
26,3120    C: 55360 1    I: 77331 0    C: 01354 1    C: 00004 0    C: 03724 0    I: 76435 1    C: 03705 0    I: 76435 1
26,3130    C: 03724 0    I: 57414 1    C: 00747 0    C: 55134 1    C: 27525 0    C: 06505 1    C: 03533 1    C: 17541 1

26,3140    C: 03722 0    I: 53657 0    C: 20577 0    C: 56176 1    C: 03543 0    I: 77735 0    C: 02012 0    I: 41215 1
26,3150    C: 15435 1    C: 03722 0    I: 41257 1    C: 21601 0    C: 03722 0    I: 53657 0    C: 20577 0    C: 57176 0
26,3160    I: 47057 0    C: 57176 0    C: 21643 0    C: 16707 0    C: 03732 1    I: 44336 1    C: 03734 1    I: 56405 0
26,3170    C: 15440 0    I: 52525 1    C: 01703 1    I: 44257 1    C: 56176 1    I: 53605 1    C: 03722 0    C: 21601 0

26,3200    C: 37547 0    C: 55400 0    I: 77624 1    C: 51770 0    I: 77650 1    C: 50644 1    I: 77624 1    C: 27447 0
26,3210    I: 43014 0    C: 01472 1    C: 01674 0    I: 77624 1    C: 53642 1    I: 77624 1    C: 51770 0    I: 45014 0
26,3220    C: 02666 0    C: 27447 0    I: 45145 0    C: 03463 0    C: 55237 1    I: 43014 0    C: 01675 1    C: 01476 0
26,3230    I: 43014 0    C: 01474 1    C: 01673 1    I: 77624 1    C: 53642 1    I: 77650 1    C: 54522 0    I: 77624 1

26,3240    C: 55250 0    I: 45014 0    C: 01474 1    C: 26702 0    I: 77624 1    C: 53642 1    I: 77650 1    C: 54522 0
26,3250    I: 77776 1       33330 1       54006 0       33436 0       55256 0       34746 0       51256 1       55400 0
26,3260       11256 0       03254 1       33331 0       54006 0       06060 1    I: 67214 1    C: 04307 1    C: 55273 1
26,3270    C: 02001 1    I: 77650 1    C: 55275 1    I: 77735 0    C: 02007 1    I: 77661 0    C: 20606 0    C: 02401 0

26,3300    C: 02411 1    C: 02421 1    I: 67214 1    C: 04307 1    C: 55310 0    C: 02002 1    I: 77650 1    C: 55312 1
26,3310    I: 77735 0    C: 02010 1    C: 02511 0    C: 02521 0    C: 02531 1    I: 77735 0    C: 02003 0    C: 02621 0
26,3320    I: 77735 0    C: 02004 1    C: 02631 1    I: 66214 0    C: 02476 0    C: 03463 0    C: 00000 1    I: 77616 0
26,3330    C: 54065 0    C: 54067 1    I: 77201 1    C: 00001 0    C: 01645 1    I: 77754 1    C: 03720 1    I: 53257 1

26,3340    C: 57165 1    C: 01661 1    I: 53715 1    C: 01573 1    C: 57165 1    I: 52255 1    C: 01607 1    I: 41434 1
26,3350    C: 21722 0    C: 17724 0    C: 00045 0    I: 77657 0    C: 20201 0    C: 24045 0    C: 03724 0    I: 77616 0
26,3360    I: 45020 1    C: 03675 0    C: 55332 0    I: 50276 1    C: 03705 0    I: 41572 1    C: 03732 1    I: 44316 0
26,3370    C: 06475 1    I: 41366 1    C: 00045 0    I: 60352 0    C: 00047 1    C: 03722 0    I: 77650 1    C: 03675 0
```

```
OCTAL LISTING FOR PARAGRAPH # 153,  WITH PARITY BIT IN BINARY AT THE RIGHT OF EACH WORD, "@" DENOTES UNUSED FIXED MEMORY

ALL VALID WORDS ARE BASIC INSTRUCTIONS EXCEPT THOSE MARKED "I" (INTERPRETIVE OPERATOR WORDS) OR "C" (CONSTANTS)

26,3400     I: 45020 1   C: 03675 0   C: 46514 0   I: 51575 1   C: 02673 1   I: 53754 1   C: 03720 1   C: 56174 0
26,3410     C: 24317 1   C: 02665 0   I: 53646 0   C: 56174 0   C: 00315 0   I: 54335 0   C: 02005 0   C: 20613 1
26,3420     I: 50025 0   C: 00315 0   C: 50650 1   I: 45335 0   C: 02006 0   C: 00317 1   I: 77640 0   C: 50650 1
26,3430     I: 77624 1   C: 46726 0   I: 77650 1   C: 03675 0   C: 00103 0   C: 03370 0   C: 00241 0   C: 31103 1

26,3440     C: 36652 0      34746 0      55736 0      34727 1      00006 1      05012 1      34727 1      70076 1
26,3450        00006 1      15146 0      33713 1      00004 0      05205 0   C: 03642 1   C: 54067 1      00003 1
26,3460        40110 0      74727 0      00006 1      15146 0      06060 1   I: 43234 0   C: 21603 1   C: 15715 0
26,3470     C: 34041 0   C: 27136 0   I: 77775 1   C: 00001 0   C: 27676 0   C: 00007 0   C: 17740 1   C: 00015 0

26,3500     C: 34041 0   C: 27124 0   I: 52375 1   C: 00001 0   C: 03676 0   I: 77656 1   C: 27712 0   C: 00007 0
26,3510     I: 47256 0   C: 00001 0   I: 77656 1   C: 03704 1   I: 52375 1   C: 00007 0   C: 03740 1   I: 76521 0
26,3520     C: 01732 0   C: 03740 1   I: 53135 0   C: 03737 1   C: 55635 1   I: 53025 0   C: 15711 1   C: 55622 1
26,3530     I: 77775 1   C: 03720 1   C: 24015 0   C: 03726 1   C: 00023 0   I: 77761 1   C: 15705 1   C: 27720 1

26,3540     C: 00015 0   I: 53361 0   C: 06503 1   C: 03720 1   I: 77656 1   C: 27720 1   C: 00015 0   I: 77761 1
26,3550     C: 15705 1   C: 27726 1   C: 00023 0   I: 52361 1   C: 06503 1   C: 03726 1   I: 77656 1   C: 03726 1
26,3560     I: 53361 0   C: 15707 0   C: 03712 0   I: 64256 1   C: 01732 0   I: 77772 0   C: 25101 0   C: 03740 1
26,3570     C: 01757 0   I: 77776 1      00004 0      06050 1   C: 52573 1      44726 1      70110 0      64726 0

26,3600        54110 0      06060 1   I: 77624 1   C: 52364 1   I: 77776 1      03674 1      03674 1      00006 1
26,3610        30036 1      53753 0      06060 1   I: 77624 1   C: 46041 0   I: 65545 0   C: 00045 0   C: 03735 0
26,3620     I: 77776 1      05146 1   I: 47375 0   C: 03704 1   C: 03712 0   I: 77656 1   C: 27720 1   C: 03712 0
26,3630     I: 53435 0   C: 03720 1   C: 03726 1   I: 77650 1   C: 55560 1   I: 64375 1   C: 03712 0   C: 01732 0

26,3640     I: 52172 1   C: 55566 1      30074 1      74736 0      00006 1      15263 1      37734 0      05076 0
26,3650     C: 03653 1   C: 54067 1      05263 0      34741 1      00006 1      02033 0      00006 1      13666 0
26,3660        46263 1      61736 1      00006 1      13441 1      25736 1      13443 0      33703 0      55733 0
26,3670        00004 0      06050 1   C: 52573 1      05146 1      05571 1   C: 00527 1      00004 0      06050 1

26,3700     C: 55642 1      06032 0      05146 1   C: 25547 0   C: 33555 1   C: 01106 1   C: 01642 0   C: 11045 0
26,3710     C: 00001 0   C: 00000 1   C: 00454 1   C: 01130 1   C: 00000 1   C: 00226 1   I: 46020 1   C: 00050 1
26,3720     C: 55733 0   I: 77624 1   C: 51674 0   I: 77775 1   C: 02013 1   I: 53235 0   C: 00001 0   C: 00001 0
26,3730     I: 52105 1   C: 00025 0   C: 51662 1   I: 77624 1   C: 55743 1   I: 77624 1   C: 15765 1   I: 76521 0

26,3740     C: 00025 0   I: 77650 1   C: 55725 1   I: 40220 0   C: 00051 0   C: 00011 1   I: 77770 1   C: 00000 1
26,3750     I: 65345 0   C: 14023 0   C: 14021 1   I: 45006 0   C: 51743 0   I: 41401 1   C: 00023 0   I: 65346 0
26,3760     C: 00023 0   I: 65356 1   C: 06505 1   I: 73525 1   C: 00023 0   I: 65276 1   C: 00023 0   I: 63346 0
26,3770     C: 06505 1   I: 41525 0   C: 06503 1   I: 77650 1   C: 00051 0   C: 03775 1   C: 03776 1 CKSM 20140 0
```

```
OCTAL LISTING FOR PARAGRAPH # 154,  WITH PARITY BIT IN BINARY AT THE RIGHT OF EACH WORD, "@" DENOTES UNUSED FIXED MEMORY

ALL VALID WORDS ARE BASIC INSTRUCTIONS EXCEPT THOSE MARKED "I" (INTERPRETIVE OPERATOR WORDS) OR "C" (CONSTANTS)

27,2000      C: 00000 1    C: 10604 1    C: 00000 1    C: 00762 1    C: 00030 1    C: 35104 1    C: 00016 0    C: 36237 1
27,2010      C: 35711 0    C: 35663 1    C: 03631 0    C: 23146 0    C: 33226 1    C: 14632 0    C: 05306 1    C: 15503 0
27,2020      C: 26337 1    C: 30000 1    C: 55340 0    C: 61710 0    C: 00072 1    C: 16206 1    C: 00344 1    C: 24331 0
27,2030      C: 24775 1    C: 30424 0    I: 40020 1    C: 03324 1    C: 56035 1    I: 52164 0    C: 03245 1    C: 56046 0

27,2040      I: 40020 1    C: 03324 1    C: 56043 0    I: 47164 1    C: 03245 1    C: 44403 0    C: 34032 1    C: 44410 1
27,2050      I: 61375 1    C: 03773 1    C: 03246 1    I: 77656 1    C: 00035 1    I: 53435 0    C: 03765 0    I: 57400 1
27,2060      C: 56170 1    C: 17270 1    C: 00045 0    I: 50025 0    C: 14423 1    C: 56170 1    I: 50375 0    C: 03765 0
27,2070      C: 00035 1    I: 65552 0    I: 77624 1    C: 44527 1    I: 75160 1    C: 03245 1    C: 02221 1    I: 77624 1

27,2100      C: 44312 1    I: 51545 1    C: 00007 0    I: 50025 0    C: 14410 1    C: 56160 0    I: 51545 1    C: 03765 0
27,2110      I: 51025 1    C: 14412 0    C: 56160 0    I: 77775 1    I: 77626 0    C: 50515 0    I: 77626 0    C: 50523 0
27,2120      I: 77626 0    C: 50531 0    C: 03254 1    I: 57444 1    C: 56125 1    I: 50035 1    C: 03765 0    C: 56134 1
27,2130      I: 57575 1    C: 03765 0    C: 37270 0    C: 56137 1    I: 77775 1    C: 03765 0    C: 03270 1    I: 51545 1

27,2140      C: 03765 0    I: 51025 1    C: 14414 0    C: 56147 0    I: 52145 0    C: 14420 1    C: 56151 1    I: 77745 1
27,2150      C: 14416 1    I: 77624 1    C: 44527 1    I: 75160 1    C: 03245 1    C: 02221 1    I: 77624 1    C: 44312 1
27,2160      I: 45160 1    C: 00000 1    C: 44654 0    I: 40234 0    C: 21630 1    C: 00001 0    I: 77650 1    C: 03324 1
27,2170      I: 50375 0    C: 00035 1    C: 03765 0    I: 72240 1    C: 54362 1    C: 00032 0    I: 77650 1    C: 03324 1

27,2200         22062 0       24002 0       00006 1       22061 0       54063 0       75003 0       64732 0       54064 1
27,2210         45003 0       70063 0       54063 0       22007 0       50001 0       41410 1       60064 0       00006 1
27,2220         12232 1       44740 1       60001 0       00006 1       12230 0       24001 0       24001 0       12214 0
27,2230         52062 1       52006 0       45003 0       50001 0       71411 0       00006 1       60063 1       00006 1

27,2240         12242 0       12221 0       34344 0       50001 0       55410 1       12230 0    I: 71220 1    C: 03632 0
27,2250      C: 03442 0    C: 03763 0    I: 77614 1    C: 01347 0    C: 56336 1    I: 77201 1    C: 00001 0    C: 03650 1
27,2260      C: 02322 0    I: 53435 0    C: 03642 1    C: 27673 0    C: 03642 1    C: 02314 0    I: 65236 0    C: 00045 0
27,2270      I: 56205 0    C: 16412 1    I: 41205 0    C: 03664 0    C: 01244 1    I: 77671 1    C: 03735 0    C: 24017 1

27,2300      C: 03656 1    I: 74241 0    C: 03673 0    C: 03673 0    I: 41552 0    I: 65245 1    C: 03656 1    C: 00017 1
27,2310      I: 63356 1    C: 00007 0    I: 53435 0    C: 03673 0    I: 45561 1    C: 50076 0    I: 65256 0    C: 00017 1
27,2320      I: 74346 0    I: 74255 0    C: 03701 1    C: 00045 0    I: 53352 0    I: 77626 0    C: 74076 0    I: 77656 1
27,2330      C: 27673 0    C: 03701 1    I: 45006 0    C: 42022 1    I: 77650 1    C: 03632 0    I: 77745 1    C: 03442 0

27,2340      C: 00041 1    I: 77621 1    C: 03631 0    C: 37452 0    C: 27115 1    I: 40375 1    C: 00001 0    C: 00001 0
27,2350      C: 03642 1    C: 02314 0    I: 77656 1    C: 27537 0    C: 00007 0    C: 03650 1    C: 02322 0    I: 65345 0
27,2360      C: 06505 1    C: 16406 1    I: 43214 1    C: 03745 1    C: 56366 1    C: 16410 0    I: 66006 1    C: 02776 0
27,2370      I: 45134 0    C: 02777 1    C: 22000 1    I: 41575 0    C: 02357 1    C: 03701 1    I: 77656 1    C: 17673 0
```

```
OCTAL LISTING FOR PARAGRAPH # 155,  WITH PARITY BIT IN BINARY AT THE RIGHT OF EACH WORD, "@" DENOTES UNUSED FIXED MEMORY

ALL VALID WORDS ARE BASIC INSTRUCTIONS EXCEPT THOSE MARKED "I" (INTERPRETIVE OPERATOR WORDS) OR "C" (CONSTANTS)

27,2400     C: 00045 0    C: 37664 1    C: 42022 1    I: 77650 1    C: 03632 0    C: 00707 1    C: 03434 1    C: 03070 0
27,2410     C: 34344 0    C: 00024 1    C: 13714 1    I: 77775 1    C: 03673 0    I: 76521 0    C: 01732 0    C: 27773 1
27,2420     C: 06503 1    C: 27765 0    C: 03673 0    C: 03607 0    I: 53435 0    C: 03642 1    I: 46125 0    C: 00045 0
27,2430     C: 56441 0    I: 45575 1    C: 74162 1    I: 76435 1    C: 03607 0    I: 77676 0    C: 03623 0    I: 43414 1

27,2440     C: 01073 1    I: 47375 0    C: 03607 0    C: 03650 1    I: 41456 0    I: 77650 1    C: 56431 1    I: 77614 1
27,2450     C: 01347 0    C: 56733 0    I: 52375 1    C: 03701 1    C: 03527 1    C: 03707 1    I: 76521 0    C: 01732 0
27,2460     C: 03252 1    I: 51575 1    C: 03707 1    C: 03664 0    I: 77776 1       05355 1    C: 10035 0       06060 1
27,2470     I: 77201 1    C: 00001 0    C: 03707 1    C: 27701 1    C: 03527 1    I: 57414 1    C: 01344 0    C: 75615 1

27,2500     I: 77656 1    I: 41441 0    C: 03707 1    I: 56244 0    C: 51634 1    C: 03743 1    I: 41215 1    C: 06503 1
27,2510     I: 56261 1    C: 20613 1    C: 00045 0    I: 43205 1    C: 16533 0    C: 03741 0    C: 03517 1    I: 77615 0
27,2520     C: 01234 0    C: 17442 0    C: 03517 1    I: 51025 1    C: 16535 0    C: 51640 1    I: 43014 0    C: 01066 0
27,2530     C: 01224 1    C: 75615 1    C: 77715 1    C: 77777 0    C: 00000 1    C: 00620 0       06060 1    I: 43001 1

27,2540     C: 00001 0    C: 01266 1    I: 51575 1    C: 03701 1    I: 41325 0    C: 16710 0    C: 34017 0    I: 72471 0
27,2550     C: 01244 1    I: 41421 0    I: 43014 0    C: 05342 1    C: 56624 1    C: 02463 1    I: 56345 0    C: 16001 1
27,2560     C: 01244 1    I: 50021 1    C: 00001 0    C: 56606 1    I: 41325 0    C: 03737 1    C: 16700 1    I: 65221 0
27,2570     C: 01244 1    C: 03735 0    I: 60405 0    C: 16702 0    I: 41471 0    I: 51021 0    C: 00003 1    C: 56624 1

27,2600     I: 55345 0    I: 43205 1    C: 16702 0    C: 16676 1    I: 77650 1    C: 56614 1    I: 41345 0    C: 01244 1
27,2610     I: 41542 1    I: 56215 1    C: 16003 0    C: 16005 0    I: 77414 0    C: 01066 0       07300 0       30154 1
27,2620        56001 0       34746 0       53517 1       12650 1    I: 41345 0    C: 00001 0    C: 01244 1    I: 43006 0
27,2630     C: 05302 0    C: 56671 1    I: 43071 0    C: 16007 1    C: 02663 0    I: 41400 0    C: 56653 1    I: 51025 1

27,2640     C: 16704 0    C: 56661 0    I: 43015 1    C: 16704 0    C: 02463 1    I: 77650 1    C: 56614 1    I: 77776 1
27,2650        05355 1    C: 00003 1       05146 1    I: 40545 1    I: 77671 1    C: 16011 0    C: 03517 1    I: 77776 1
27,2660        12650 1    I: 51025 1    C: 16706 1    C: 56666 1    I: 77614 1    C: 02463 1    I: 77745 1    I: 77776 1
27,2670        12616 0    I: 62471 1    C: 34007 1    I: 77650 1    C: 56667 0    C: 00144 0    C: 00000 1    C: 01274 1

27,2700     C: 00000 1    C: 00764 1    C: 00000 1    C: 01130 1    C: 00000 1    C: 21304 0    C: 00000 1    C: 00121 0
27,2710     C: 10000 0       06060 1    I: 77601 0    C: 00001 0    I: 71214 0    C: 01072 0    C: 06505 1    I: 77725 1
27,2720     C: 16406 1    I: 43214 1    C: 03745 1    C: 56725 1    C: 16410 0    I: 45006 0    C: 22002 0    I: 77776 1
27,2730        05355 1    C: 00002 0       15146 0    I: 51575 1    C: 01220 0    I: 53744 0    C: 02777 1    C: 57576 1

27,2740     C: 27715 1    C: 03444 0    I: 47051 0    C: 01220 0    C: 21722 0    C: 17656 1    C: 00045 0    I: 53674 1
27,2750     C: 00046 0    C: 57576 1    C: 00037 0    I: 41301 0    C: 00050 1    C: 03715 1    I: 57101 0    C: 00047 1
27,2760     C: 00046 0    I: 77734 1    C: 03766 0    C: 17725 1    C: 00037 0    I: 65342 1    C: 03715 1    I: 65342 1
27,2770     C: 03723 1    I: 43342 0    I: 45415 0    C: 74044 1    I: 41225 1    C: 00037 0    C: 03721 0    I: 77621 1
```

```
OCTAL LISTING FOR PARAGRAPH # 156,  WITH PARITY BIT IN BINARY AT THE RIGHT OF EACH WORD, "@" DENOTES UNUSED FIXED MEMORY

ALL VALID WORDS ARE BASIC INSTRUCTIONS EXCEPT THOSE MARKED "I" (INTERPRETIVE OPERATOR WORDS) OR "C" (CONSTANTS)

27,3000      C: 03717 0    I: 45325 1    C: 03733 0    C: 03715 1    I: 70501 1    C: 00047 1    I: 41271 0    C: 03725 1
27,3010      I: 53664 0    C: 00046 0    C: 57575 1    I: 77754 1    C: 03766 0    I: 75366 0    C: 02673 1    C: 00041 1
27,3020      I: 41345 0    C: 03733 0    C: 03721 0    I: 77621 1    C: 03717 0    I: 45325 1    C: 03733 0    C: 03723 1
27,3030      I: 70501 1    C: 00047 1    I: 41271 0    C: 03725 1    I: 53664 0    C: 00046 0    C: 57575 1    I: 65366 1

27,3040      C: 03733 0    I: 56225 1    C: 00037 0    C: 03733 0    I: 41566 1    I: 67542 0    I: 65205 0    C: 17220 1
27,3050      I: 56325 0    C: 00037 0    C: 03733 0    I: 77600 1    C: 57055 0    I: 41366 1    I: 44242 0    I: 65365 1
27,3060      C: 02673 1    C: 17220 1    I: 45302 1    I: 65205 0    C: 03733 0    C: 03733 0    I: 75442 1    I: 77605 1
27,3070      I: 52525 1    C: 03717 0    I: 55366 1    I: 43225 0    C: 03631 0    C: 01234 0    C: 14037 0    I: 77765 0

27,3100      C: 00037 0    C: 00037 0    I: 77214 0    C: 03705 0    C: 57125 0    C: 03656 1    I: 53451 1    C: 03537 0
27,3110      I: 63361 0    C: 00037 0    C: 03656 1    I: 53455 0    C: 03537 0    I: 53361 0    C: 00041 1    I: 53744 0
27,3120      C: 02777 1    C: 57177 1    C: 02330 0    I: 77650 1    C: 57170 0    I: 50375 0    C: 03656 1    C: 03537 0
27,3130      I: 77240 1    C: 57150 1    C: 03656 1    I: 63362 0    C: 03537 0    I: 53362 0    I: 77656 1    I: 57406 1

27,3140      I: 75235 1    C: 02674 0    C: 02673 1    I: 74256 0    C: 00037 0    I: 77715 1    I: 77650 1    C: 57115 0
27,3150      I: 74575 0    C: 03537 0    I: 74515 0    C: 03656 1    I: 53451 1    I: 77606 1    I: 75235 1    C: 02674 0
27,3160      C: 02673 1    I: 74256 0    C: 00041 1    I: 77715 1    I: 53361 0    C: 00037 0    I: 77650 1    C: 57117 1
27,3170      I: 77651 0    C: 03553 1    C: 02357 1    I: 53135 0    C: 03000 1    C: 57201 0    I: 52175 0    C: 02357 1

27,3200      C: 57214 1    I: 53575 0    C: 01220 0    I: 45345 1    C: 01234 0    C: 03512 1    I: 56205 0    C: 16023 1
27,3210      C: 00043 0    I: 53361 0    C: 03521 1    C: 02357 1    C: 02357 1    I: 77650 1    C: 56455 0    C: 31103 1
27,3220      C: 36652 0       05520 0    C: 00137 1       45010 1       00006 1       03012 1       35005 1       00006 1
27,3230         05012 1       05223 1    C: 13560 0       45005 0       00006 1       03012 1       35010 0       00006 1

27,3240         05012 1       31402 0       05175 1    C: 03262 1       31401 0       05226 1       44731 1       00006 1
27,3250         03012 1       30102 1       74733 0       00006 1       13266 1       34730 1       05063 1    C: 02330 0
27,3260      C: 02067 1       05263 0       44733 0       00006 1       03012 1       13251 0       05506 1    C: 00137 1
27,3270         05263 0    I: 76521 0    C: 01732 0    I: 77650 1    C: 47640 0    I: 53575 0    C: 03252 1    I: 77641 1

27,3300      C: 02137 0    I: 51025 1    C: 02566 0    C: 57312 0    I: 50375 0    C: 02137 0    C: 03537 0    I: 50025 0
27,3310      C: 02570 1    C: 71453 0    I: 77614 1    C: 04631 1    C: 60717 0    I: 50375 0    C: 03537 0    C: 02600 0
27,3320      I: 41312 1    C: 03631 0    C: 02326 1    I: 77616 0       00006 1       33362 0       53252 1       40103 1
27,3330         74736 0       26103 1       34726 0       54107 0       00006 1       34746 0       52752 0       30102 1

27,3340         74735 0       10000 0       13346 1       00006 1       34746 0       52754 0       00006 1       34746 0
27,3350         52756 1       00006 1       34746 0       52764 0       34755 1       54001 1       40000 0       52760 1
27,3360         15636 0    C: 03656 1    C: 64067 1    C: 00037 0    I: 53575 0    C: 02200 1    I: 77725 1    C: 00045 0
27,3370      C: 00015 0    I: 77701 1    C: 00047 1    C: 24041 1    C: 02206 1    I: 77761 1    C: 00037 0    C: 02161 0
```

```
OCTAL LISTING FOR PARAGRAPH # 157,  WITH PARITY BIT IN BINARY AT THE RIGHT OF EACH WORD, "@" DENOTES UNUSED FIXED MEMORY

ALL VALIO WORDS ARE BASIC INSTRUCTIONS EXCEPT THOSE MARKED "I" (INTERPRETIVF OPERATOR WORDS) OR "C" (CONSTANTS)

27,3400      I: 47361 0    C: 00041 1    I: 47572 1    C: 14035 1    C: 06475 1    I: 63271 0    C: 00041 1    C: 02161 0
27,3410      I: 57436 1    C: 00025 0    I: 43257 0    C: 20573 1    I: 77626 0    C: 77744 0    I: 41457 1    C: 20173 0
27,3420      I: 75446 0    I: 77701 1    C: 00050 1    C: 00031 0    I: 75316 1    I: 55254 1    C: 57430 1    C: 06475 1
27,3430      C: 00027 1    I: 77616 0    I: 41345 0    C: 00033 1    C: 00035 1    I: 57457 0    C: 20571 0    I: 51415 0

27,3440      C: 17770 1    I: 43366 0    C: 06475 1    I: 55206 0    C: 00035 1    I: 53657 0    C: 20601 1    C: 20572 0
27,3450      C: 14017 1    I: 41005 1    C: 00027 1    C: 57756 1    I: 53654 0    C: 57464 0    C: 57603 0    I: 40057 1
27,3460      C: 57576 1    C: 57464 0    I: 77644 1    C: 57466 1    I: 77745 1    C: 17774 0    C: 00021 1    I: 77616 0
27,3470      I: 77614 1    C: 03436 0    C: 57475 0    I: 77614 1    C: 03676 0    C: 00023 0    I: 77657 0    C: 20201 0

27,3500      C: 00021 1    I: 44205 0    C: 00033 1    C: 06475 1    I: 41206 0    C: 00021 1    I: 53725 1    C: 00035 1
27,3510      C: 20573 1    I: 43276 0    I: 77657 0    C: 20601 1    I: 71214 0    C: 03756 0    C: 57520 1    C: 06505 1
27,3520      I: 75440 0    C: 57653 0    I: 41076 0    C: 57756 1    C: 24045 0    C: 02161 0    I: 52441 1    C: 02200 1
27,3530      C: 00017 1    I: 44240 1    C: 57553 0    C: 00045 0    C: 14043 0    C: 00033 1    I: 44205 0    C: 00041 1

27,3540      I: 51406 1    I: 40015 1    C: 17762 1    C: 57564 1    I: 65345 0    C: 06505 1    I: 57545 1    C: 00033 1
27,3550      I: 71240 1    C: 57660 0    I: 77616 0    I: 77745 1    I: 45345 1    C: 00023 0    C: 00015 0    C: 14043 0
27,3560      C: 00045 0    I: 52015 1    C: 00017 1    C: 57540 1    I: 65215 1    C: 17764 1    C: 00043 0    I: 53605 1
27,3570      C: 00031 0    C: 57201 0    I: 77671 1    I: 40145 0    C: 00043 0    C: 57656 0    I: 45471 1    C: 77732 1

27,3600      I: 63406 0    I: 41206 0    C: 00035 1    I: 75261 0    C: 20206 1    C: 00045 0    C: 14045 0    I: 41206 0
27,3610      C: 00033 1    I: 77657 0    C: 20201 0    C: 00043 0    I: 41234 1    C: 57740 0    I: 44302 0    C: 00023 0
27,3620      I: 41215 1    C: 00015 0    I: 51042 0    C: 57644 0    I: 75206 1    C: 00017 1    I: 71244 0    C: 57650 0
27,3630      C: 00027 1    I: 51076 1    C: 57650 0    I: 77676 0    I: 56205 0    C: 17760 0    C: 00031 0    I: 53657 0

27,3640      C: 57602 1    C: 57602 1    I: 43257 0    C: 57576 1    I: 40005 0    C: 00037 0    C: 57654 1    I: 77616 0
27,3650      I: 77745 1    I: 77650 1    C: 57644 0    I: 77745 1    I: 43545 1    C: 17774 0    I: 77712 0    I: 41465 0
27,3660      I: 45345 1    C: 00045 0    C: 00017 1    C: 14013 0    I: 77626 0    C: 77732 1    I: 53605 1    C: 00027 1
27,3670      C: 57576 1    I: 41206 0    C: 00045 0    I: 41057 0    C: 57576 1    C: 31765 1    C: 00043 0    I: 41234 1

27,3700      C: 57740 0    C: 00043 0    I: 45242 1    C: 17766 0    I: 41405 0    I: 41345 0    C: 00045 0    C: 00015 0
27,3710      I: 43312 0    C: 00017 1    C: 14045 0    C: 00035 1    I: 53605 1    C: 00027 1    C: 57575 1    I: 53765 0
27,3720      C: 00045 0    C: 57576 1    C: 14045 0    C: 00027 1    I: 41366 1    C: 17760 0    I: 77615 0    I: 45257 0
27,3730      C: 57577 0    C: 00013 0    I: 53605 1    C: 00027 1    C: 57601 1    I: 52057 1    C: 57602 1    C: 57644 0

27,3740         07243 0    C: 00004 0    C: 12525 0    C: 12525 0    C: 71463 0    C: 57703 1    C: 04423 0    C: 17645 0
27,3750      C: 74604 0    C: 43667 1    C: 01626 1    C: 37256 1    C: 77404 1    C: 52071 0       06102 1    C: 06220 1
27,3760      C: 37553 0    C: 37777 1    C: 37700 1    C: 00000 1    C: 00100 0    C: 04000 0    C: 00000 1    C: 02000 0
27,3770      C: 00000 1    C: 00305 1    C: 11205 0    C: 37777 1    C: 37777 1    C: 03775 1    C: 03776 1  CKSM 53501 0
```

```
OCTAL LISTING FOR PARAGRAPH # 160,  WITH PARITY BIT IN BINARY AT THE RIGHT OF EACH WORD, "@" DENOTES UNUSED FIXED MEMORY

ALL VALID WOROS ARE BASIC INSTRUCTIONS EXCEPT THOSE MARKED "I" (INTERPRETIVE OPERATOR WORDS) OR "C" (CONSTANTS)

30,2000      C: 02445 0    C: 00274 0    I: 77615 0    C: 02172 1    C: 02172 1    I: 47573 0    C: 02555 0    I: 77615 0
30,2010      C: 02174 1    C: 02174 1    I: 47573 0    C: 02643 1    I: 77615 0    C: 02176 0    C: 02176 0    I: 75500 0
30,2020      C: 62137 0    I: 77661 0    C: 20613 1    C: 16176 0    C: 02174 1    I: 77766 0    C: 16174 1    C: 02172 1
30,2030      I: 77766 0    C: 02172 1    I: 52000 0    C: 60035 1    C: 60042 1    I: 77745 1    C: 06513 0    C: 02172 1

30,2040      C: 02174 1    C: 02176 0    I: 45345 1    C: 02172 1    C: 20060 0    I: 71240 1    C: 60051 0    C: 20060 0
30,2050      C: 02172 1    I: 66150 0    C: 00051 0    C: 00052 0    I: 77776 1       04626 1    C: 27460 0    C: 01670 1
30,2060      C: 17000 1       05355 1    C: 04024 0       04607 1    C: 33757 1       36000 1       55250 0       34742 1
30,2070         55515 0       33014 1       04607 1    C: 20471 1       16001 1       12077 1       12071 1       05355 1

30,2100      C: 04024 0       06060 1    I: 43014 0    C: 03067 0    C: 06464 1    I: 43014 0    C: 00075 0    C: 00270 1
30,2110      I: 43014 0    C: 04464 0    C: 04461 0    I: 45014 0    C: 04665 0    C: 71346 0    I: 77624 1    C: 60243 1
30,2120      I: 77745 1    C: 25650 0    C: 17517 1    C: 03442 0    C: 34041 0    C: 27115 1    I: 64375 1    C: 00007 0
30,2130      C: 01732 0    I: 77772 0    C: 27601 0    C: 00001 0    I: 52521 0    C: 01732 0    C: 37521 0    C: 67037 1

30,2140      I: 53575 0    C: 03521 1    C: 37537 1    C: 57315 1    I: 57461 0    C: 20606 0    C: 17643 0    C: 31372 0
30,2150      C: 16270 0    C: 31374 0    C: 02264 0    I: 77776 1       05355 1    C: 04024 0       33013 0       04607 1
30,2160      C: 20471 1       16001 1       12164 1       12156 0       32306 0       55455 0       05355 1    C: 04024 0
30,2170         06060 1    I: 54345 1    C: 03643 0    C: 20206 1    I: 77615 0    C: 02326 1    C: 27633 1    C: 03537 0

30,2200      I: 53361 0    C: 31370 1    C: 03601 0    C: 03527 1    I: 72441 0    C: 03537 0    C: 37474 1    C: 60307 0
30,2210      I: 77745 1    C: 02352 1    I: 65316 0    C: 02346 1    I: 43316 1    I: 75454 0    C: 60222 0    I: 55352 0
30,2220      C: 02346 1    I: 77736 0    C: 26354 1    C: 03252 1    I: 50256 0    C: 03537 0    I: 65552 0    I: 77676 0
30,2230      C: 02356 0    I: 77776 1       05355 1    C: 04024 0       00004 0       04665 0    C: 40143 0       05520 0

30,2240      C: 00213 1       04626 1    C: 74130 0    I: 77745 1    C: 16013 1    C: 03641 1    C: 03637 0    C: 17635 1
30,2250      C: 16017 0    C: 16254 0    C: 16021 0    C: 16262 0    C: 34013 1    I: 54276 0    C: 20214 1    C: 02260 1
30,2260      I: 57535 0    C: 26001 1    I: 77702 1    C: 02256 1    I: 43414 1    C: 04747 1    C: 60267 1    I: 43345 1
30,2270      C: 25646 1    C: 02324 0    C: 17631 0    C: 06505 1    C: 03654 0    C: 03633 1    C: 26266 1    C: 01563 0

30,2300      I: 64235 1    C: 01555 0    C: 01732 0    I: 77656 1    C: 02600 0    I: 77616 0    C: 02024 0    I: 51575 1
30,2310      C: 03521 1    C: 26272 1    C: 03537 0    I: 53435 0    C: 02600 0    C: 02606 0    I: 72441 0    C: 03527 1
30,2320      C: 26304 1    C: 02606 0    I: 76435 1    C: 03537 0    C: 02274 1    I: 72441 0    C: 03527 1    C: 36302 0
30,2330      C: 57315 1    I: 77775 1    C: 03563 1    I: 50341 1    C: 27053 1    C: 03537 0    I: 47315 0    C: 03537 0

30,2340      C: 03527 1    I: 56236 0    C: 02272 1    I: 43352 1    I: 77626 0    C: 75471 1    I: 45014 0    C: 04742 1
30,2350      C: 60352 0    C: 71620 0    I: 45345 1    C: 02270 0    C: 02304 1    C: 02334 1    I: 65361 0    C: 02606 0
30,2360      C: 02266 1    I: 77625 0    C: 02302 1    C: 02332 1    I: 65361 0    C: 02274 1    C: 02264 0    I: 77625 0
30,2370      C: 03474 0    C: 02330 0    I: 53361 0    C: 03537 0    I: 76455 1    I: 77626 0    C: 74131 1    I: 41345 0
```

OCTAL LISTING FOR PARAGRAPH # 161, WITH PARITY BIT IN BINARY AT THE RIGHT OF EACH WORD, "@" DENOTES UNUSED FIXED MEMORY

ALL VALID WORDS ARE BASIC INSTRUCTIONS EXCEPT THOSE MARKED "I" (INTERPRETIVE OPERATOR WORDS) OR "C" (CONSTANTS)

```
30,2400      C: 03517 1    C: 02306 0    I: 76561 1    C: 03537 0    I: 77645 0    C: 03646 0    C: 03646 0    I: 76521 0
30,2410      C: 02137 0    C: 27502 0    C: 03646 0    I: 43046 1    C: 04745 0    C: 60424 0    I: 77671 1    C: 20001 1
30,2420      C: 37517 0    C: 71571 1    I: 77650 1    C: 60746 1    I: 41471 0    C: 02256 1    I: 44342 1    C: 17774 0
30,2430      I: 41205 0    C: 02262 0    I: 77625 0    C: 02260 1    C: 03517 1    I: 57461 0    C: 20614 0    C: 17454 1

30,2440      C: 03517 1    I: 45214 1    C: 03710 1    C: 60447 0    C: 21000 1    I: 77640 0    C: 71457 1    I: 77745 1
30,2450      C: 03517 1    I: 50025 0    C: 21002 0    C: 60607 0    I: 45345 1    C: 02262 0    C: 03517 1    I: 45071 0
30,2460      C: 02262 0    C: 61015 1    I: 41461 1    C: 20206 1    I: 44265 0    C: 03517 1    C: 02262 0    I: 43006 0
30,2470      C: 04703 1    C: 60500 1    I: 45345 1    C: 03517 1    C: 21004 0    I: 43044 0    C: 60505 1    C: 04463 1

30,2500      I: 77745 1    C: 06505 1    C: 02342 0    C: 36344 1    C: 60567 0    I: 45345 1    C: 03517 1    C: 00003 1
30,2510      I: 72406 0    I: 52421 1    C: 03517 1    I: 41325 0    C: 03517 1    C: 03474 0    I: 45215 0    C: 02272 1
30,2520      C: 03631 0    I: 41325 0    C: 02330 0    C: 00005 1    I: 62415 0    I: 56271 0    C: 00007 0    C: 03517 1
30,2530      C: 02342 0    I: 71240 1    C: 60536 1    C: 06505 1    C: 36342 1    C: 60550 1    I: 56202 1    C: 02262 0

30,2540      I: 51025 1    C: 26114 1    C: 60550 1    I: 41345 0    C: 26114 1    C: 02262 0    I: 77612 1    C: 02342 0
30,2550      I: 77745 1    C: 03517 1    I: 43205 1    C: 02302 1    C: 02326 1    I: 65225 1    C: 03633 1    C: 02332 1
30,2560      I: 43205 1    C: 00005 1    I: 56312 1    I: 40271 1    C: 03517 1    C: 00005 1    C: 02344 0    I: 41345 0
30,2570      C: 02342 0    C: 00003 1    I: 56325 0    C: 02330 0    C: 00001 0    I: 45302 1    I: 77626 0    C: 61441 1

30,2600      C: 02344 0    I: 65205 0    I: 60465 0    C: 02332 1    I: 77625 0    C: 00001 0    C: 02340 1    I: 43001 1
30,2610      C: 00001 0    C: 04742 1    C: 60615 0    I: 77624 1    C: 71575 0    I: 41345 0    C: 27053 1    C: 02342 0
30,2620      I: 56215 1    C: 02336 0    C: 02262 0    I: 45352 1    C: 02306 0    C: 16350 0    C: 27053 1    I: 43205 1
30,2630      C: 02344 0    C: 02340 1    I: 72471 0    C: 02262 0    C: 02346 1    I: 65361 0    C: 02274 1    C: 02350 0

30,2640      I: 53361 0    C: 03537 0    I: 41572 1    I: 65246 1    C: 02254 0    I: 45316 1    C: 00043 0    I: 41525 0
30,2650      C: 02254 0    I: 45316 1    C: 00043 0    I: 71240 1    C: 60660 1    C: 00011 1    I: 52166 1    C: 60666 1
30,2660      I: 55345 0    C: 00007 0    I: 77761 1    C: 00001 0    C: 14001 0    C: 06505 1    I: 77765 0    C: 02334 1
30,2670      C: 02352 1    I: 77761 1    C: 02606 0    I: 53372 1    C: 00001 0    C: 03252 1    I: 43001 1    C: 00001 0

30,2700      C: 04704 0    C: 60210 1    I: 77614 1    C: 04701 0    C: 60755 0    I: 57575 1    C: 03537 0    C: 17260 0
30,2710      C: 03654 0    I: 51025 1    C: 01234 0    C: 60721 0    I: 77614 1    C: 04711 1    C: 57275 0    I: 77614 1
30,2720      C: 06666 1    I: 77776 1       30105 0       74733 0       10000 0       12747 0       06060 1    I: 77624 1
30,2730      C: 61072 0    I: 77776 1       30105 0       74733 0       10000 0       12747 0       30104 1       74733 0

30,2740         10000 0       12747 0       05156 0       33012 1       04607 1    C: 20436 1    I: 77776 1       15146 0
30,2750      I: 77776 1       00004 0       04665 0    C: 40166 1       12732 1    I: 45345 1    C: 02272 1    C: 02324 0
30,2760      I: 50025 0    C: 26120 0    C: 46453 1    I: 43014 0    C: 04661 1    C: 04711 1    C: 60705 0    I: 43345 1
30,2770      C: 01234 0    C: 25644 0    C: 37654 1    C: 60705 0    I: 77614 1    C: 04631 1    C: 60763 0    C: 00062 0
```

```
OCTAL LISTING FOR PARAGRAPH # 162,  WITH PARITY BIT IN BINARY AT THE RIGHT OF EACH WORD, "@" DENOTES UNUSED FIXED MEMORY

ALL VALID WORDS ARE BASIC INSTRUCTIONS EXCEPT THOSE MARKED "I" (INTERPRETIVE OPERATOR WORDS) OR "C" (CONSTANTS)

30,3000      C: 00000 1    C: 00031 0    C: 00000 1    C: 00175 1    C: 00000 1    C: 00045 0    C: 20000 0    C: 00010 0
30,3010      C: 14400 0    C: 00000 1    C: 01536 0    C: 01514 0    C: 01441 1    I: 44301 0    C: 00163 0    C: 17774 0
30,3020      I: 77776 1       07243 0    C: 00006 1    C: 00000 1    C: 00002 0    C: 76777 1    C: 77175 1    C: 77400 0
30,3030      C: 75416 0    C: 77507 0    C: 65515 0    C: 77741 0    C: 63547 1    C: 77052 0    C: 55373 0    C: 01167 0

30,3040      C: 30361 0    C: 76520 1    C: 75267 0       34746 0       54156 1       00006 1       33062 0       52155 1
30,3050         52132 0       30162 1       07330 0       52156 1       52155 1       52132 0       20155 1       06060 1
30,3060      I: 43476 0    C: 00542 1    C: 34414 1    I: 77331 0    C: 03277 0    C: 00000 1    C: 06503 1    C: 03266 0
30,3070      C: 03260 0    I: 77616 0    I: 77775 1    C: 03252 1    I: 40200 1    C: 61074 0    C: 00023 0    I: 77420 1

30,3100      C: 03246 1       33745 1       56003 1       55645 0       30111 0       74730 0       10000 0       34744 1
30,3110         55647 1       34734 0       70111 1       55650 1       00004 0       30032 0       54771 1       30033 1
30,3120         54765 1       30034 0       54767 0       34733 1       00006 1       02030 0       10000 0       13143 0
30,3130         34727 1       00006 1       02031 1       10000 0       13143 0       31634 1       54771 1       31635 0

30,3140         54765 1       31636 0       54767 0       06060 1    I: 77634 0    C: 21724 0    C: 24001 0    C: 03260 0
30,3150      I: 47034 0    C: 21724 0    C: 47607 0    C: 24015 0    C: 00325 0    I: 53404 1    C: 61734 0    I: 45000 0
30,3160      C: 61174 1    C: 47663 1    I: 77776 1       31667 1       22157 1       03467 1       55667 0       31671 0
30,3170         22161 1       03467 1       55671 1       06060 1    I: 46135 1    C: 03251 1    C: 61202 0    I: 45175 0

30,3200      C: 00015 0    C: 61507 1    I: 77775 1    C: 02153 1    C: 34015 1    C: 61507 1    I: 57575 1    C: 02137 0
30,3210      C: 00015 0    I: 47375 0    C: 00015 0    C: 00001 0    I: 41456 0    I: 76435 1    C: 00001 0    C: 00015 0
30,3220      I: 63361 0    C: 03272 0    I: 51361 1    C: 03270 1    I: 53372 1    C: 00001 0    I: 77656 1    C: 00001 0
30,3230      I: 76435 1    C: 00015 0    C: 00007 0    I: 47276 1    C: 00001 0    I: 77772 0    C: 00015 0    I: 77624 1

30,3240      C: 61517 0    I: 77776 1       31676 1       26154 0       30156 0       54001 1       33757 1       03713 1
30,3250         56156 0       00006 1       20156 1       00006 1       13256 1       13742 1       00004 0       22007 0
30,3260         34743 0       54142 1       30001 0       00006 1       70000 0       64341 0       00006 1       63272 0
30,3270         34746 0       55650 1       50142 0       30154 1       50142 0       54321 0       00006 1       50142 0

30,3300         21634 0       40000 0       50142 0       55673 0       54001 1       10142 1       13261 0       34727 1
30,3310         00006 1       02031 1       10000 0       13736 1       30101 1       74736 0       00006 1       13736 1
30,3320         23675 1       51647 0       33753 0       03713 1       55675 0       31674 0       00006 1       70745 0
30,3330         54001 1       51647 0       33755 0       03713 1       00006 1       10745 0       57674 0       00006 1

30,3340         70737 0       20001 1       40000 0       00006 1       21673 0       54001 1       51647 0       33753 0
30,3350         03713 1       55673 0       11650 1       41673 0       55673 0       41674 1       00006 1       70737 0
30,3360         20001 1       27673 0       41673 0       55642 1       41674 1       00006 1       70737 0       20001 1
30,3370         27642 1       27642 1       41674 1       00006 1       70747 1       20001 1       00006 1       70745 0
```

OCTAL LISTING FOR PARAGRAPH # 163, WITH PARITY BIT IN BINARY AT THE RIGHT OF EACH WORD, "@" DENOTES UNUSED FIXED MEMORY

ALL VALID WORDS ARE BASIC INSTRUCTIONS EXCEPT THOSE MARKED "I" (INTERPRETIVE OPERATOR WORDS) OR "C" (CONSTANTS)

```
30,3400      55643 0     41675 0     00006 1     70741 1     27643 0     27643 0     27643 0     31674 0
30,3410      00006 1     70741 1     20001 1     00006 1     70745 0     55644 1     41675 0     00006 1
30,3420      70747 1     27644 1     27644 1     27644 1     34743 0     54142 1     50142 0     31673 1
30,3430      00006 1     73760 1     03727 0     50142 0     55637 0     50142 0     11642 1     64744 1

30,3440      13442 1     64744 1     00006 1     50142 0     71642 1     00006 1     74732 1     00006 1
30,3450      50142 0     11530 1     54001 1     33755 0     03713 1     50142 0     55274 0     10142 1
30,3460      13425 0     31645 1     54003 0     06060 1  I: 52001 1  C: 00001 0  C: 03246 1     00006 1
30,3470      22142 0     54143 0     40000 0     60001 0     00006 1     51647 0     73746 0     54001 1

30,3500      33750 0     03713 1     60143 1     54001 1     33751 1     03713 1     00142 0  I: 63441 0
30,3510   C: 00001 0  I: 50025 0  C: 21753 0  C: 61211 1  I: 43531 1  C: 03251 1  C: 00000 1  I: 63545 0
30,3520   C: 00003 1  I: 51021 0  C: 06475 1  C: 61526 1  I: 77745 1  C: 06505 1  I: 77566 1     00006 1
30,3530      30155 0     20001 1     54145 0     13536 0     34724 1     54145 0     50120 1     30002 0

30,3540      22154 1     03606 1     54156 1     34746 0     03564 0     34742 1     03564 0     40141 1
30,3550      03606 1     54155 1     34741 1     03564 0     33563 1     03564 0     40141 1     03606 1
30,3560      54154 0     06060 1  I: 77616 0  C: 00016 0     60120 1     54116 0     50116 1     30000 1
30,3570      00006 1     63573 0     40000 0     60145 1     00006 1     63603 1     00006 1     50116 1

30,3600      30001 0     00006 1     10145 0     54001 1     22141 0     00002 0     00006 1     13651 1
30,3610      00006 1     22144 0     54142 1     30001 0     54143 0     34746 0     00006 1     10142 1
30,3620      00006 1     13640 1     10143 0     34746 0     13630 0     40142 1     54142 1     34726 0
30,3630      54143 0     30142 0     03656 1     03727 0     00006 1     20143 0     03727 0     00144 0

30,3640      40143 0     03656 1     64727 1     54143 0     10142 1     30143 1     13636 0     40143 0
30,3650      13636 0     10001 1     34746 0     00002 0     34726 0     00002 0     60000 1     54021 0
30,3660      13664 1     50000 1     44725 1     54021 0     00006 1     70000 0     54141 1     00006 1
30,3670      73712 1     63711 0     00006 1     70141 1     63710 1     00006 1     70141 1     63707 1

30,3700      00006 1     70141 1     63706 0     00006 1     70021 0     00002 0  C: 24406 0  C: 00660 1
30,3710   C: 16204 0  C: 50744 0  C: 20315 1     54141 1     34746 0     00006 1     10141 1     10000 0
30,3720      22141 0     13723 0     13725 0     30001 0     00002 0     40141 1     00002 0     10000 0
30,3730      64744 1     00002 0     40000 0     00002 0     05571 1  C: 00402 1     00004 0     04665 0

30,3740   C: 40166 1     13461 0     05571 1  C: 00401 1     13256 1  C: 03245 1  C: 06315 0  C: 03146 1
30,3750   C: 00071 1  C: 02041 0  C: 01673 1  C: 03434 1  C: 00266 0  C: 01616 1  C: 00133 0  C: 14344 1
30,3760   C: 01463 1  C: 03761 1  C: 03762 1  CKSM 64432 0       @           @           @           @
30,3770         @           @           @           @           @           @           @           @
```

```
OCTAL LISTING FOR PARAGRAPH # 164,  WITH PARITY BIT IN BINARY AT THE RIGHT OF EACH WORD, "@" DENOTES UNUSED FIXED MEMORY

ALL VALID WORDS ARE BASIC INSTRUCTIONS EXCEPT THOSE MARKED "I" (INTERPRETIVE OPERATOR WORDS) OR "C" (CONSTANTS)

31,2000     C: 00222 0   C: 33316 0   C: 07401 0   C: 06613 0   C: 00010 0   C: 00307 0   C: 17534 0      06060 1
31,2010     I: 77624 1   C: 62120 0   I: 77776 1      00006 1      31572 0      53600 1      00006 1      31574 0
31,2020        53602 0      00006 1      31576 1      53604 0      32143 0      04607 1   C: 20323 1      15474 1
31,2030        12032 0      12024 1      22007 0      34747 1      54002 1      50002 0      41571 1      50002 0

31,2040        61577 0      26001 1      10002 1      12034 0      22000 1      00006 1      12051 0      05506 1
31,2050     C: 00160 0      06060 1   I: 77414 0   C: 03707 1   C: 62056 0      15474 1   I: 77745 1   C: 02172 1
31,2060     I: 72412 0   C: 14001 0   C: 02174 1   C: 14003 1   C: 02176 0   I: 77661 0   C: 20213 0   C: 00005 1
31,2070     I: 72014 1   C: 04307 1   C: 62102 0   C: 00000 1   I: 72130 0   C: 02000 0   C: 00002 0   I: 52130 1

31,2100     C: 02001 1   C: 62110 0   I: 66150 0   C: 00000 1   C: 02006 0   I: 66150 0   C: 00002 0   C: 02007 1
31,2110     I: 66150 0   C: 00004 0   C: 02003 0   I: 77730 0   C: 02002 1   I: 77414 0   C: 02676 1      15474 1
31,2120     I: 40020 1   C: 00051 0   C: 62123 0   I: 45014 0   C: 03667 0   C: 27447 0   I: 71331 0   C: 00051 0
31,2130     C: 00006 1   C: 06505 1   C: 02172 1   C: 02174 1   C: 02176 0   I: 77770 1   C: 00066 1   I: 47573 0

31,2140     C: 02467 0   I: 77650 1   C: 60002 0   C: 01543 1      31245 0      00006 1      72363 1      00006 1
31,2150        23607 1      02344 0      53470 1      00006 1      31464 0      02344 0      00004 0      55615 0
31,2160        53466 0      00006 1      31234 0      53753 0      00003 1      32365 0      54002 1      31615 1
31,2170        72364 0      00006 1      10002 1      00006 1      74774 0      55750 0      41617 1      60025 0

31,2200        74724 0      40000 0      64773 0      00006 1      62210 0      00006 1      31611 0      21470 1
31,2210        35005 1      54003 0      00006 1      31473 0      52131 0      35007 0      54003 0      44746 1
31,2220        55606 1      40131 0      61620 1      00006 1      62236 1      40130 1      61465 1      00006 1
31,2230        62233 1      31467 0      12243 1      42002 0      61467 0      12245 1      40131 0      61465 1

31,2240        00006 1      62246 0      32003 0      57465 1      34730 1      55606 1      03751 1      00006 1
31,2250        31466 1      55620 0      53613 0      00006 1      41470 1      21613 0      31612 0      61606 0
31,2260        55614 1      54055 0      34741 1      00006 1      05014 1      30025 0      55617 1      31762 0
31,2270        54130 1      41010 0      62454 0      00006 1      12301 0      31234 0      54130 1      34774 1

31,2300        12302 0      34771 1      54002 1      00006 1      74737 1      22131 1      40130 1      60025 0
31,2310        62004 1      74350 1      22007 0      00006 1      10002 1      00006 1      71612 1      20001 1
31,2320        53611 1      11612 1      64744 1      12325 0      64744 1      00006 1      71612 1      00006 1
31,2330        10131 0      22007 0      21611 1      01607 1      34730 1      55606 1      44746 1      55620 0

31,2340        55612 1      00006 1      23607 1      12256 0      00006 1      22130 0      52155 1      07124 1
31,2350     C: 01243 0      07124 1   C: 02005 0      07300 0      30154 1      00006 1      12361 0      34724 1
31,2360        00130 0      52156 1      00130 0   C: 04143 0   C: 17777 0   C: 35074 1      12562 0      12562 0
31,2370        12550 1      12452 1      12742 0      12752 1      12643 0      13015 1      13015 1      13015 1
```

```
OCTAL LISTING FOR PARAGRAPH # 165,  WITH PARITY BIT IN BINARY AT THE RIGHT OF EACH WORD, "@" DENOTES UNUSED FIXED MEMORY

ALL VALID WORDS ARE BASIC INSTRUCTIONS EXCEPT THOSE MARKED "I" (INTERPRETIVE OPERATOR WORDS) OR "C" (CONSTANTS)

31,2400       13222 1     13207 0     13207 0     13266 1     13307 1     13315 1     13426 0     13444 1
31,2410       13502 1     13731 0     13733 1     13733 1  C: 00000 1  C: 00000 1  C: 00002 0  I: 77776 1
31,2420       34743 0     55647 1     12530 1     55647 1     12742 0     05355 1  C: 00035 1     30101 1
31,2430       74735 0     00006 1     13420 0     05355 1  C: 05023 0  C: 20000 0     41010 0     62454 0

31,2440       00006 1     12523 0     34730 1     00006 1     02031 1     10000 0     12530 1     31746 0
31,2450       00006 1     12530 1     03751 1     05313 0  C: 00102 1     00006 1     31474 1     53645 0
31,2460       05506 1  C: 00016 0     41354 0     55623 0     06060 1  I: 47375 0  C: 02316 1  C: 03521 1
31,2470    C: 03434 1  I: 57551 1  C: 01254 0  C: 27764 1  C: 06505 1  C: 17767 1  C: 02535 0  C: 17757 1

31,2500    C: 01234 0  C: 03760 0  I: 77776 1     04607 1  C: 65425 1     34746 0     55620 0     55610 0
31,2510       55611 1     34743 0     55621 1     55346 0     05520 0  C: 00311 1     05506 1  C: 00023 0
31,2520       05506 1  C: 00022 1     13517 0     30075 0     74731 1     00006 1     12464 1     13517 0
31,2530       34746 0     55746 1     00006 1     31625 1     53574 1     03751 1     00006 1     31561 1

31,2540       53625 0     00006 1     31643 1     53553 1     11623 0     12562 0     51346 1     12367 0
31,2550       05313 0  C: 00100 0     31425 0     27552 0     33761 1     55343 0     05520 0  C: 00143 1
31,2560       31315 1     55421 0     06060 1  I: 45345 1  C: 03625 0  C: 03574 1  I: 41461 1  C: 21214 0
31,2570    I: 47361 0  C: 03635 1  C: 02316 1  I: 47045 0  C: 03635 1  C: 21724 0  I: 76561 1  C: 02324 0

31,2600    C: 17545 0  I: 77776 1     52155 1     21553 1     03751 1     00006 1     31553 0     53643 0
31,2610       03702 1     37737 0     05137 1     06060 1  I: 53375 0  C: 03545 0  C: 02632 1  C: 03635 1
31,2620    I: 77646 0  C: 02324 0  I: 77776 1     03751 1     35005 1     54003 0     34746 0     55631 0
31,2630       55632 0     55633 1     55634 0     55635 1     55636 1     35007 0     54003 0     34727 1

31,2640       05137 1     51346 1     12373 0     30102 1     74737 1     00006 1     12752 1     31666 0
31,2650       00006 1     12752 1     00004 0     31645 1     55554 0     31644 0     55556 1     03751 1
31,2660       34746 0     55645 0     55644 1     55555 1     55557 0     30120 1     54166 1     06060 1
31,2670    I: 52375 1  C: 03635 1  C: 03521 1  I: 41434 1  C: 21724 0  I: 76435 1  C: 02145 0  I: 65361 0

31,2700    C: 03555 1  C: 03557 0  I: 52361 1  C: 02145 0  I: 41455 0  I: 45345 1  C: 00001 0  C: 05662 0
31,2710    I: 71240 1  C: 62714 1  C: 05662 0  C: 00001 0  I: 45345 1  C: 03635 1  C: 03521 1  I: 74271 0
31,2720    C: 00001 0  I: 53455 0  C: 03521 1  I: 76561 1  C: 02324 0  C: 03545 0  I: 77776 1     03751 1
31,2730       00006 1     31545 1     53635 1     00006 1     31547 0     53637 0     00006 1     31551 1

31,2740       53641 1     12752 1     06060 1  I: 64375 1  C: 00025 0  C: 01732 0  I: 53362 0  C: 03252 1
31,2750    C: 03527 1  I: 77776 1     06060 1  I: 47375 0  C: 03521 1  C: 02316 1  I: 70455 1  C: 03527 1
31,2760    C: 02222 1  I: 77721 0  C: 02572 0  C: 27627 1  C: 03521 1  I: 41451 1  C: 03635 1  I: 76521 0
31,2770    C: 02572 0  C: 16624 0  C: 00162 1  C: 26614 0  I: 50234 1  C: 21724 0  C: 02137 0  I: 77776 1
```

```
OCTAL LISTING FOR PARAGRAPH # 166,  WITH PARITY BIT IN BINARY AT THE RIGHT OF EACH WORD, "@" DENOTES UNUSED FIXED MEMORY

ALL VALID WORDS ARE BASIC INSTRUCTIONS EXCEPT THOSE MARKED "I" (INTERPRETIVE OPERATOR WORDS) OR "C" (CONSTANTS)

31,3000      30120 1     54166 1     30154 1     60000 1     04607 1  C: 61656 0     63765 0     61353 0
31,3010      00006 1     73764 0     55667 0     51346 1     12376 0     31346 1     03675 0  I: 77743 1
31,3020   C: 02443 0  C: 23571 0  C: 02437 0  C: 17567 0  C: 03633 1  I: 42605 1  C: 05660 1  C: 02433 1
31,3030   C: 23565 0  C: 02407 0  I: 41225 1  C: 02630 0  C: 05656 1  C: 03563 1  I: 77776 1     34735 1

31,3040      55572 1     00006 1     31643 1     52155 1     34743 0     54001 1     33757 1     03545 0
31,3050      51346 1     12412 0     00006 1     30155 0     53643 0     03702 1     41642 1     61426 0
31,3060      64724 1     54001 1     40001 1     60001 0     22007 0     00006 1     11642 1     54130 1
31,3070      00006 1     70000 0     54131 0     60130 0     56131 1     60131 1     54154 0     60131 1

31,3100      50120 1     54032 1     60131 1     50120 1     54034 1     60130 0     64724 1     60131 1
31,3110      60131 1     50120 1     54036 0     34746 0     54163 1     31346 1     03675 0  I: 65361 0
31,3120   C: 03627 1  C: 00035 1  I: 47157 1  C: 02413 0  C: 63671 1  I: 47113 1  C: 02403 1  C: 63671 1
31,3130   I: 70251 0  C: 02624 0  C: 03643 0  I: 74342 1  C: 00033 1  I: 53255 0  I: 74341 1  C: 03643 0

31,3140   C: 05660 1  I: 73725 0  C: 00037 0  C: 02423 0  I: 53234 1  C: 63671 1  I: 76505 0  C: 02572 0
31,3150   I: 70315 1  C: 01236 1  C: 05654 0  I: 45445 0  C: 74525 0  I: 77646 0  C: 17464 1  C: 03252 1
31,3160   I: 65316 0  C: 03254 1  I: 65316 0  C: 05652 0  I: 63471 0  C: 01244 1  I: 45225 0  I: 71244 0
31,3170   C: 63172 0  C: 06505 1  I: 43366 0  C: 03256 0  I: 44244 0  C: 63200 0  C: 03256 0  C: 03256 0

31,3200   I: 77776 1     03751 1     31346 1     55621 1     25623 1     51346 1     12401 1     51346 1
31,3210      31423 0     61642 0     00006 1     63222 0     03751 1     31621 0     64744 1     55346 0
31,3220      34746 0     55623 0     31621 0     03675 0  I: 77543 0  C: 02453 1     31642 0     54001 1
31,3230      20155 1     10155 1     10154 0     13264 0     13264 0     13236 1     06060 1  I: 53575 0

31,3240   C: 03635 1  C: 16572 0  C: 03643 0  I: 74203 0  C: 02447 1  C: 02222 1  I: 77655 1  C: 03635 1
31,3250   I: 47051 0  C: 03521 1  C: 21724 0  I: 47035 1  C: 03635 1  C: 21724 0  C: 26600 0  C: 02572 0
31,3260   I: 76435 1  C: 02600 0  C: 02606 0  I: 77776 1     51621 0     12404 1     06060 1  I: 47175 1
31,3270   C: 03252 1  C: 21724 0  I: 74361 0  C: 03423 1  C: 22001 0  C: 03252 1  I: 77776 1     11647 1

31,3300      12423 1     11646 0     13305 0     05571 1  C: 01412 1     04626 1  C: 64712 1     06060 1
31,3310   I: 77775 1  C: 03537 0  C: 03260 0  I: 77776 1     13371 0     06060 1  I: 52375 1  C: 03635 1
31,3320   C: 03521 1  I: 77634 0  C: 21724 0  C: 03260 0  I: 50235 0  C: 02137 0  C: 02600 0  I: 77776 1
31,3330      40154 0     63766 0     64724 1     54130 1     40130 1     26130 1     43767 0     60154 1

31,3340      64724 1     54131 0     40131 0     26131 0     34742 1     76263 1     54002 1     35005 1
31,3350      54003 0     30130 0     00006 1     50002 0     71605 1     24006 1     50002 0     53660 1
31,3360      00006 1     70131 0     50002 0     21660 1     10002 1     13345 1     31773 0     55676 0
31,3370      24006 1     30121 0     00006 1     13376 1     03736 0     13415 0     40076 1     74732 1
```

```
OCTAL LISTING FOR PARAGRAPH # 167,  WITH PARITY BIT IN BINARY AT THE RIGHT OF EACH WORD, "@" DENOTES UNUSED FIXED MEMORY

ALL VALID WORDS ARE BASIC INSTRUCTIONS EXCEPT THOSE MARKED "I" (INTERPRETIVE OPERATOR WORDS) OR "C" (CONSTANTS)

31,3400        00006 1      13407 0      00004 0      04665 0   C: 40166 1      00003 1      13415 0      02144 1
31,3410        03751 1      06060 1   I: 77624 1   C: 61072 0   I: 77776 1      00006 1      34746 0      52756 1
31,3420        40104 0      74733 0      00006 1      15146 0      51621 0      12406 0      05156 0      40107 0
31,3430        74735 0      00006 1      13441 1      33770 1      04607 1   C: 20452 0      05146 1      05146 1

31,3440        05146 1      33770 1      04607 1   C: 20460 1      31666 0      00006 1      13475 0      40102 0
31,3450        74737 1      00006 1      13477 1      05156 0      33771 0      04607 1   C: 20452 0      16001 1
31,3460        13462 0      13444 1      34746 0      55645 0      55644 1      00004 0      06040 0      34731 0
31,3470        00006 1      05013 0      05506 1   C: 00143 1      15146 0      05520 0   C: 00143 1      05156 0

31,3500        33771 0      13442 1      05156 0      33772 0      04607 1   C: 20452 0      16001 1      13511 0
31,3510        13511 0      05520 0   C: 00016 0      15146 0      02147 1      25623 1      13420 0      05355 1
31,3520     C: 00003 1      06060 1   I: 45234 0   C: 21603 1   C: 01234 0   I: 51021 0   C: 02500 0   C: 65074 1
31,3530     I: 77414 0   C: 00663 1      41354 0      57623 1      00006 1      63537 0      13420 0      00004 0

31,3540        04607 1   C: 40166 1      05571 1   C: 01466 1      13420 0      00006 1      22132 1      54117 1
31,3550        52160 1      33670 0      54141 1      54161 0      10160 1      54162 0      34746 0      54163 1
31,3560        00006 1      30155 0      52127 1      50157 1      30005 1      07330 0      04704 0   C: 01226 0
31,3570        52155 1      52125 0      00006 1      50117 0      30004 0      52155 1      30160 0      54140 0

31,3600        64744 1      07337 1      00006 1      50117 0      30002 0      52155 1      50141 0      52004 1
31,3610        44743 1      26117 1      44743 1      26141 1      10140 0      13577 0      00006 1      30127 0
31,3620        52155 1      00006 1      30162 1      07236 1      00006 1      30127 0      52155 1      52131 0
31,3630        00006 1      30160 0      07236 1      04704 0   C: 00353 1      00006 1      40155 1      20127 1

31,3640        04704 0   C: 01226 0      00006 1      40125 0      20155 1      30163 0      74741 0      10000 0
31,3650        00132 1      24163 0      10154 0      13616 1      13656 0      13662 1      10155 1      13616 1
31,3660        13662 1      13662 1      52127 1      52155 1      30163 0      54156 1      50132 1      10002 1
31,3670     C: 00147 0      34746 0      54157 0      54160 1      16102 0      50000 1      42415 1      50120 1

31,3700        54046 1      16060 0      31642 0      00006 1      74741 0      53476 1      35005 1      54003 0
31,3710        31454 0      24006 1      24006 1      61642 0      00006 1      73763 1      63760 0      64726 0
31,3720        54001 1      40001 1      60001 0      63762 1      64724 1      55666 1      41666 1      27666 1
31,3730        00002 0      05644 1   C: 21406 0      05571 1   C: 01406 1      13402 0      00006 1      23456 1

31,3740        05571 1   C: 01410 0      00004 0      04665 0   C: 40166 1      00003 1      34746 0      54121 1
31,3750        01456 1      35000 1      56003 1      52002 1      55442 0      22003 1      00000 1   C: 01565 0
31,3760     C: 77630 1   C: 00155 0   C: 00143 1   C: 75340 1   C: 00264 1   C: 00056 1   C: 01542 0   C: 01022 0
31,3770     C: 01477 1   C: 01500 0   C: 01474 1   C: 03773 1   C: 03774 0 CKSM 44101 1         @            @
```

```
OCTAL LISTING FOR PARAGRAPH # 170,  WITH PARITY BIT IN BINARY AT THE RIGHT OF EACH WORD, "@" DENOTES UNUSED FIXED MEMORY

ALL VALID WORDS ARE BASIC INSTRUCTIONS EXCEPT THOSE MARKED "I" (INTERPRETIVE OPERATOR WORDS) OR "C" (CONSTANTS)

32,2000      C: 00044 1    C: 70123 0    C: 40702 0    C: 13337 1    C: 10776 0       34730 1       70077 0       10000 0
32,2010         02017 0       05571 1    C: 00220 1       05474 0       00006 1       30014 1       53772 0       00006 1
32,2020         31772 1       53051 0       32166 1       04607 1    C: 20323 1       05474 0       02036 0       44737 1
32,2030         60154 1       00006 1       12014 1       00006 1       31051 1       02016 1       06060 1    I: 77414 0

32,2040      C: 02076 1       32166 1       04607 1    C: 20632 1       06060 1    I: 77634 0    C: 21603 1    C: 34041 0
32,2050      C: 27115 1    I: 77624 1    C: 64126 0    C: 16172 1    C: 00015 0    C: 34041 0    C: 27101 1    I: 77624 1
32,2060      C: 64126 0    C: 16200 1    C: 00015 0    I: 56225 1    C: 03372 1    C: 24171 0    C: 02206 1    I: 77776 1
32,2070         34744 1       54333 0       32172 1       04607 1    C: 01736 1       31321 0       54333 0       34735 1

32,2100         70074 0       10000 0       02120 0       11301 0       12107 1       12113 1       12107 1       34354 1
32,2110         04607 1    C: 01736 1       12103 0       04607 1    C: 16701 0       04607 1    C: 17735 0       02120 0
32,2120         32167 0       04607 1    C: 20334 1       15474 1       15474 1       05474 0    I: 64375 1    C: 00025 0
32,2130      C: 01732 0    I: 72561 0    C: 24176 1    I: 53255 0    C: 24200 0    C: 24206 0    I: 77634 0    C: 21770 1

32,2140      C: 24025 0    C: 00017 1    I: 74321 1    C: 01732 0    C: 24174 0    I: 53212 0    C: 24200 0    I: 47055 1
32,2150      C: 24206 0    C: 21770 1    I: 77750 0    C: 00024 1    I: 72130 0    C: 00155 0    C: 00026 0    I: 72130 0
32,2160      C: 00160 0    C: 00030 1    I: 43530 0    C: 00162 1    C: 00216 1    C: 14400 0    C: 01420 0    C: 14420 1
32,2170      C: 03100 0    C: 00000 1    C: 03720 1    C: 15077 0    C: 05041 1    C: 24402 1    C: 25724 1    C: 00000 1

32,2200      C: 60000 1    C: 00000 1    C: 60000 1    C: 00000 1    C: 60000 1    C: 00000 1    C: 37777 1    C: 00000 1
32,2210      C: 37777 1    C: 00000 1    C: 37777 1    I: 77624 1    C: 27447 0    I: 77745 1    C: 03442 0    C: 03661 0
32,2220      C: 00041 1    I: 43014 0    C: 01674 0    C: 01673 1    I: 43014 0    C: 01676 1    C: 01675 1    I: 77624 1
32,2230      C: 27172 0    I: 77624 1    C: 51770 0    I: 77775 1    C: 00017 1    C: 17631 0    C: 00015 0    C: 34041 0

32,2240      C: 27447 0    I: 43014 0    C: 01474 1    C: 01673 1    I: 43014 0    C: 01676 1    C: 02756 1    C: 64253 1
32,2250      I: 43014 0    C: 01476 0    C: 01475 0    I: 77624 1    C: 27172 0    I: 77624 1    C: 51770 0    I: 77775 1
32,2260      C: 00025 0    C: 25757 0    C: 00017 1    C: 01101 0    I: 53435 0    C: 01757 0    C: 24025 0    C: 03631 0
32,2270      I: 53435 0    C: 00025 0    C: 27637 0    C: 01101 0    I: 50256 0    C: 03637 0    I: 77752 1    C: 02732 0

32,2300      I: 44316 0    C: 06475 1    I: 77766 0    C: 26730 1    C: 01101 0    C: 26655 0    C: 01757 0    I: 77676 0
32,2310      C: 02744 1    I: 45014 0    C: 03666 1    C: 24732 1    I: 77676 0    C: 03645 0    I: 77745 1    C: 00037 0
32,2320      C: 27663 1    C: 03645 0    I: 77646 0    C: 24025 0    C: 00001 0    C: 03653 1    I: 53435 0    C: 03631 0
32,2330      I: 53435 0    C: 03653 1    I: 76561 1    C: 00025 0    C: 37665 0    C: 51770 0    I: 77624 1    C: 27447 0

32,2340      I: 44345 0    C: 03663 1    C: 03661 0    C: 25517 0    C: 03653 1    C: 01535 0    C: 25503 0    C: 03665 1
32,2350      C: 35511 1    C: 27734 1    I: 45174 1    C: 00002 0    C: 26717 1    I: 77624 1    C: 27456 0    I: 77776 1
32,2360         04607 1    C: 50040 0       04635 0       55737 1       05520 0    C: 00120 1       00004 0       34742 1
32,2370         00006 1       02033 0       54001 1       44742 0       70110 0       60001 0       54110 0       00003 1
```

```
OCTAL LISTING FOR PARAGRAPH # 171,  WITH PARITY BIT IN BINARY AT THE RIGHT OF EACH WORD, "@" DENOTES UNUSED FIXED MEMORY

ALL VALID WORDS ARE BASIC INSTRUCTIONS EXCEPT THOSE MARKED "I" (INTERPRETIVE OPERATOR WORDS) OR "C" (CONSTANTS)

32,2400       04607 1    C: 53072 1       04607 1    C: 17733 0       12560 1       00004 0       53105 0       52162 0
32,2410       53101 1       53747 0       00006 1       30034 0       52160 1       30032 0       54156 1       00006 1
32,2420       30025 0       52155 1       00006 1       30036 1       53107 1       00003 1       04607 1    C: 53074 1
32,2430       04607 1    C: 17733 0       02554 1       00004 0       00006 1       31331 1       53761 1       52162 0

32,2440       53755 0       52160 1       53460 0       00006 1       31107 0       53753 0       30156 0       55461 1
32,2450       06060 1    C: 14025 0    C: 03755 0    I: 45225 0    C: 01777 1    C: 24567 0    I: 77440 1    C: 64472 1
32,2460       40110 0       74742 0       10000 0       34724 1       62565 0       55073 0       06060 1    I: 77745 1
32,2470    C: 03755 0    C: 01777 1    I: 77745 1    C: 03747 0    I: 57261 0    C: 20217 1    C: 24002 0    C: 03751 1

32,2500    I: 47135 0    C: 01107 0    C: 21606 1    C: 03734 1    I: 47135 0    C: 01110 0    C: 21606 1    C: 17736 0
32,2510    C: 01101 0    I: 66405 0    C: 24004 0    C: 37757 0    C: 46041 0    C: 17741 0    C: 00025 0    C: 34041 0
32,2520    C: 51337 1    I: 77776 1       31457 0       54765 1       31460 1       54767 0       31461 0       54771 1
32,2530       06060 1    I: 45175 0    C: 01101 0    C: 47643 0    I: 77641 1    C: 03741 0    I: 65552 0    C: 01045 1

32,2540    I: 50025 0    C: 24564 0    C: 64547 0    I: 77776 1       34743 0       54154 0       12552 0    I: 77776 1
32,2550       34746 0       54154 0       31737 0       04631 1       30101 1       74733 0       10000 0       12400 0
32,2560       34744 1       54154 0       02552 1    C: 00210 1    C: 21042 1    C: 57776 0    C: 00000 1    C: 11610 0
32,2570       06060 1    I: 77624 1    C: 75612 0    I: 45175 0    C: 03701 1    C: 57271 1    C: 03502 0    I: 77776 1

32,2600       04626 1    C: 65656 1       05355 1    C: 04024 0       04607 1    C: 33757 1       33063 1       55455 0
32,2610       32000 0       55250 0       34742 1       55515 0       44744 0       55346 0       34746 0       55623 0
32,2620       44727 0       00006 1       03012 1       06060 1    I: 77614 1    C: 00664 0    I: 43014 0    C: 02663 0
32,2630    C: 03271 0    I: 43014 0    C: 05660 1    C: 03067 0    I: 43014 0    C: 00266 0    C: 00270 1    I: 77201 1

32,2640    C: 00001 0    C: 02021 0    I: 41525 0    C: 02027 0    C: 37625 1    C: 55716 1    I: 64312 0    C: 01732 0
32,2650    C: 37635 0    C: 71346 0    I: 45345 1    C: 02027 0    C: 25070 1    C: 34041 0    C: 27115 1    I: 77331 0
32,2660    C: 03647 1    C: 00050 1    C: 06503 1    C: 26572 0    C: 06501 0    C: 26600 0    C: 06477 0    C: 16606 0
32,2670    C: 25066 0    C: 27665 1    C: 06505 1    C: 17252 1    C: 06505 1    C: 17643 0    C: 25074 0    C: 03452 1

32,2700    I: 77745 1    C: 00015 0    C: 27561 0    C: 00017 1    I: 64312 0    C: 01732 0    C: 37521 0    C: 67037 1
32,2710    C: 35236 0    C: 62417 1       55646 0       06060 1    I: 57345 1    C: 03627 1    C: 02465 1    I: 44232 1
32,2720    C: 03633 1    I: 45325 1    C: 02463 1    C: 02630 0    I: 65222 0    C: 02626 1    I: 57316 1    C: 02467 0
32,2730    I: 65232 1    C: 02624 0    I: 57225 0    C: 02461 0    C: 02465 1    I: 51515 1    C: 03627 1    I: 57225 0

32,2740    C: 02457 0    C: 02471 1    I: 43215 0    I: 56215 1    I: 77661 0    C: 21613 0    I: 43206 1    C: 03561 0
32,2750    C: 14041 1    I: 45246 0    C: 25072 0    I: 45040 1    C: 64773 0    C: 27447 0    I: 43014 0    C: 01473 0
32,2760    C: 00063 1    I: 77745 1    C: 03561 0    C: 25517 0    C: 00017 1    C: 25535 0    C: 00025 0    C: 35543 0
32,2770    C: 27145 1    I: 77650 1    C: 64700 1    I: 53575 0    C: 03252 1    C: 27773 1    C: 06503 1    C: 27765 0
```

```
OCTAL LISTING FOR PARAGRAPH # 172,  WITH PARITY BIT IN BINARY AT THE RIGHT OF EACH WORD, "@" DENOTES UNUSED FIXED MEMORY

ALL VALID WORDS ARE BASIC INSTRUCTIONS EXCEPT THOSE MARKED "I" (INTERPRETIVE OPERATOR WORDS) OR "C" (CONSTANTS)

32,3000     C: 03527 1   I: 53435 0   C: 03521 1   I: 72441 0   C: 03635 1   C: 16614 0   C: 03423 1   I: 44261 1
32,3010     C: 20617 0   C: 00041 1   C: 03442 0   I: 77776 1      05355 1   C: 04024 0      44353 1      04607 1
32,3020     C: 74663 1      15146 0      35007 0      54003 0      00004 0      04665 0   C: 40143 0      00003 1
32,3030        04607 1   C: 54125 0      05355 1   C: 04024 0      34737 0      00006 1      02033 0      00006 1

32,3040        13046 1      33064 0      04607 1   C: 20635 0      16001 1      13034 1      34743 0      55674 1
32,3050        55675 0      34746 0      55670 0      55672 1      55671 1      55673 0      55462 1      34742 1
32,3060        55622 1      04626 1   C: 74130 0   C: 02100 1   C: 00500 1   C: 00035 1   C: 30373 0   C: 00004 0
32,3070     C: 01610 1   C: 00000 1   C: 00010 0   C: 00364 0   I: 74375 0   C: 03252 1   C: 02476 0   I: 52315 1

32,3100     C: 03434 1   C: 03527 1   I: 52341 0   C: 02475 0   I: 77776 1      35022 1      05137 1      33436 0
32,3110        54154 0      35005 1      54003 0      22157 1      31476 0      04607 1   C: 61713 0      54157 0
32,3120        22161 1      31476 0      04607 1   C: 61713 0      54161 0      35007 0      54003 0      30121 0
32,3130        00006 1      13135 1      04607 1   C: 63736 0      13164 0      34742 1      00006 1      02030 0

32,3140        00006 1      13146 0      30074 1      74744 0      00006 1      13154 0      06060 1   C: 03252 1
32,3150     I: 77624 1   C: 61074 0   I: 77776 1      13164 0      33435 0      55262 1      13164 0      37731 0
32,3160        05076 0   C: 03167 1   C: 64067 1      15263 1      34770 0      05175 1   C: 03157 1      37732 0
32,3170        05137 1      00004 0      34746 0      57746 0      00006 1      71756 0      21645 0      34741 1

32,3200        70374 0      10000 0      13213 0      34740 0      00006 1      02030 0      00006 1      13213 0
32,3210        00006 1      31474 1      53645 0      00006 1      30040 0      53764 1      52071 0      30041 1
32,3220        57765 1      56072 1      00006 1      30025 0      53762 1      03425 1      61157 0      54154 0
32,3230        31764 0      61160 1      54157 0      31765 1      61161 0      54161 0      41763 0      61253 1

32,3240        60070 0      55766 0      41764 1      61254 0      60071 1      55770 1      41765 0      61255 1
32,3250        60072 1      55772 0      34746 0      54155 1      54160 1      54162 0      55253 0      55254 1
32,3260        55255 0      44744 0      54163 1      06060 1   I: 65361 0   C: 26074 0   C: 03762 1   I: 77625 0
32,3270     C: 01234 0   C: 00037 0   I: 63271 0   C: 27057 0   C: 01236 1   I: 74251 1   C: 02616 1   I: 53352 0

32,3300     C: 03527 1   I: 45455 1   C: 53746 1   C: 03521 1   I: 77656 1   C: 00017 1   I: 72441 0   C: 00031 0
32,3310     C: 17474 0   C: 00037 0   I: 41261 1   C: 20214 1   C: 03474 0   I: 45215 0   C: 00045 0   C: 02324 0
32,3320     C: 17775 1   C: 03474 0   I: 56221 0   C: 03645 0   C: 02536 0   I: 51515 1   C: 01236 1   I: 60471 0
32,3330     C: 05654 0   C: 00025 0   I: 43234 0   C: 47600 1   I: 45115 0   C: 06503 1   C: 47665 1   I: 77641 1

32,3340     C: 00017 1   C: 00027 1   I: 45465 1   C: 50313 0   C: 03767 1   I: 53361 0   C: 26074 0   C: 02616 1
32,3350     I: 65246 1   C: 03762 1   I: 65225 1   C: 03760 0   C: 03762 1   C: 17760 0   I: 55271 0   C: 25441 1
32,3360     I: 41325 0   C: 03611 1   C: 25440 0   I: 56271 0   C: 01244 1   C: 22006 1   I: 65215 1   C: 00001 0
32,3370     C: 00025 0   I: 45271 1   C: 00027 1   I: 43205 1   C: 02540 1   C: 03464 1   I: 56325 0   C: 02544 0
```

```
OCTAL LISTING FOR PARAGRAPH # 173,  WITH PARITY BIT IN BINARY AT THE RIGHT OF EACH WORD, "@" DENOTES UNUSED FIXED MEMORY

ALL VALID WORDS ARE BASIC INSTRUCTIONS EXCEPT THOSE MARKED "I" (INTERPRETIVE OPERATOR WORDS) OR "C" (CONSTANTS)

32,3400     C: 01244 1    I: 56325 0    C: 02542 0    C: 01244 1    I: 44206 0    C: 00003 1    I: 71240 1    C: 65415 1
32,3410     I: 41545 0    I: 51021 0    C: 00003 1    C: 65415 1    I: 77745 1    I: 77745 1    I: 77601 0    C: 00003 1
32,3420     C: 17464 1    I: 77776 1       52155 1       04626 1    C: 63514 1       35006 1       54003 0       41422 0
32,3430        24006 1       00006 1       73442 1       27763 0       00002 0    C: 02037 1    C: 00053 1    C: 00001 0

32,3440     C: 00000 1    C: 04000 0    C: 00143 1       34742 1       55515 0       33653 1       55455 0       06060 1
32,3450     I: 43014 0    C: 04665 0    C: 04265 1    I: 43014 0    C: 03670 0    C: 06464 1    I: 45014 0    C: 04462 0
32,3460     C: 61063 0    I: 77776 1       05323 0    C: 00106 0       13577 0       06060 1    I: 77624 1    C: 65626 0
32,3470     I: 54345 1    C: 34003 0    C: 20205 1    I: 77665 1    C: 01244 1    C: 16262 0    C: 01244 1    I: 70471 1

32,3500     C: 16015 1    C: 03635 1    C: 03637 0    C: 03641 1    I: 77665 1    C: 25652 1    C: 16254 0    C: 34015 1
32,3510     C: 02260 1    I: 57535 0    C: 26002 1    I: 77702 1    C: 36256 0    C: 60267 1    I: 77745 1    C: 02564 1
32,3520     C: 36264 1    C: 57315 1    I: 45246 0    C: 02562 1    I: 75240 0    C: 65530 1    C: 02326 1    C: 03633 1
32,3530     I: 45345 1    C: 03633 1    C: 02326 1    I: 77661 0    C: 20606 0    C: 03643 0    I: 45014 0    C: 04461 0

32,3540     C: 71650 1    I: 51025 1    C: 02556 0    C: 65547 1    I: 52175 0    C: 02546 1    C: 65552 0    I: 43175 0
32,3550     C: 02552 1    C: 04470 0    C: 16572 0    C: 03631 0    C: 02576 1    I: 77414 0    C: 04471 1       03635 1
32,3560        05355 1    C: 04024 0       05506 1    C: 00216 1       04607 1    C: 73710 0       03635 1       35020 0
32,3570        05137 1       00006 1       33655 1       53252 1       05355 1    C: 00004 0       15146 0       05520 0

32,3600     C: 00215 1       36000 1       55250 0       06060 1    I: 77624 1    C: 60243 1    I: 45014 0    C: 04707 0
32,3610     C: 65614 1    C: 65626 0    I: 77650 1    C: 65516 0    I: 72545 0    C: 03517 1    C: 03502 0    I: 77776 1
32,3620        05355 1    C: 04024 0       00006 1       31502 1       53517 1       13564 1    I: 45234 0    C: 21603 1
32,3630     C: 03442 0    I: 77661 0    C: 20214 1    C: 03517 1    I: 77616 0       34730 1       54055 0       34741 1

32,3640        00006 1       05014 1       00002 0    C: 00000 1    C: 01750 1    C: 00021 1    C: 33400 0    C: 11021 1
32,3650     C: 00000 1    C: 00507 0    C: 25605 0    C: 02114 1    C: 03375 0    C: 70067 1       05355 1    C: 00035 1
32,3660        15146 0       06060 1    I: 43175 0    C: 03545 0    C: 03347 1    C: 66344 1    I: 64252 0    C: 01732 0
32,3670     C: 37521 0    C: 67037 1    I: 76575 1    C: 03553 1    I: 77721 0    C: 01732 0    C: 03527 1    I: 41535 1

32,3700     C: 01457 0    I: 41535 1    C: 01455 1    I: 55535 1    C: 01453 1    I: 77761 1    C: 26641 0    C: 02616 1
32,3710     I: 77776 I       00006 1       34746 0       52754 0       04626 1    C: 66347 1    C: 03716 1    C: 03717 0
32,3720   CKSM 02351 1          @             @             @             @             @             @             @
32,3730           @             @             @             @             @             @             @             @

32,3740           @             @             @             @             @             @             @             @
32,3750           @             @             @             @             @             @             @             @
32,3760           @             @             @             @             @             @             @             @
32,3770           @             @             @             @             @             @             @             @
```

```
OCTAL LISTING FOR PARAGRAPH # 174,  WITH PARITY BIT IN BINARY AT THE RIGHT OF EACH WORD, "@" DENOTES UNUSED FIXED MEMORY

ALL VALID WORDS ARE BASIC INSTRUCTIONS EXCEPT THOSE MARKED "I" (INTERPRETIVE OPERATOR WORDS) OR "C" (CONSTANTS)

33,2000     C: 41545 0    C: 42341 1    C: 51102 0    C: 42414 0    C: 75522 0    C: 46002 1    C: 51573 1    C: 62362 1
33,2010     C: 62770 0    C: 40667 1    C: 03034 0    C: 21031 0    C: 35045 0    C: 21077 1    C: 00000 1    C: 00000 1
33,2020     C: 37646 1    C: 07712 1    C: 74517 1    C: 54765 1    C: 35167 1    C: 20727 1    C: 01270 0    C: 22313 0
33,2030     C: 14743 1    C: 16747 1    C: 42001 0    C: 62422 1    C: 76653 0    C: 63102 1    C: 64725 0    C: 63461 1

33,2040     C: 00000 1    C: 00000 1    C: 03260 0    C: 23012 0    C: 37646 1    C: 07712 1    C: 00000 1    C: 00000 1
33,2050     C: 37646 1    C: 07712 1    C: 74517 1    C: 54765 1    C: 37777 1    C: 37777 1    C: 00000 1    C: 00000 1
33,2060     C: 00000 1    C: 00000 1    C: 65363 1    C: 64451 0    C: 21241 0    C: 03216 1    C: 30153 0    C: 23101 0
33,2070     C: 63105 0    C: 61733 1    C: 01507 1    C: 00321 1    C: 26706 1    C: 00150 0    C: 33343 0    C: 61377 0

33,2100     C: 55754 1    C: 77644 1    C: 65556 1    C: 64453 1    C: 55670 0    C: 00002 0    C: 11777 0    C: 01023 1
33,2110     C: 37155 1    C: 00065 1    C: 06244 0    C: 75751 0    C: 41775 1    C: 00022 1    C: 07212 1    C: 00007 0
33,2120     C: 16100 1       65355 1    C: 16035 0    C: 20000 0    C: 02132 0    C: 66067 0       37737 0       55074 1
33,2130        04607 1    C: 15333 0       06060 1    I: 51575 1    C: 00325 0    I: 77776 1       30154 1       55245 1

33,2140        00006 1       72072 1       53514 1       00006 1       31244 1       53571 1       40104 0       74735 0
33,2150        00006 1       12202 1       30106 0       74730 0       10000 0       00006 1       32001 1       54002 1
33,2160        00006 1       31514 0       00006 1       10002 1       00006 1       71243 1       21571 1       07124 1
33,2170     C: 02073 1       00006 1       31510 1       20155 1       52155 1       53174 0       03473 1       00006 1

33,2200        31174 1       53510 0       02367 1       04607 1    C: 47607 0       32343 1       04607 1    C: 20037 1
33,2210        06060 1    I: 45014 0    C: 03307 0    C: 66744 0    C: 66710 1    I: 77776 1       03473 1       02352 1
33,2220        55157 1       55160 0       55161 1       44732 1       70076 1       54076 1       34736 1       70103 1
33,2230        10000 0       12264 1       40102 0       74743 1       10000 0       12270 1       41250 0       61245 0

33,2240        00006 1       62274 1       40076 1       74732 1       26076 1       34744 1       55515 0       30106 0
33,2250        74730 0       10000 0       12317 1       34734 0       00006 1       02032 1       00006 1       12317 1
33,2260        44727 0       70111 1       54111 1       12322 1       44743 1       70102 0       54102 0       12317 1
33,2270        40102 0       74743 1       26102 0       12317 1       03473 1       11515 0       12310 0       10760 1

33,2300        12322 1       05355 1    C: 00374 1       37734 0       05063 1    C: 02570 1    C: 74067 0       12322 1
33,2310        55570 0       03473 1       31570 1       55515 0       00004 0       04665 0    C: 40166 1       40111 1
33,2320        74727 0       26111 1       00003 1       04607 1    C: 40463 1       30167 1       74775 1       54166 1
33,2330        22007 0       52121 1       03473 1       41234 1       60025 0       64727 1       64727 1       57355 0

33,2340        00006 1       31252 0       52006 0    C: 02136 1    I: 77624 1    C: 66642 1    I: 77776 1       32366 0
33,2350        02353 0       05146 1       36007 0       00004 0       77770 1       54061 1       00006 1       50061 0
33,2360        31545 1       50061 0       53220 1       10061 1       12354 0       00002 0    C: 00022 1       31155 1
33,2370        54765 1       31156 1       54767 0       31154 0       54771 1       00002 0       05355 1    C: 00051 0
```

```
OCTAL LISTING FOR PARAGRAPH # 175,  WITH PARITY BIT IN BINARY AT THE RIGHT OF EACH WORD, "@" DENOTES UNUSED FIXED MEMORY

ALL VALID WORDS ARE BASIC INSTRUCTIONS EXCEPT THOSE MARKED "I" (INTERPRETIVE OPERATOR WORDS) OR "C" (CONSTANTS)

33,2400      37741 1      05076 0   C: 03561 0   C: 66067 0      40107 0      75006 0      26107 0      12502 0
33,2410   I: 77776 1      40107 0      74726 1      00006 1      12505 1      40107 0      74734 1      00006 1
33,2420      12432 1      00006 1      33062 0      20155 1      10000 0      12444 0      05506 1   C: 00311 1
33,2430      05506 1   C: 00253 0      31534 1      00006 1      12436 0      12444 0      41535 1      61451 0

33,2440      00006 1      62444 1      05520 0   C: 00254 1      40107 0      74733 0      00006 1      12501 0
33,2450      34767 0      00006 1      02033 0      00006 1      74733 0      50000 1      12457 1      12462 1
33,2460      12471 0      12471 0      11622 1      12467 1      05571 1   C: 00511 1      44746 1      55622 1
33,2470      12501 0      54001 1      34742 1      55622 1      23650 0      41650 1      60001 0      00006 1

33,2500      13064 1      00004 0      43060 0      70107 0      54107 0      03473 1      30120 1      54166 1
33,2510      06060 1   I: 51575 1   C: 03573 0   I: 45206 1   C: 02324 0   C: 03535 1   C: 03775 1   I: 63261 1
33,2520   C: 20212 I   C: 03537 0   I: 51435 1   C: 03601 0   I: 56316 0   C: 00001 0   I: 63352 0   C: 03537 0
33,2530   I: 72441 0   C: 03601 0   C: 03474 0   I: 63312 1   C: 03573 0   I: 60505 1   C: 01732 0   C: 27545 0

33,2540   C: 03601 0   I: 76505 0   C: 01732 0   C: 27553 1   C: 03563 1   I: 70251 0   C: 02616 1   C: 26637 1
33,2550   I: 77776 1      00004 0      50120 1      52003 0      53710 1      50120 1      30004 0      55713 1
33,2560      50120 1      52007 1      53712 0      30154 1      55676 0      30157 1      55677 1      30161 1
33,2570      55700 0      00006 1      31537 1      20001 1      54000 0      12577 1      34724 1      57714 1

33,2600      00006 1      31541 C      20001 1      57715 0      00006 1      31543 1      20001 1      57716 0
33,2610      40103 1      74732 1      26103 1      00006 1      31573 1      53521 1      00006 1      31575 1
33,2620      53523 0      00006 1      31577 0      53525 0      00006 1      31601 1      53527 1      00006 1
33,2630      31603 0      53531 0      00006 1      31605 0      53533 1      12217 0   C: 00031 0   C: 00000 1

33,2640   C: 00000 1   C: 05075 0   I: 41456 0   C: 03537 0   I: 67340 1   C: 02777 1   C: 03000 1   I: 50076 0
33,2650   C: 66677 1   I: 50375 0   C: 06477 0   C: 03537 0   I: 41552 0   I: 44316 0   C: 26741 1   I: 56325 0
33,2660   C: 26106 1   C: 00043 0   C: 00041 1   I: 41205 0   C: 26110 0   I: 65361 0   C: 03537 0   I: 41205 0
33,2670   C: 26112 1   C: 00041 1   I: 76561 1   C: 06477 0   I: 45455 1   C: 74256 0   I: 41455 0   I: 60345 0

33,2700   C: 00043 0   C: 00050 1   I: 53663 1   C: 26100 1   C: 56623 0   I: 45561 1   C: 74214 0   I: 77616 0
33,2710   I: 61375 1   C: 00325 0   C: 01732 0   I: 76561 1   C: 26074 0   C: 03527 1   I: 41562 0   I: 41455 0
33,2720   C: 01236 1   I: 65255 0   C: 01226 0   C: 01247 1   I: 74261 1   C: 20207 0   I: 44055 1   C: 01220 0
33,2730   C: 00037 0   C: 37545 1   C: 66642 1   I: 53255 0   I: 77655 1   C: 01226 0   C: 37553 0   C: 00037 0

33,2740   C: 01463 1   C: 06315 0   C: 00010 0   C: 00000 1   I: 41575 0   C: 02310 1   I: 65255 0   C: 01724 1
33,2750   C: 01247 1   I: 74271 0   C: 25743 0   I: 77655 1   C: 01716 0   C: 37573 1   C: 67037 1   I: 53255 0
33,2760   C: 01724 1   I: 77626 0   C: 74176 1   I: 77776 1      03473 1      06060 1   I: 77775 1   C: 03563 1
33,2770   C: 26310 1   C: 03573 0   C: 25716 0   C: 03601 0   C: 01724 1   I: 77776 1      03473 1      06060 1
```

```
OCTAL LISTING FOR PARAGRAPH # 176,  WITH PARITY BIT IN BINARY AT THE RIGHT OF EACH WORD, "@" DENOTES UNUSED FIXED MEMORY

ALL VALID WORDS ARE BASIC INSTRUCTIONS EXCEPT THOSE MARKED "I" (INTERPRETIVE OPERATOR WOROS) OR "C" (CONSTANTS)

33,3000      I: 74375 0    C: 00325 0    C: 26076 1    I: 53206 0    C: 01236 1    I: 53206 0    C: 03527 1    I: 56325 0
33,3010      C: 01247 1    C: 26743 0    I: 77761 1    I: 77655 1    C: 03521 1    C: 37573 1    C: 67037 1    I: 53255 0
33,3020      I: 77655 1    C: 03527 1    C: 03601 0    I: 77646 0    C: 27472 0    C: 02316 1    I: 72435 0    C: 03573 0
33,3030      C: 17702 1    C: 00045 0    I: 47025 0    C: 02324 0    C: 21622 1    C: 37535 0    C: 66410 1    I: 77656 1

33,3040      C: 17537 0    C: 00043 0    I: 55261 1    C: 20207 0    C: 26104 0    I: 74205 0    C: 26743 0    C: 03537 0
33,3050      C: 03563 1    I: 77616 0    C: 00014 1    C: 20000 0    C: 00000 1    C: 00310 0    C: 00000 1    C: 00620 0
33,3060      C: 00110 1    C: 37767 0    C: 02200 1    C: 00102 1       34741 1       70107 0       00006 1       13261 0
33,3070         03473 1       03501 0       06060 1    I: 61373 1    C: 26003 0    C: 02137 0    I: 54325 1    C: 03655 1

33,3100      C: 20207 0    I: 74205 0    C: 26063 0    I: 50206 0    C: 03537 0    I: 77625 0    C: 03535 1    C: 03767 1
33,3110      I: 77725 1    I: 43342 0    C: 03641 1    I: 54221 1    C: 03577 1    C: 20207 0    I: 77404 1    C: 31765 1
33,3120         40075 1       74732 1       00006 1       13161 0       35005 1       54003 0       34746 0       54142 1
33,3130         34742 1       54145 0       30154 1       54001 1       50145 1       41522 1       04607 1    C: 61713 0

33,3140         54144 1       60142 0       00006 1       50145 1       71527 1       50120 1       20005 0       30141 0
33,3150         54142 1       60144 0       00006 1       13155 1       13157 0       10145 0       13131 0       35007 0
33,3160         54003 0       00004 0       50120 1       52005 0       53665 1       53767 1       53737 1       00003 1
33,3170         30120 1       54166 1       30107 1       74732 1       00006 1       13215 0       06060 1    I: 51545 1

33,3200      C: 03665 1    I: 62425 0    C: 02504 1    I: 77425 1    C: 03535 1       25670 1       06744 0       13513 1
33,3210         13513 1       05520 0    C: 00247 0       05520 0    C: 00263 0       40107 0       74735 0       10000 0
33,3220         13261 0       06060 1    I: 40545 1    C: 03535 1    I: 77776 1       00006 1       31665 0       52155 1
33,3230         07565 0       00006 1       13234 0       13261 0       54156 1       40001 1       61420 0       00006 1

33,3240         63261 1       00006 1       71421 0       00006 1       11420 1       54135 1       07334 1       06060 1
33,3250      I: 77752 1    I: 53361 0    C: 03537 0    C: 03573 0    C: 03657 0    I: 77776 1       03473 1       34746 0
33,3260         03455 0       03473 1       40107 0       74742 0       10000 0       13271 1       10067 1       05113 1
33,3270         13262 0       40107 0       74736 0       10000 0       13433 1       03501 0       41462 1       54001 1

33,3300         26001 1       60001 0       60001 0       50120 1       20047 0       06060 1    I: 61373 1    C: 26011 0
33,3310      C: 02137 0    I: 54325 1    C: 03653 1    C: 20215 0    I: 63203 0    C: 51712 1    C: 03601 0    I: 52352 1
33,3320      C: 03702 1    I: 51406 1    I: 43202 0    C: 02401 0    C: 24025 0    I: 44241 0    C: 00001 0    I: 51406 1
33,3330      I: 77425 1    C: 00025 0       25672 0       06744 0       13532 1       13532 1       05520 0    C: 00246 1

33,3340         05520 0    C: 00262 1       30107 1       74731 1       00006 1       13354 1       05520 0    C: 00250 0
33,3350         31462 0       67767 0       00006 1       13433 1       40107 0       74735 0       10000 0       13433 1
33,3360         54155 1       31471 1       54130 1       31462 0       54131 0       35005 1       54003 0       41512 1
33,3370         60130 0       00006 1       63405 0       40130 1       61511 0       00006 1       63410 1       00006 1
```

```
OCTAL LISTING FOR PARAGRAPH # 177,  WITH PARITY BIT IN BINARY AT THE RIGHT OF EACH WORD, "@" DENOTES UNUSED FIXED MEMORY

ALL VALID WORDS ARE BASIC INSTRUCTIONS EXCEPT THOSE MARKED "I" (INTERPRETIVE OPERATOR WORDS) OR "C" (CONSTANTS)

33,3400       50131 1      71513 0      00006 1      11511 1      13411 1      50131 1      31516 1      13411 1
33,3410       34746 0      54154 0      44736 0      61010 1      00006 1      63420 1      31521 0      54154 0
33,3420       35007 0      54003 0      06060 1   I: 74205 0   I: 77655 1   C: 03601 0   C: 03657 0   I: 77776 1
33,3430       03473 1      36263 0      03455 0      03473 1      40107 0      74732 1      00006 1      12501 0

33,3440       31642 0      61427 1      00006 1      62501 1      34732 0      56003 1      54001 1      41536 1
33,3450       22003 1      61430 1      00006 1      62376 1      12501 0      54130 1      00006 1      31657 1
33,3460       50130 0      53573 0      00006 1      31661 1      50130 0      53575 0      00006 1      31663 0
33,3470       50130 0      53577 1      00002 0      35000 1      56003 1      52002 1      55446 1      22003 1

33,3500       00000 1      30120 1      54166 1      34744 1      71650 1      10000 0      44754 1      22007 0
33,3510       50120 1      52047 0      00002 0      05506 1   C: 00247 0      41671 1      00006 1      13527 0
33,3520       61670 1      77766 0      00006 1      13525 1      13527 0      05506 1   C: 00263 0      31670 1
33,3530       55671 1      13261 0      05506 1   C: 00246 1      41673 0      00006 1      13546 1      61672 0

33,3540       77766 0      00006 1      13544 0      13546 1      05506 1   C: 00262 1      31672 0      55673 0
33,3550       11462 1      13433 1      05506 1   C: 00250 0      13433 1      00004 0      40107 0      75006 0
33,3560       26107 0      04607 1   C: 53511 1      04607 1   C: 17733 0      13566 0      34744 1      55650 1
33,3570       05520 0   C: 00252 1      05355 1   C: 00001 0      05146 1   C: 03575 0   C: 03576 0 CKSM 75463 1

33,3600          @            @            @            @            @            @            @            @
33,3610          @            @            @            @            @            @            @            @
33,3620          @            @            @            @            @            @            @            @
33,3630          @            @            @            @            @            @            @            @

33,3640          @            @            @            @            @            @            @            @
33,3650          @            @            @            @            @            @            @            @
33,3660          @            @            @            @            @            @            @            @
33,3670          @            @            @            @            @            @            @            @

33,3700          @            @            @            @            @            @            @            @
33,3710          @            @            @            @            @            @            @            @
33,3720          @            @            @            @            @            @            @            @
33,3730          @            @            @            @            @            @            @            @

33,3740          @            @            @            @            @            @            @            @
33,3750          @            @            @            @            @            @            @            @
33,3760          @            @            @            @            @            @            @            @
33,3770          @            @            @            @            @            @            @            @
```

```
OCTAL LISTING FOR PARAGRAPH # 200,  WITH PARITY BIT IN BINARY AT THE RIGHT OF EACH WORD, "@" DENOTES UNUSED FIXED MEMORY

ALL VALID WORDS ARE BASIC INSTRUCTIONS EXCEPT THOSE MARKED "I" (INTERPRETIVE OPERATOR WORDS) OR "C" (CONSTANTS)

34,2000    I: 71220 1   C: 03632 0   C: 03442 0   C: 34041 0   C: 27115 1   I: 67175 0   C: 00001 0   C: 02777 1
34,2010    C: 03642 1   I: 57456 1   C: 27656 1   C: 00007 0   C: 03650 1   I: 53435 0   C: 03642 1   I: 66001 0
34,2020    C: 00001 0   C: 02776 0   I: 47206 0   C: 03656 1   I: 63372 1   I: 63315 0   C: 03656 1   C: 03434 1
34,2030    I: 76505 0   C: 00001 0   C: 03656 1   I: 77646 0   C: 27664 0   C: 03642 1   I: 53315 0   C: 03650 1

34,2040    C: 03656 1   I: 77624 1   C: 46337 1   I: 77624 1   C: 46447 1   I: 77624 1   C: 45640 1   C: 16312 0
34,2050    C: 00005 1   I: 77624 1   C: 46447 1   I: 77624 1   C: 45640 1   C: 36310 0   C: 03632 0   C: 00000 1
34,2060    C: 00020 0   C: 00003 1   C: 34661 1   C: 00606 1   C: 04467 0   C: 00601 0   C: 33216 1   C: 10000 0
34,2070    C: 00000 1   C: 00000 1   C: 00001 0   C: 00004 0   C: 31566 0   C: 00000 1   C: 01177 1   C: 00002 0

34,2100    C: 27311 1   C: 77754 1   C: 57611 0   C: 00000 1   C: 12326 0   C: 00116 1   C: 00730 0   C: 00000 1
34,2110    C: 06433 0   C: 00003 1   C: 25140 0   I: 43014 0   C: 03260 0   C: 03061 0   I: 43014 0   C: 03262 1
34,2120    C: 03063 1   I: 77745 1   C: 32425 0   C: 03606 1   C: 03614 1   I: 77201 1   C: 00001 0   C: 02274 1
34,2130    I: 41446 1   I: 70501 1   C: 00050 1   I: 51515 1   C: 03552 0   I: 55301 0   C: 00047 1   I: 53664 0

34,2140    C: 00046 0   C: 57175 0   I: 41215 1   C: 30070 0   I: 65301 0   C: 00047 1   C: 02312 0   I: 56342 1
34,2150    I: 75457 0   C: 20172 1   I: 53515 0   C: 02274 1   I: 47315 0   C: 02252 0   I: 77656 1   I: 72441 0
34,2160    C: 03472 0   I: 45421 1   C: 60203 0   C: 30062 0   C: 03612 1   I: 43345 1   C: 03606 1   C: 30072 1
34,2170    C: 03606 1   I: 77025 0   C: 30060 1   C: 00006 1   I: 77644 1   C: 70776 0   I: 77601 0   C: 00001 0

34,2200    I: 51545 1   C: 03574 1   I: 50025 0   C: 30064 0   C: 70224 1   I: 43174 1   C: 00007 0   C: 03300 1
34,2210    C: 70776 0   I: 43014 0   C: 03342 1   C: 70216 0   C: 03303 1   C: 70776 0   I: 71214 0   C: 03060 1
34,2220    C: 30066 1   I: 77765 0   C: 03574 1   C: 03574 1   I: 41575 0   C: 02274 1   I: 63256 0   C: 02252 0
34,2230    I: 53435 0   I: 76561 1   C: 03574 1   C: 02260 1   I: 40055 0   C: 03472 0   C: 70237 0   C: 37566 0

34,2240    C: 46437 0   C: 26744 1   I: 77614 1   C: 03466 0   C: 26655 0   C: 32421 1   C: 36730 0   C: 24732 1
34,2250    I: 72142 0   C: 02776 0   C: 37604 1   C: 46347 0   I: 77624 1   C: 46447 1   C: 17602 0   C: 03621 1
34,2260    I: 52054 1   C: 70263 1   C: 70372 0   I: 77745 1   C: 02752 0   I: 50025 0   C: 30110 1   C: 70372 0
34,2270    I: 45145 0   C: 00041 1   C: 46447 1   I: 60201 1   C: 00003 1   C: 00047 1   I: 50315 0   C: 02274 1

34,2300    C: 03566 1   I: 56246 1   C: 00003 1   I: 45257 0   C: 20201 0   C: 30100 0   I: 71240 1   C: 70372 0
34,2310    C: 02740 0   I: 45312 0   C: 30070 0   C: 14017 1   C: 02310 1   I: 56342 1   I: 41325 0   C: 02740 0
34,2320    C: 00041 1   I: 77624 1   C: 46447 1   I: 72412 0   I: 41366 1   I: 52414 1   C: 04343 1   C: 70330 0
34,2330    I: 50315 0   C: 02274 1   C: 03566 1   C: 03617 1   I: 77646 0   I: 41301 0   C: 00050 1   I: 53660 1

34,2340    C: 00047 1   C: 20204 0   C: 14015 0   C: 32425 0   C: 00021 1   I: 53575 0   C: 00015 0   C: 26730 1
34,2350    C: 02274 1   I: 75315 1   C: 03566 1   C: 03617 1   I: 45076 1   C: 46437 0   C: 26744 1   I: 77614 1
34,2360    C: 03466 0   C: 36655 1   C: 24732 1   I: 51125 0   C: 03617 1   C: 70376 1   I: 45345 1   C: 03604 0
34,2370    I: 52006 0   C: 70376 1   I: 71201 1   C: 00001 0   C: 32425 0   I: 77606 1   I: 41345 0   C: 03467 1
```

```
OCTAL LISTING FOR PARAGRAPH # 201,  WITH PARITY BIT IN BINARY AT THE RIGHT OF EACH WORD, "@" DENOTES UNUSED FIXED MEMORY

ALL VALID WORDS ARE BASIC INSTRUCTIONS EXCEPT THOSE MARKED "I" (INTERPRETIVE OPERATOR WORDS) OR "C" (CONSTANTS)

34,2400        C: 03604 0     I: 45261 0     C: 20217 1     I: 77615 0     C: 03634 0     C: 01775 0     I: 77021 1     C: 03636 1
34,2410        C: 00005 1     I: 40240 0     C: 70776 0     C: 00001 0     I: 63375 0     C: 03566 1     C: 02274 1     I: 77624 1
34,2420        C: 71062 0     C: 26302 1     C: 00007 0     C: 27514 1     C: 03506 1     I: 63201 1     C: 00001 0     C: 03500 1
34,2430        I: 77624 1     C: 71062 0     C: 27522 1     C: 00007 0     C: 37530 0     C: 71133 0     I: 40375 1     C: 02302 1

34,2440        C: 00001 0     I: 45115 0     C: 03544 1     C: 46337 1     I: 77624 1     C: 46447 1     C: 27604 0     C: 03544 1
34,2450        I: 63201 1     C: 00001 0     C: 02302 1     I: 65325 0     C: 01775 0     C: 03636 1     I: 41525 0     C: 33642 1
34,2460        I: 77624 1     C: 73404 0     I: 77624 1     C: 46423 0     I: 77745 1     C: 02250 1     I: 73401 0     C: 00007 0
34,2470        I: 53515 0     C: 03536 1     C: 00001 0     I: 47315 0     C: 02252 0     I: 77656 1     I: 71525 0     C: 02250 1

34,2500        I: 45561 1     C: 77754 1     I: 74345 0     I: 76455 1     C: 00023 0     I: 50206 0     C: 03536 1     I: 41552 0
34,2510        I: 72316 0     C: 00155 0     I: 50315 0     C: 03536 1     C: 03536 1     I: 57551 1     C: 00155 0     I: 50315 0
34,2520        C: 03552 0     C: 03552 0     I: 76371 0     I: 71244 0     C: 70542 0     C: 03606 1     I: 77025 0     C: 30072 1
34,2530        C: 00001 0     I: 77654 0     C: 72043 0     I: 70545 1     C: 03612 1     C: 03612 1     I: 77621 1     C: 03576 0

34,2540        C: 37574 0     C: 70165 1     I: 41566 1     I: 45276 0     C: 00007 0     C: 14013 0     I: 45425 0     C: 77762 1
34,2550        I: 77646 0     C: 14017 1     C: 00013 0     I: 45246 0     C: 00017 1     I: 71240 1     C: 70561 1     C: 00015 0
34,2560        C: 00013 0     I: 77745 1     C: 00013 0     I: 76561 1     I: 53455 0     C: 03536 1     I: 53515 0     C: 03552 0
34,2570        I: 53515 0     C: 03560 1     I: 63235 0     C: 00007 0     C: 00007 0     I: 50235 0     C: 00001 0     I: 77626 0

34,2600        C: 53762 1     I: 72441 0     I: 75326 1     C: 00015 0     I: 41542 1     I: 71214 0     C: 03301 0     C: 70644 0
34,2610        C: 00001 0     I: 65225 1     C: 03610 0     C: 03574 1     I: 60225 1     C: 03576 0     C: 00047 1     I: 65265 0
34,2620        C: 00003 1     C: 03574 1     C: 03576 0     I: 43014 0     C: 03342 1     C: 70656 0     C: 03343 0     C: 70656 0
34,2630        I: 41345 0     C: 00003 1     C: 03610 0     I: 71244 0     C: 70663 0     C: 30062 0     I: 77765 0     C: 03612 1

34,2640        C: 03612 1     I: 43014 0     C: 03062 0     C: 03263 0     I: 77745 1     C: 00001 0     C: 17610 0     C: 03574 1
34,2650        C: 03576 0     I: 43025 1     C: 03612 1     C: 03261 1     C: 37574 0     C: 70165 1     I: 43014 0     C: 03302 0
34,2660        C: 70702 0     C: 03303 1     C: 70702 0     I: 75345 1     C: 30102 1     C: 00005 1     I: 77765 0     C: 03610 0
34,2670        C: 03612 1     I: 43276 0     C: 03574 1     C: 17574 1     C: 00001 0     I: 43014 0     C: 03063 1     C: 03062 0

34,2700        C: 37610 1     C: 70176 0     I: 60345 0     C: 00005 1     C: 00050 1     I: 54065 0     C: 00001 0     C: 00047 1
34,2710        I: 77657 0     C: 20601 1     C: 17612 1     C: 00001 0     C: 03610 0     I: 51545 1     C: 03612 1     I: 45206 1
34,2720        C: 30076 0     I: 71240 1     C: 70737 0     I: 50025 0     C: 30106 0     C: 70732 0     I: 75345 1     C: 30106 0
34,2730        C: 03612 1     C: 03612 1     I: 45345 1     C: 03574 1     C: 03612 1     C: 37574 0     C: 70165 1     I: 77145 1

34,2740        C: 03602 0     C: 00002 0     I: 77750 0     C: 02776 0     I: 50023 0     C: 30072 1     C: 70776 0     I: 71374 1
34,2750        C: 00003 1     C: 03604 0     I: 50023 0     C: 30072 1     C: 70776 0     I: 45345 1     C: 01775 0     C: 03634 0
34,2760        C: 02244 1     I: 45374 0     C: 00004 0     C: 30112 0     I: 77040 0     C: 70776 0     C: 00005 1     I: 45345 1
34,2770        C: 03636 1     C: 01775 0     C: 02246 0     I: 51025 1     C: 30112 0     C: 72157 1     I: 43014 0     C: 03302 0
```

```
OCTAL LISTING FOR PARAGRAPH # 202,  WITH PARITY BIT IN BINARY AT THE RIGHT OF EACH WORD, "@" DENOTES UNUSED FIXED MEMORY

ALL VALID WORDS ARE BASIC INSTRUCTIONS EXCEPT THOSE MARKED "I" (INTERPRETIVE OPERATOR WORDS) OR "C" (CONSTANTS)

34,3000      C: 72045 0    C: 03343 0    C: 72045 0    I: 71334 0    C: 03613 0    C: 32425 0    I: 43014 0    C: 03260 0
34,3010      C: 03061 0    I: 43014 0    C: 03262 1    C: 03263 0    C: 37606 0    C: 70125 0    I: 71220 1    C: 03470 1
34,3020      C: 03442 0    C: 34041 0    C: 46401 0    I: 77214 0    C: 01067 1    C: 03560 1    C: 03530 1    C: 27506 1
34,3030      C: 03552 0    C: 03522 1    C: 03500 1    I: 47256 0    C: 03506 1    I: 77656 1    C: 26252 0    C: 03536 1

34,3040      C: 37642 0    C: 71052 0    C: 02302 1    C: 26274 1    C: 03544 1    C: 37650 0    C: 71052 0    C: 03514 1
34,3050      C: 37472 1    C: 03470 1    I: 41406 0    I: 74241 0    C: 02252 0    C: 02252 0    I: 51352 1    I: 63256 0
34,3060      I: 74246 1    I: 43572 0    I: 65325 0    C: 03634 0    C: 01775 0    I: 41525 0    C: 33642 1    I: 77650 1
34,3070      C: 73404 0    I: 65325 0    C: 01775 0    C: 03636 1    I: 41525 0    C: 32425 0    I: 77650 1    C: 73404 0

34,3100      I: 76020 1    C: 03470 1    C: 01521 0    I: 77624 1    C: 72375 0    I: 77624 1    C: 71120 1    I: 61375 1
34,3110      C: 03434 1    C: 00001 0    I: 77772 0    C: 03656 1    I: 51406 1    C: 27664 0    I: 77650 1    C: 03470 1
34,3120      I: 77201 1    C: 00007 0    C: 02252 0    I: 63276 1    C: 02274 1    I: 57456 1    I: 47206 0    C: 02252 0
34,3130      I: 77772 0    C: 00001 0    I: 77616 0    I: 77220 1    C: 03470 1    C: 02302 1    I: 53406 0    C: 27544 1

34,3140      C: 03522 1    I: 50256 0    C: 03544 1    I: 72406 0    C: 16732 0    I: 65316 0    C: 06475 1    I: 45302 1
34,3150      I: 72566 1    I: 57515 1    I: 77635 1    C: 03522 1    I: 65241 0    C: 02252 0    I: 45565 0    C: 51047 0
34,3160      C: 03522 1    I: 45115 0    C: 03530 1    C: 46437 0    C: 26744 1    I: 77614 1    C: 03666 1    C: 36655 1
34,3170      C: 24732 1    I: 53754 1    C: 02777 1    C: 57576 1    C: 00023 0    I: 76441 1    C: 03544 1    I: 51515 1

34,3200      I: 63257 1    C: 57576 1    C: 02302 1    I: 65246 1    I: 77625 0    C: 00003 1    C: 17600 1    C: 02742 1
34,3210      I: 65301 0    C: 00047 1    C: 00041 1    I: 77624 1    C: 46447 1    I: 56362 0    I: 41457 1    C: 20174 1
34,3220      I: 65225 1    C: 03600 1    I: 56302 0    C: 00005 1    I: 75406 1    I: 41275 1    C: 00007 0    C: 00001 0
34,3230      I: 65272 0    C: 00003 1    I: 65301 0    C: 00047 1    C: 02312 0    I: 56342 1    I: 65257 1    C: 20174 1

34,3240      C: 00005 1    I: 65301 0    C: 00050 1    C: 02312 0    I: 56342 1    I: 44257 1    C: 57604 1    I: 63525 0
34,3250      C: 00011 1    I: 75421 1    I: 47315 0    C: 02252 0    C: 03544 1    I: 74256 0    C: 00013 0    I: 74315 0
34,3260      C: 03544 1    C: 00011 1    I: 76455 1    I: 77626 0    C: 74233 0    I: 77651 0    C: 03514 1    C: 36266 0
34,3270      C: 03470 1       05355 1    C: 04024 0       00004 0       04607 1    C: 40154 0       06060 1    I: 77614 1

34,3300      C: 06460 0    I: 43014 0    C: 04067 1    C: 04666 0    I: 77214 0    C: 05062 0    C: 01220 0    C: 16032 1
34,3310      C: 01234 0    I: 45014 0    C: 01463 1    C: 26406 1    I: 77201 1    C: 00001 0    C: 01220 0    I: 65352 0
34,3320      C: 01234 0    I: 45006 0    C: 51644 0    C: 02021 0    I: 77776 1       33345 0       04607 1    C: 20471 1
34,3330         16001 1       13333 0       13325 1       06060 1    I: 64375 1    C: 01220 0    C: 01732 0    I: 45056 0

34,3340      C: 47640 0    C: 36222 0    C: 33470 1    I: 77776 1       16001 1    C: 01453 1    I: 40220 0    C: 01163 1
34,3350      C: 00001 0    I: 41575 0    C: 06477 0    I: 41434 1    C: 21603 1    I: 77624 1    C: 55716 1    I: 74321 1
34,3360      C: 01732 0    C: 16027 0    C: 26316 1    C: 02021 0    I: 52446 0    C: 36324 1    C: 01163 1    C: 00046 0
34,3370      C: 07374 0    C: 04145 0    C: 20055 0    C: 00007 0    C: 23346 1       05355 1    C: 00035 1       06060 1
```

```
OCTAL LISTING FOR PARAGRAPH # 203,  WITH PARITY BIT IN BINARY AT THE RIGHT OF EACH WORD, "@" DENOTES UNUSED FIXED MEMORY

ALL VALID WORDS ARE BASIC INSTRUCTIONS EXCEPT THOSE MARKED "I" (INTERPRETIVE OPERATOR WORDS) OR "C" (CONSTANTS)

34,3400     I: 77614 1     C: 04705 1     C: 60307 0     I: 45345 1     C: 03514 1     C: 26116 0     I: 43040 1     C: 60750 0
34,3410     C: 04267 0     I: 67214 1     C: 02676 1     C: 31451 0     I: 77471 0     C: 03514 1        52155 1        53641 1
34,3420        53637 0        53635 1        53571 1        06060 1     I: 43345 1     C: 03571 1     C: 03635 1     I: 43215 0
34,3430     C: 03637 0     C: 03641 1     I: 41205 0     C: 02256 1     C: 21011 1     I: 65252 1     C: 02262 0     I: 43342 0

34,3440     I: 77625 0     C: 21006 1     C: 16262 0     C: 02256 1     I: 56342 1     C: 02262 0     C: 36254 1     C: 60307 0
34,3450     C: 00004 0     I: 45575 1     C: 74517 1     I: 77775 1     C: 03537 0     C: 37252 0     C: 60721 0     I: 77634 0
34,3460     C: 21603 1     I: 43225 0     C: 01234 0     C: 03454 1     I: 77476 1        07300 0        35007 0        54003 0
34,3470        00004 0        10155 1        13475 0        13475 0        34746 0        64744 1        55644 1        05175 1

34,3500     C: 03512 1        05355 1     C: 47014 1     C: 76133 1     C: 03512 1     C: 70067 1        06060 1     I: 52014 0
34,3510     C: 03470 1     C: 60447 0        04665 0     C: 75552 1        35020 0        05063 1     C: 03526 0     C: 70067 1
34,3520        05355 1     C: 07024 0     C: 17000 1     C: 03526 0     C: 70067 1        15263 1        05506 1     C: 00214 0
34,3530        33547 1        04607 1     C: 20471 1        13536 0        13540 1        13530 0        04626 1     C: 71560 1

34,3540        00004 0        04665 0     C: 40154 0        04665 0     C: 40141 1        04626 1     C: 71550 1     C: 04136 1
34,3550        05355 1     C: 04024 0        33570 0        04607 1     C: 20471 1        13560 0        13560 0        13550 0
34,3560        05355 1     C: 04024 0        00004 0        04665 0     C: 40115 0        05520 0     C: 00215 1        16001 1
34,3570     C: 04125 0     I: 77745 1     C: 06505 1     C: 02336 0     C: 02342 0     I: 41345 0     C: 02342 0     C: 03517 1

34,3600     I: 43205 1     C: 33646 0     C: 02336 0     I: 41205 0     C: 03517 1     C: 03517 1     I: 72471 0     C: 02262 0
34,3610     I: 65215 1     C: 02272 1     C: 03474 0     I: 43205 1     C: 03517 1     I: 77626 0     C: 75201 0     I: 77616 0
34,3620     I: 45020 1     C: 02637 1     C: 71650 1     I: 43205 1     C: 02574 0     C: 02572 0     I: 41425 1     C: 02576 1
34,3630     I: 51025 1     C: 02560 0     C: 71635 1     I: 65345 0     C: 02560 0     I: 41345 0     C: 00001 0     C: 16025 1

34,3640     I: 77725 1     I: 41215 1     C: 02576 1     C: 02576 1     I: 75465 1     I: 77626 0     C: 41507 0     C: 02637 1
34,3650     I: 53575 0     C: 03521 1     I: 53515 0     C: 01716 0     I: 47206 0     C: 00001 0     I: 77641 1     C: 02316 1
34,3660     C: 24037 0     I: 72441 0     I: 75326 1     C: 00037 0     I: 77616 0     C: 03665 1     C: 03666 1  CKSM 00555 1
34,3670           @              @              @              @              @              @              @              @

34,3700           @              @              @              @              @              @              @              @
34,3710           @              @              @              @              @              @              @              @
34,3720           @              @              @              @              @              @              @              @
34,3730           @              @              @              @              @              @              @              @

34,3740           @              @              @              @              @              @              @              @
34,3750           @              @              @              @              @              @              @              @
34,3760           @              @              @              @              @              @              @              @
34,3770           @              @              @              @              @              @              @              @
```

```
GAP:  ASSEMBLE REVISION 210 OF AGC PROGRAM LUMINARY BY NASA 2021112-161      17:11 MAR. 19,1971                  PAGE 1706

OCTAL LISTING FOR PARAGRAPH # 204,  WITH PARITY BIT IN BINARY AT THE RIGHT OF EACH WORD, "@" DENOTES UNUSED FIXED MEMORY

ALL VALID WORDS ARE BASIC INSTRUCTIONS EXCEPT THOSE MARKED "I" (INTERPRETIVE OPERATOR WORDS) OR "C" (CONSTANTS)

35,2000      05506 1   C: 00027 1      05506 1   C: 00031 0      32032 1      03622 1      33637 0      03622 1
35,2010      05520 0   C: 00027 1      06060 1   I: 77624 1   C: 70000 0   I: 43014 0   C: 00470 1   C: 01067 1
35,2020   I: 77776 1      32033 0      03622 1      06060 1   I: 77614 1   C: 01071 0   I: 77624 1   C: 73516 1
35,2030   I: 77650 1   C: 72026 0   C: 01441 1   C: 01452 0      02354 1      02037 1      02361 1      00006 1

35,2040      32425 0      53621 1      02060 0   I: 77734 1   C: 03613 0   I: 77740 1   C: 03613 0   I: 77533 1
35,2050   C: 32430 1      30154 1      05740 1      34777 1      04607 1   C: 20471 1      06001 0      02053 0
35,2060      02366 0      32424 1      55467 1      55633 1      55634 0      32415 0      03622 1      06060 1
35,2070   I: 57545 1   C: 03634 0   I: 71240 1   C: 72120 1   C: 01643 1   C: 34041 0   C: 46401 0   I: 53775 1

35,2100   C: 03536 1   C: 57176 0   C: 26655 0   C: 03544 1   I: 43057 1   C: 57176 0   C: 03466 0   C: 16744 1
35,2110   C: 06513 0   C: 36756 0   C: 25557 1   I: 77615 0   C: 03574 1   C: 03634 0   I: 77776 1      02065 0
35,2120   I: 77776 1      33634 0      04607 1   C: 20471 1      06001 0      02127 1      02121 1      33633 1
35,2130      03622 1      06060 1   I: 77745 1   C: 03634 0   C: 37442 1   C: 20000 0   I: 77624 1   C: 71016 0

35,2140   I: 77201 1   C: 00001 0   C: 03506 1   I: 65315 0   C: 03500 1   C: 03634 0   I: 65325 0   C: 03636 1
35,2150   C: 33642 1   I: 45006 0   C: 73404 0   I: 77624 1   C: 46433 1   I: 77624 1   C: 70113 0   I: 43014 0
35,2160   C: 01311 0   C: 72163 0   C: 00470 1   I: 77745 1   C: 02244 1   C: 02244 1   I: 51025 1   C: 32427 1
35,2170   C: 72165 0   I: 77745 1   C: 02246 0   C: 02246 0   I: 51025 1   C: 32427 1   C: 72173 1   I: 77776 1

35,2200      32417 1      03622 1      06060 1   I: 45175 0   C: 02260 1   C: 71100 0   C: 26260 1   C: 02302 1
35,2210   C: 26274 1   C: 02266 1   I: 45170 0   C: 01522 0   C: 72375 0   I: 77745 1   C: 03636 1   C: 37640 1
35,2220   C: 73516 1   I: 77650 1   C: 72136 0      02354 1      02226 0      02361 1      02366 0      32416 0
35,2230      03622 1      06060 1   I: 77745 1   C: 03640 0   C: 17636 1   C: 01775 0   C: 37442 1   C: 20000 0

35,2240   I: 77624 1   C: 71016 0   I: 77624 1   C: 71133 0   I: 77201 1   C: 00001 0   C: 03544 1   I: 45115 0
35,2250   C: 02302 1   C: 71071 1   I: 77624 1   C: 46423 0   I: 77201 1   C: 00001 0   C: 03530 1   I: 45115 0
35,2260   C: 03522 1   C: 71071 1   I: 77624 1   C: 46433 1   I: 43145 0   C: 32425 0   C: 03460 0   C: 36310 0
35,2270   C: 72702 1   I: 77454 1   C: 72307 0      05571 1   C: 00611 1      34777 1      04607 1   C: 20471 1

35,2300      06001 0      02303 0      02226 0      06060 1   I: 77745 1   C: 32425 0   C: 02310 1   I: 43014 0
35,2310   C: 01311 0   C: 72313 0   C: 00470 1   I: 43345 1   C: 02310 1   C: 03636 1   C: 03636 1   I: 77625 0
35,2320   C: 01775 0   I: 51025 1   C: 32427 1   C: 72321 1   I: 77615 0   C: 32427 1   C: 16244 1   C: 03636 1
35,2330   I: 41425 1   C: 03640 0   I: 45246 0   C: 32427 1   I: 43244 1   C: 72332 0   C: 32427 1   I: 45565 0

35,2340   C: 75531 1   I: 77776 1      32417 1      03622 1      06060 1   I: 45175 0   C: 02266 1   C: 71100 0
35,2350   C: 36266 0   C: 73516 1   I: 77650 1   C: 72240 1      00006 1      23470 0      05506 1   C: 00050 1
35,2360      01470 0      00006 1      23470 0      05520 0   C: 00050 1      01470 0      00006 1      23470 0
35,2370      05506 1   C: 00027 1      05506 1   C: 00031 0      01470 0   C: 03434 1   I: 45020 1   C: 03463 0
```

OCTAL LISTING FOR PARAGRAPH # 205, WITH PARITY BIT IN BINARY AT THE RIGHT OF EACH WORD, "@" DENOTES UNUSED FIXED MEMORY

ALL VALID WORDS ARE BASIC INSTRUCTIONS EXCEPT THOSE MARKED "I" (INTERPRETIVE OPERATOR WORDS) OR "C" (CONSTANTS)

```
35,2400      C: 71120 1    I: 64375 1    C: 03434 1    C: 00001 0    I: 66172 0    C: 03615 0    C: 03434 1    I: 77776 1
35,2410         31615 1       03622 1       06060 1    I: 77650 1    C: 03463 0    C: 01413 0    C: 01415 0    C: 01513 1
35,2420      C: 77776 1    C: 62460 1    C: 17777 0    C: 37776 0    C: 00000 1    C: 00000 1    C: 00025 0    C: 37100 1
35,2430      C: 00600 1    C: 00601 0    C: 00602 0    C: 00603 1    C: 00604 0    C: 00605 1    C: 00606 1       00006 1

35,2440         23465 1       34746 0       55162 1       34743 0       00004 0       05205 0    C: 02716 0    C: 74067 0
35,2450         05331 0    C: 40036 0    C: 05024 1    C: 13000 0       01465 1       02354 1       02460 1       02361 1
35,2460         02366 0       33633 1       03622 1       00006 1       33656 1       53621 1       34732 0       54001 1
35,2470         32424 1       55466 0       22003 1       55647 1       55650 1       22003 1       03604 0       06060 1

35,2500      I: 71214 0    C: 01270 0    C: 03636 1    C: 17442 0    C: 02250 1    I: 43054 1    C: 72510 0    C: 01070 1
35,2510      I: 77624 1    C: 20000 0    I: 43145 0    C: 06505 1    C: 03460 0    I: 43014 0    C: 01310 1    C: 72521 1
35,2520      C: 03660 1    C: 02310 1    I: 43345 1    C: 03636 1    C: 02310 1    C: 34041 0    C: 46401 0    I: 77624 1
35,2530      C: 72702 1    I: 77454 1    C: 72543 0       05571 1    C: 00611 1       34777 1       04607 1    C: 20471 1

35,2540         06001 0       02460 1       02533 0    I: 43014 0    C: 03600 1    C: 72522 1    C: 01310 1    C: 72553 1
35,2550      I: 77776 1       03604 0       02556 0    I: 77776 1       33633 1       03622 1       06060 1    I: 71201 1
35,2560      C: 00001 0    C: 02777 1    C: 14047 1    C: 03621 1    I: 71406 0    C: 16732 0    I: 77756 0    C: 26730 1
35,2570      C: 03552 0    I: 77657 0    C: 57176 0    C: 26655 0    C: 03560 1    I: 43057 1    C: 57176 0    C: 03466 0

35,2600      C: 36744 0    C: 24732 1    I: 77745 1    C: 03636 1    C: 03610 0    I: 77615 0    C: 00037 0    C: 37631 1
35,2610      C: 73224 1    I: 51575 1    C: 02357 1    C: 27576 0    C: 03506 1    I: 51451 0    C: 03566 1    C: 26341 0
35,2620      C: 03536 1    I: 45115 0    C: 02330 0    C: 46337 1    I: 77624 1    C: 46447 1    C: 17606 1    C: 03636 1
35,2630      C: 03442 0    I: 77776 1       33635 1       03622 1       06060 1    I: 77624 1    C: 73440 0    I: 77624 1

35,2640      C: 73516 1    I: 77650 1    C: 72512 1       02354 1       00006 1       31401 0       02652 1       02361 1
35,2650         00006 1       31403 1       53576 0       02366 0       06060 1    I: 77624 1    C: 20000 0    I: 77634 0
35,2660      C: 21603 1    C: 03612 1    I: 77615 0    C: 03576 0    C: 03442 0    C: 03610 0    C: 34041 0    C: 46401 0
35,2670      I: 77624 1    C: 73212 1    I: 77624 1    C: 73224 1    I: 77624 1    C: 73440 0    I: 77624 1    C: 73516 1

35,2700      I: 77650 1    C: 72657 0    I: 66220 1    C: 03463 0    C: 03614 1    C: 40000 0    I: 40345 1    C: 33644 1
35,2710      C: 00001 0    C: 27574 1    C: 03536 1    C: 27500 1    C: 03544 1    C: 27506 1    C: 03552 0    C: 27522 1
35,2720      C: 03560 1    C: 03530 1    I: 77624 1    C: 73212 1    I: 63235 0    C: 03536 1    I: 53515 0    C: 03536 1
35,2730      I: 46315 1    I: 51352 1    C: 02302 1    I: 63256 0    I: 63241 0    C: 00001 0    I: 75241 1    C: 02302 1

35,2740      I: 65552 0    I: 50315 0    C: 02302 1    C: 03536 1    I: 71244 0    C: 72750 0    C: 06513 0    I: 41425 1
35,2750      I: 71214 0    C: 03740 1    C: 73177 1    C: 03576 0    C: 14033 1    I: 77625 0    C: 02250 1    C: 03576 0
35,2760      I: 45246 0    C: 33650 1    I: 77640 0    C: 73207 0    I: 70535 0    C: 03614 1    I: 72030 1    C: 03463 0
35,2770      C: 00154 1    I: 77330 1    C: 03513 0    C: 03552 0    I: 65256 0    C: 00045 0    I: 53515 0    C: 03536 1
```

OCTAL LISTING FOR PARAGRAPH # 206, WITH PARITY BIT IN BINARY AT THE RIGHT OF EACH WORD, "@" DENOTES UNUSED FIXED MEMORY

ALL VALID WORDS ARE BASIC INSTRUCTIONS EXCEPT THOSE MARKED "I" (INTERPRETIVE OPERATOR WORDS) OR "C" (CONSTANTS)

```
35,3000     I: 77725 1   I: 41525 0   C: 00045 0   I: 77621 1   C: 00015 0   C: 14037 0   C: 06503 1   I: 41425 1
35,3010     C: 02250 1   I: 50165 0   C: 00037 0   C: 03463 0   I: 71545 0   I: 56205 0   C: 00017 1   C: 00015 0
35,3020     I: 77676 0   C: 00035 1   I: 44246 1   C: 06503 1   I: 77240 1   C: 03463 0   C: 02252 0   I: 53435 0
35,3030     C: 00007 0   I: 41241 0   C: 03544 1   C: 00015 0   I: 47315 0   C: 00001 0   C: 03560 1   I: 53435 0

35,3040     C: 00001 0   I: 41241 0   C: 03560 1   C: 00017 1   I: 77621 1   I: 63301 0   C: 00047 1   C: 00007 0
35,3050     I: 50235 0   C: 00001 0   C: 02252 0   I: 50315 0   C: 00001 0   C: 00007 0   I: 65552 0   I: 77765 0
35,3060     I: 43225 0   C: 06503 1   C: 02250 1   I: 65525 0   C: 00035 1   I: 75221 1   C: 06503 1   C: 00037 0
35,3070     I: 77615 0   I: 56205 0   C: 33642 1   I: 77605 1   I: 41257 1   C: 20176 0   I: 51406 1   I: 50025 0

35,3100     C: 03574 1   C: 73105 1   I: 75345 1   C: 03574 1   I: 77606 1   I: 51135 1   C: 03614 1   C: 73115 0
35,3110     I: 71331 0   C: 03614 1   C: 37777 1   I: 77650 1   C: 73153 1   I: 41345 0   C: 03576 0   C: 00033 1
35,3120     I: 71244 0   C: 73131 0   C: 03574 1   I: 77605 1   C: 33646 0   C: 17574 1   I: 70446 0   I: 52076 1
35,3130     C: 73141 1   I: 51545 1   C: 03576 0   I: 51525 1   C: 00033 1   I: 77625 0   I: 71240 1   C: 73144 1

35,3140     I: 77646 0   I: 52165 1   C: 03606 1   C: 73153 1   I: 57545 1   C: 03606 1   I: 70406 1   C: 03606 1
35,3150     I: 77615 0   I: 77650 1   C: 73154 0   C: 03606 1   I: 77615 0   C: 02310 1   C: 02310 1   I: 63375 0
35,3160     C: 03506 1   C: 03500 1   I: 77624 1   C: 73400 1   I: 77624 1   C: 46423 0   I: 63375 0   C: 03530 1
35,3170     C: 03522 1   I: 77624 1   C: 73400 1   I: 77624 1   C: 46433 1   I: 77650 1   C: 72722 0   I: 43345 1

35,3200     C: 03636 1   C: 02310 1   C: 17636 1   I: 77614 1   C: 01310 1   C: 73207 0   C: 02250 1   I: 52145 0
35,3210     C: 06505 1   C: 03463 0   I: 52375 1   C: 03552 0   C: 03536 1   I: 41456 0   C: 26302 1   C: 03536 1
35,3220     I: 53435 0   C: 03544 1   C: 02252 0   I: 77616 0   I: 77220 1   C: 03470 1   C: 03560 1   I: 65315 0
35,3230     C: 03552 0   C: 03610 0   I: 65325 0   C: 03631 0   C: 33642 1   I: 46125 0   C: 03467 1   C: 73243 0

35,3240     I: 77745 1   I: 41545 0   C: 06505 1   I: 77624 1   C: 73404 0   C: 27444 0   C: 00007 0   C: 27506 1
35,3250     C: 03444 0   I: 63256 0   C: 03536 1   I: 41456 0   I: 50235 0   C: 00001 0   C: 02252 0   I: 77715 1
35,3260     I: 72441 0   C: 00001 0   I: 75326 1   I: 43244 1   C: 73266 1   C: 06513 0   C: 15754 0   C: 03631 0
35,3270     I: 77625 0   C: 03610 0   C: 03452 1   I: 40335 0   C: 03467 1   C: 00001 0   I: 63325 0   C: 33654 0

35,3300     C: 03536 1   C: 26314 0   C: 03544 1   C: 36322 1   C: 22000 1   I: 77624 1   C: 73365 0   I: 64375 1
35,3310     C: 02357 1   C: 00001 0   I: 77772 0   C: 37434 0   C: 03470 1   I: 45020 1   C: 03463 0   C: 73365 0
35,3320     I: 61375 1   C: 03434 1   C: 00001 0   I: 77772 0   C: 02357 1   I: 63255 0   C: 03544 1   C: 03536 1
35,3330     I: 65325 0   C: 03442 0   C: 03631 0   I: 41525 0   C: 06513 0   I: 77624 1   C: 73404 0   I: 77775 1

35,3340     C: 00001 0   C: 03444 0   I: 41575 0   C: 02302 1   I: 57435 1   C: 02252 0   I: 41456 0   I: 76435 1
35,3350     C: 02302 1   I: 77715 1   I: 64315 1   C: 02357 1   C: 00001 0   I: 77772 0   C: 36274 0   C: 03463 0
35,3360     I: 40220 0   C: 03463 0   C: 00001 0   I: 77650 1   C: 73342 0   I: 57575 1   C: 02252 0   C: 24007 0
35,3370     C: 03536 1   I: 57456 1   C: 00015 0   I: 76435 1   C: 02252 0   C: 00001 0   I: 43401 0   C: 00023 0
```

```
OCTAL LISTING FOR PARAGRAPH # 207,  WITH PARITY BIT IN BINARY AT THE RIGHT OF EACH WORD, "@" DENOTES UNUSED FIXED MEMORY

ALL VALID WORDS ARE BASIC INSTRUCTIONS EXCEPT THOSE MARKED "I" (INTERPRETIVE OPERATOR WORDS) OR "C" (CONSTANTS)

35,3400     I: 65325 0   C: 06505 1   C: 02310 1   I: 41406 0   I: 45020 1   C: 03465 0   C: 27447 0   I: 71214 0
35,3410     C: 01673 1   I: 43054 1   C: 73414 1   C: 01473 0   I: 45545 1   C: 63736 0   I: 73014 0   C: 00063 1
35,3420     C: 02777 I   I: 43014 0   C: 04303 0   C: 73425 0   C: 00263 0   C: 25517 0   I: 77657 0   C: 57176 0
35,3430     C: 25535 0   I: 77657 0   C: 57176 0   C: 35543 0   C: 27145 1   I: 52175 0   C: 00001 0   C: 03465 0

35,3440     I: 43020 1   C: 03470 1   C: 01311 0   C: 73446 0   I: 77614 1   C: 00470 1   I: 77214 0   C: 03274 0
35,3450     C: 03434 1   C: 01236 1   I: 77776 1      33637 0      04607 1   C: 20471 1      06001 0      03461 1
35,3460        03453 0      35007 0      54003 0      22007 0      34747 1      54002 1      50002 0      41433 0
35,3470        50002 0      61235 1      26001 1      10002 1      13465 1      22000 1      00006 1      13502 1

35,3500        05506 1   C: 00146 1      06060 1   I: 45014 0   C: 03354 0   C: 73507 1   C: 73315 1   I: 77775 1
35,3510     C: 02357 1   C: 03656 1   I: 77624 1   C: 73360 0   I: 77650 1   C: 03470 1   I: 71220 1   C: 03470 1
35,3520     C: 33652 0   C: 02244 1   I: 71214 0   C: 01351 1   C: 73544 0   C: 33652 0   I: 77615 0   C: 33652 0
35,3530     C: 02244 1   I: 77414 0   C: 01742 1   C: 73544 0      03614 1      03537 0      03545 0      06060 1

35,3540     I: 41575 0   C: 03656 1   I: 77624 1   C: 42006 1   I: 77776 1      02437 0      31470 0      55464 1
35,3550        34770 0      04607 1   C: 01736 1      33640 0      04607 1   C: 20471 1      03561 0      03564 0
35,3560        03574 1      30005 1      55162 1      06001 0      40076 1      74737 1      00006 1      13561 1
35,3570        05355 1   C: 04024 0      05506 1   C: 00047 1      30005 1      55162 1      05355 1   C: 04024 0

35,3600        06060 1   I: 52014 0   C: 00670 0   C: 03464 1      00006 1      23463 1      33634 0      04607 1
35,3610     C: 20471 1      16001 1      01463 1      13606 0      37765 1      71010 0      00006 1      13621 0
35,3620        24002 0      00002 0      00006 1      23465 1      55615 0      31615 1      04607 1   C: 20471 1
35,3630        16001 1      01465 1      13625 1   C: 01445 0   C: 01467 0   C: 01472 1   C: 01473 0   C: 01521 0

35,3640     C: 04055 0   C: 14441 0   C: 37325 1   C: 00001 0   C: 20650 0   C: 12525 0   C: 12525 0   C: 00004 0
35,3650     C: 21505 1   C: 77777 0   C: 61337 1   C: 01252 0   C: 25253 1   C: 13434 0   C: 16162 0      35017 1
35,3660        05063 1   C: 03240 1   C: 74067 0      05520 0   C: 00303 1      05355 1   C: 00006 1      15263 1
35,3670        05323 0   C: 00077 1      13700 1      05506 1   C: 00122 0      04665 0   C: 62334 1      13705 1

35,3700        34730 1      54055 0      34741 1      00006 1      05014 1      05355 1   C: 00003 1      15263 1
35,3710        04636 0      55163 0      04607 1   C: 54267 0      10000 0      13733 1      34730 1      70106 1
35,3720        10000 0      13740 0      34741 1      70374 0      10000 0      13740 0      34740 0      00006 1
35,3730        02030 0      00006 1      13740 0      33742 0      04607 1   C: 20635 0      16001 1      13712 1

35,3740        31163 1      04631 1   C: 00203 0   C: 03743 1   C: 03744 0 CKSM 65573 0        @            @
35,3750          @            @            @            @            @            @            @            @
35,3760          @            @            @            @            @            @            @            @
35,3770          @            @            @            @            @            @            @            @
```

```
OCTAL LISTING FOR PARAGRAPH # 210,  WITH PARITY BIT IN BINARY AT THE RIGHT OF EACH WORD, "@" DENOTES UNUSED FIXED MEMORY

ALL VALID WORDS ARE BASIC INSTRUCTIONS EXCEPT THOSE MARKED "I" (INTERPRETIVE OPERATOR WORDS) CR "C" (CONSTANTS)

36,2000     C: 01056 0   C: 37167 0   C: 00457 1   C: 03250 0   C: 77777 0   C: 77731 1   C: 00307 0   C: 11040 0
36,2010     C: 00151 1   C: 05214 0   C: 77777 0   C: 77755 0   C: 00003 1   C: 00000 1   C: 00026 0   C: 30605 1
36,2020     C: 00013 0   C: 14303 1   C: 00030 1   C: 00014 1   C: 01512 0      12327 1      12611 1      13061 1
36,2030        15263 1      12150 0   C: 00000 1   C: 03656 1   C: 64067 1      12402 1      12562 0      12523 0

36,2040     C: 01450 1      12327 1      12613 0      13046 1      15263 1      12150 0   C: 04300 0   C: 03667 0
36,2050     C: 74066 1      12372 1      12562 0      12506 1      13122 1      12153 0   C: 77776 1   C: 02570 1
36,2060     C: 64066 0      12404 1      12566 1   C: 01450 1      12324 1      12613 0      13046 1      15263 1
36,2070        12150 0   C: 04526 1   C: 03667 0   C: 74066 1      12372 1      12562 0      12540 0      13421 1

36,2100     C: 01476 0      12327 1      12611 1      12776 1      15263 1      12153 0   C: 04300 0   C: 03656 1
36,2110     C: 64067 1      12402 1      12562 0      12465 0   C: 01477 1      12327 1      12611 1      13061 1
36,2120        15263 1      12122 0      12123 1      12124 0      12125 1      12402 1      12562 0      12533 1
36,2130        05355 1   C: 04024 0      34746 0      55507 0      55510 0      04607 1   C: 73710 0      00006 1

36,2140        31442 1      53512 1      00004 0      04665 0   C: 75565 0      00003 1      51455 1      00005 1
36,2150        44753 0      04607 1   C: 74663 1      06060 1   I: 45345 1   C: 03442 0   C: 35142 0   C: 34041 0
36,2160     C: 61063 0   I: 45014 0   C: 03347 1   C: 74202 1   C: 27101 1   I: 64375 1   C: 00025 0   C: 01732 0
36,2170     I: 77762 1   C: 25724 1   C: 00017 1   I: 64312 0   C: 01732 0   C: 35716 1   C: 67037 1   C: 16310 1

36,2200     C: 00015 0   C: 00041 1   I: 77624 1   C: 27606 1      12213 1      00006 1      31561 1      53442 0
36,2210        00006 1      33142 0      21442 0      52155 1      53500 1      00006 1      43751 0      21500 1
36,2220        00006 1      31500 0      05301 0   C: 02242 1   C: 74067 0      05355 1   C: 20254 0      05323 0
36,2230     C: 00077 1      15146 0      44753 0      55162 1      06060 1   I: 51575 1   C: 03553 1   C: 03472 0

36,2240     I: 77776 1      15146 0      33751 1      05175 1   C: 02300 0      05355 1   C: 40154 0      44743 1
36,2250        55162 1      51455 1      40006 0      00006 1      65263 0      33144 0      05175 1   C: 02270 0
36,2260        35020 0      05063 1   C: 02265 1   C: 74067 0      15263 1      04607 1   C: 20451 0      15146 0
36,2270        35020 0      05063 1   C: 02275 0   C: 74067 0      15263 1      33753 0      04607 1   C: 20460 1

36,2300        33143 1      05175 1   C: 02354 1      44753 0      55162 1      51455 1      30006 1      00006 1
36,2310        62327 0      55477 0      05175 1   C: 02350 0      36266 0      54001 1      46266 1      52752 0
36,2320        40025 1      55052 0      51455 1      00001 0      40106 1      74730 0      26106 1      00006 1
36,2330        51455 1      30010 0      53252 1      34743 0      54001 1      44743 1      52760 1      40025 1

36,2340        55060 1      00006 1      34746 0      52754 0      10762 0      15263 1      04626 1   C: 77401 1
36,2350        02656 0      05355 1   C: 00001 0      15263 1      00006 1      34746 0      52756 1      33751 1
36,2360        05175 1   C: 02407 0      05520 0   C: 00153 0      05520 0   C: 00154 1      05520 0   C: 00122 0
36,2370        51455 1      00011 1      10756 1      12402 1      34727 1      05076 0   C: 02536 0   C: 56067 0
```

```
OCTAL LISTING FOR PARAGRAPH # 211,  WITH PARITY BIT IN BINARY AT THE RIGHT OF EACH WORD, "@" DENOTES UNUSED FIXED MEMORY

ALL VALID WORDS ARE BASIC INSTRUCTIONS EXCEPT THOSE MARKED "I" (INTERPRETIVE OPERATOR WORDS) OR "C" (CONSTANTS)

36,2400       05355 1  C: 00053 1     44751 1     55162 1     05355 1  C: 40074 0     15263 1     40103 1
36,2410       74730 0     26103 1     05323 0  C: 00077 1     12425 1     31422 1     05205 0  C: 03670 0
36,2420    C: 72067 0     05331 0  C: 40033 0  C: 05014 1  C: 77777 0     34731 0     70103 1     10000 0
36,2430       12433 0     51455 1     00012 1     40101 0     74736 0     26101 0     44346 0     00006 1

36,2440       02011 0     64730 1     00006 1     01011 0     00006 1     30025 0     53342 1     44726 1
36,2450       70111 1     54111 1     00006 1     31517 0     53442 0     00006 1     30025 0     21442 0
36,2460       44733 0     70104 0     54104 0     51455 1     00013 0     00006 1     33136 0     53252 1
36,2470       30005 1     55162 1     40105 1     74734 1     26105 1     00006 1     30025 0     53442 0

36,2500       34746 0     55346 0     55621 1     34743 0     55623 0     12540 0     40101 0     74731 1
36,2510       00006 1     12540 0     31422 1     05205 0  C: 03670 0  C: 72067 0     05331 0  C: 40033 0
36,2520    C: 05014 1  C: 77777 0     12540 0     35006 1     54003 0     31412 1     55536 1     31413 0
36,2530       55540 0     35007 0     54003 0     30005 1     55162 1     00006 1     33140 1     53252 1

36,2540       44735 0     70111 1     54111 1     34734 0     70076 1     10000 0     13523 1     05520 0
36,2550    C: 00153 0     05520 0  C: 00154 1     05520 0  C: 00161 1     05355 1  C: 40054 1     05223 1
36,2560    C: 00062 0     02652 1     00006 1     34746 0     52760 1     15263 1     04626 1  C: 73657 1
36,2570       05506 1  C: 00161 1     05506 1  C: 00175 1     34742 1     55515 0     10764 0     12602 0

36,2600       04607 1  C: 74662 0     44756 0     55162 1     05355 1  C: 00004 0     15146 0     51455 1
36,2610       00002 0     30005 1     12614 1     44753 0     55162 1     05520 0  C: 00161 1     05520 0
36,2620    C: 00175 1     15146 0     05355 1  C: 00003 1     00004 0     06050 1  C: 73670 1     04665 0
36,2630    C: 75562 1     05506 1  C: 00312 1     02644 0  C: 00310 0     05506 1  C: 00314 1     34744 1

36,2640       00004 0     05175 1  C: 02354 1     15146 0     30002 0     05524 1     40000 0     00006 1
36,2650       06001 0     15513 1     44737 1     70111 1     54111 1     00002 0     40111 1     74737 1
36,2660       26111 1     00002 0     34746 0     55162 1     04636 0     55060 1     00006 1     31442 1
36,2670       52155 1     00006 1     40025 1     20155 1     07300 0     34770 0     54002 1     52155 1

36,2700       74337 0     00006 1     10002 1     30001 0     64743 0     00004 0     05175 1  C: 02716 0
36,2710       05331 0  C: 40036 0  C: 05024 1  C: 13000 0     31060 0     04631 1     40025 1     55064 0
36,2720       11162 1     12732 1     12723 1     37736 1     05063 1  C: 02736 1  C: 74067 0     05223 1
36,2730    C: 00144 0     12716 1     00006 1     34746 0     52764 0     15263 1     00006 1     41442 0

36,2740       53454 1     00006 1     30025 0     21454 1     00004 0     11162 1     15146 0     15146 0
36,2750       40000 0     00003 1     50000 1     13010 1     44746 1     55066 1     30370 0     04607 1
36,2760    C: 20466 1     13012 0     12607 0     12622 1     33145 1     04607 1  C: 20452 0     13012 0
36,2770       13027 0     12764 1     51455 1     30000 1     04607 1  C: 20460 1     44734 1     55066 1
```

```
OCTAL LISTING FOR PARAGRAPH # 212,  WITH PARITY BIT IN BINARY AT THE RIGHT OF EACH WORD, "@" DENOTES UNUSED FIXED MEMORY

ALL VALID WORDS ARE BASIC INSTRUCTIONS EXCEPT THOSE MARKED "I" (INTERPRETIVE OPERATOR WORDS) OR "C" (CONSTANTS)

36,3000       51455 1      30000 1      04607 1   C: 20466 1      13012 0      13040 1      13043 1      04607 1
36,3010    C: 20451 0      15146 0      03014 1      16001 1      00004 0      00006 1      23141 1      02652 1
36,3020       06050 1   C: 74350 1      05355 1   C: 00001 0      30005 1      55162 1      01141 1      05355 1
36,3030    C: 04024 0      34746 0      55162 1      35014 1      05076 0   C: 03022 1   C: 64065 0      15146 0

36,3040       05506 1   C: 00154 1      13101 0      00004 0      51455 1      00003 1      34635 0      05076 0
36,3050    C: 03222 0   C: 74067 0      00004 0      04665 0   C: 40205 1      03014 1      05355 1   C: 00134 1
36,3060       15146 0      35020 0      05076 0   C: 03526 0   C: 70067 1      05520 0   C: 00175 1      00004 0
36,3070       04665 0   C: 40205 1      03014 1      05355 1   C: 07024 0   C: 17000 1   C: 03526 0   C: 70067 1

36,3100       15146 0      40103 1      74730 0      10000 0      13115 0      34744 1      00004 0      05175 1
36,3110    C: 02433 1      34351 1      54001 1      40000 0      52760 1      44753 0      55162 1      15146 0
36,3120       05571 1   C: 01706 1      34777 1      04607 1   C: 20471 1      16001 1      13130 1      13122 1
36,3130       51455 1      00014 1   C: 02040 1   C: 02050 0   C: 02063 0   C: 02425 0   C: 62067 1   C: 03375 0

36,3140    C: 70067 1   C: 00000 1   C: 05656 1   C: 04672 0   C: 00752 1   C: 01475 0      05355 1   C: 04024 0
36,3150       33132 1      55455 0      30106 0      74730 0      10000 0      13120 0      04607 1   C: 33757 1
36,3160       40111 1      74730 0      10000 0      32022 0      62023 1      55250 0      34742 1      55515 0
36,3170       06060 1   I: 43175 0   C: 34001 1   C: 02663 0   C: 03735 0   I: 77735 0   C: 26002 1   I: 70476 0

36,3200    C: 37743 0   C: 56246 1   I: 77624 1   C: 56413 1   I: 77776 1      00004 0      04665 0   C: 40143 0
36,3210       03212 0      12130 0      00006 1      23141 1      00003 1      05520 0   C: 00124 0      04607 1
36,3220    C: 54125 0      01141 1      30005 1      55162 1      00006 1      32060 0      53252 1      33752 1
36,3230       04607 1   C: 20647 0      03255 0      13240 0      03222 0      05355 1   C: 00014 1      15146 0

36,3240       00004 0      04665 0   C: 40154 0      04665 0   C: 40141 1      00003 1      33753 0      04607 1
36,3250    C: 20455 1      03255 0      13255 1      03246 1      13235 1      00006 1      32110 0      53252 1
36,3260       34746 0      55462 1      30005 1      55162 1      00004 0      04665 0   C: 40115 0      00003 1
36,3270       06001 0      33133 0      55455 0      04607 1   C: 33757 1      34746 0      55507 0      55510 0

36,3300       35010 0      55162 1      05076 0   C: 03366 1   C: 74067 0      05331 0   C: 00116 1   C: 04024 0
36,3310       06060 1   I: 71214 0   C: 00700 0   C: 75317 0   C: 34017 0   C: 37735 1   C: 75322 0   I: 77745 1
36,3320    C: 34021 0   C: 03735 0   I: 77624 1   C: 56246 1   I: 77624 1   C: 56413 1   I: 77776 1      00004 0
36,3330       04665 0   C: 40154 0      04665 0   C: 40141 1      03212 0      06060 1   I: 45175 0   C: 03701 1

36,3340    C: 57271 1   C: 03502 0   I: 77776 1      33753 0      04607 1   C: 20441 1      05331 0   C: 00076 0
36,3350    C: 04024 0      12137 1      34770 0      04607 1   C: 01736 1      31162 0      64743 0      00006 1
36,3360       13352 1      33753 0      04607 1   C: 20441 1      35010 0      05137 1      31162 0      00006 1
36,3370       65146 1      00006 1      41442 0      53454 1      00006 1      30025 0      21454 1      06060 1
```

```
OCTAL LISTING FOR PARAGRAPH # 213,  WITH PARITY BIT IN BINARY AT THE RIGHT OF EACH WORD, "@" DENOTES UNUSED FIXED MEMORY

ALL VALID WORDS ARE BASIC INSTRUCTIONS EXCEPT THOSE MARKED "I" (INTERPRETIVE OPERATOR WORDS) OR "C" (CONSTANTS)

36,3400    I: 45175 0    C: 03701 1    C: 57271 1    C: 03502 0    I: 77776 1       34770 0       04607 1    C: 01736 1
36,3410       13366 0       05355 1    C: 04024 0       33134 1       55455 0       40106 1       74730 0       10000 0
36,3420       03120 1       04607 1    C: 33757 1       36000 1       55250 0       34742 1       55515 0       06060 1
36,3430    I: 77214 0    C: 01072 0    C: 34007 1    C: 03735 0    I: 52135 1    C: 26001 1    C: 75177 1       04607 1

36,3440    C: 33757 1       06060 1    I: 77624 1    C: 42760 0       30155 0       05175 1    C: 03450 0       15146 0
36,3450       05355 1    C: 05014 1    C: 77777 0       00006 1       33756 0       53252 1       34727 1       05076 0
36,3460    C: 03514 1    C: 74067 0       12344 1       06060 1    I: 53375 0    C: 03502 0    C: 03527 1    C: 03656 1
36,3470    I: 77624 1    C: 57271 1    C: 03623 0    I: 77776 1       05355 1    C: 10035 0       06060 1    I: 77775 1

36,3500    C: 03656 1    C: 03502 0    I: 77776 1       04626 1    C: 65656 1       33754 1       04607 1    C: 20647 0
36,3510       06001 0       06001 0       13514 0       13235 1       06060 1    I: 77775 1    C: 06505 1    C: 03623 0
36,3520    C: 03502 0    I: 77776 1       03505 1       31517 0       03736 0       05175 1    C: 03543 0       05520 0
36,3530    C: 00153 0       05520 0    C: 00154 1       05520 0    C: 00044 1       05355 1    C: 40114 1       05223 1

36,3540    C: 00062 0       02652 1       05263 0       04665 0    C: 75546 1       05263 0       34635 0       05076 0
36,3550    C: 03222 0    C: 74067 0       34744 1       05205 0    C: 03607 0    C: 74066 1       40103 1       74736 0
36,3560       26103 1       02652 1       00006 1       30025 0       53342 1       44736 0       70101 0       54101 0
36,3570       44346 0       00006 1       02011 0       64727 1       00006 1       01011 0       40111 1       74727 0

36,3600       26111 1       44730 0       54055 0       34741 1       00006 1       05014 1       04700 1       04665 0
36,3610    C: 40205 1       05263 0    I: 45020 1    C: 03665 1    C: 56447 0    I: 43014 0    C: 01307 1    C: 03665 1
36,3620    C: 03705 0    C: 75634 1    I: 45345 1    C: 01234 0    C: 03763 0    I: 50025 0    C: 03432 1    C: 75657 1
36,3630    I: 43345 1    C: 03763 0    C: 03432 1    C: 03765 0    I: 77776 1       10754 0       13664 1       34730 1

36,3640       00004 0       05076 0    C: 02711 1    C: 56067 0       05331 0    C: 00172 0    C: 10035 0       06060 1
36,3650    I: 77745 1    C: 03765 0    C: 27763 0    C: 01220 0    C: 26314 0    C: 01226 0    C: 02322 0    I: 45345 1
36,3660    C: 03631 0    C: 01234 0    C: 37452 0    C: 03665 1       06060 1    I: 77650 1    C: 03665 1       06060 1
36,3670    I: 77624 1    C: 75612 0    I: 77776 1       00004 0       35007 0       54003 0       40076 1       74734 1

36,3700       10000 0       13706 1       40103 1       74736 0       10000 0       13710 0       04626 1    C: 65656 1
36,3710       04665 0    C: 40166 1       05520 0    C: 00044 1       05506 1    C: 00161 1       00004 0       00006 1
36,3720       31442 1       52155 1       00006 1       40025 1       20155 1       07300 0       30155 0       03736 0
36,3730       05175 1    C: 03543 0       05331 0    C: 40114 1    C: 00035 1       15146 0       10000 0       13742 1

36,3740       13742 1       34746 0       64744 1       56001 0       34746 0       53517 1       31517 0       00002 0
36,3750    C: 00000 1    C: 00764 1    C: 04050 0    C: 04125 0    C: 04123 0    C: 03463 0    C: 74067 0    C: 03757 1
36,3760    C: 03760 0  CKSM 57311 0         @             @             @             @             @             @
36,3770          @             @             @             @             @             @             @             @
```

```
OCTAL LISTING FOR PARAGRAPH # 214,  WITH PARITY BIT IN BINARY AT THE RIGHT OF EACH WORD, "@" DENOTES UNUSEO FIXED MEMORY

ALL VALIO WORDS ARE BASIC INSTRUCTIONS EXCEPT THOSF MARKED "I" (INTERPRETIVE OPFRATOR WOROS) OR "C" (CONSTANTS)

37,2000      C: 07623 1   C: 26552 1      05313 0   C: 00007 0      02325 1      34746 0      55414 0      55440 1
37,2010         55441 0      55576 0      34352 1      55571 1      32476 0      02367 1      34727 1      55664 0
37,2020         06060 1   I: 62545 1   C: 02403 1   C: 15046 1   C: 02401 0   I: 77434 1   C: 21624 1      56154 1
37,2030         55044 1      32473 0      04607 1   C: 20471 1      02270 0      02037 1      02031 1      06060 1

37,2040      I: 47135 0   C: 01045 1   C: 21606 1   C: 02401 0   I: 60535 1   C: 01046 1   C: 02403 1   I: 57546 1
37,2050      I: 77752 1   C: 16437 0   C: 02403 1   I: 72556 1   C: 16435 1   C: 02401 0   I: 73406 1   C: 02675 1
37,2060      C: 16705 1   I: 77746 1   C: 02677 0   I: 77676 0   C: 36703 0   C: 47336 1   I: 77776 1      04607 1
37,2070      C: 16765 1      34727 1      70077 0      00006 1      12076 0      25414 1      05520 0   C: 00056 1

37,2100         02315 1      11414 0      02126 0      02320 1      00006 1      31575 1      05301 0   C: 02113 0
37,2110      C: 76065 0      32116 0      05124 0      32116 0      05130 0      05263 0   C: 76500 0      34746 0
37,2120         55047 1      31504 1      55050 1      51416 0      55420 1      02457 0      51414 1      02130 1
37,2130         02447 1      34352 1      55476 1      32474 1      55412 0      34744 1      55537 0      34746 0

37,2140         51415 0      54037 1      55472 0      02332 1      00004 0      34743 0      05175 1   C: 02151 0
37,2150         05146 1      00006 1      27412 0      31412 1      00006 1      62161 0      34733 1      05175 1
37,2160      C: 02151 0      34727 1      05076 0   C: 02166 1   C: 76065 0      05263 0      51414 1      02170 0
37,2170         02447 1      31412 1      00006 1      62175 0      05146 1      34747 1      55537 0      02332 1

37,2200         11473 1      02205 1      05701 1      41476 1      55476 1      00006 1      41473 1      21477 0
37,2210         06060 1   I: 45345 1   C: 02501 1   C: 02475 0   I: 45044 0   C: 76217 1   C: 76275 0   I: 56325 0
37,2220      C: 02477 1   I: 47075 0   C: 37056 0   C: 21622 1   C: 01050 0   I: 77776 1      11414 0      02301 1
37,2230         02457 0      32471 1      55412 0      51416 0      41417 0      55442 0      11415 1      12245 1

37,2240         44740 1      27565 1      34740 0      27567 0      12251 1      44740 1      27565 1      34740 0
37,2250         27563 1      02447 1      34746 0      55404 1      55405 0      34724 1      55440 1      55441 0
37,2260         30032 0      55413 1      02500 0      31502 1      55050 1      34746 0      55047 1      02457 0
37,2270         05520 0   C: 00007 0      44746 1      05316 0      05474 0   I: 43215 0   C: 06513 0   C: 37064 1

37,2300      I: 77616 0      00006 1      23571 0      34746 0      54321 0      54322 0      54323 1      04607 1
37,2310      C: 16765 1      04607 1   C: 17735 0      03047 1      01571 0      00006 1      23571 0      02311 0
37,2320         00006 1      23571 0      04607 1   C: 17175 1      02311 0      00006 1      23571 0      04607 1
37,2330      C: 16701 0      02311 0      00006 1      23417 1      02342 0      00003 1      30067 0      00006 1

37,2340         62346 1      05113 1      00004 0      51415 0      40037 1      55571 1      00004 0      51415 0
37,2350         30037 0      61571 0      00006 1      12335 1      51415 0      30037 0      51537 1      55472 0
37,2360         04102 0      51537 1      55473 1      51537 1      23474 1      00003 1      01417 1      54001 1
37,2370         12372 1      55571 1      34746 0      50001 0      54000 0      24001 0      11571 1      12371 1
```

```
OCTAL LISTING FOR PARAGRAPH # 215,  WITH PARITY BIT IN BINARY AT THE RIGHT OF EACH WORD, "@" DENOTES UNUSED FIXED MEMORY

ALL VALID WORDS ARE BASIC INSTRUCTIONS EXCEPT THOSE MARKED "I" (INTERPRETIVE OPERATOR WORDS) OR "C" (CONSTANTS)

37,2400        00002 0   I: 65345 0   C: 37057 1   C: 02403 1   I: 57546 1   I: 73525 1   C: 02403 1   I: 74266 0
37,2410     C: 36001 0   C: 02405 1   I: 77634 0   C: 21603 1   C: 26433 1   C: 37057 1   C: 02564 1   I: 77616 0
37,2420     I: 47020 0   C: 00051 0   C: 21603 1   C: 02431 0   I: 51025 1   C: 02433 1   C: 76431 0   I: 77624 1
37,2430     C: 76275 0   I: 74261 1   C: 20212 1   C: 02405 1   I: 53321 1   C: 02643 1   C: 02564 1   C: 16564 1

37,2440     C: 02431 0   C: 02433 1   I: 47170 1   C: 02563 0   C: 21715 1   I: 77650 1   C: 00051 0      00006 1
37,2450        23420 0      06060 1   I: 77624 1   C: 76420 0   I: 77776 1      02315 1      01420 0      00006 1
37,2460        23417 1      31416 0      55051 0      32472 1      04607 1   C: 20471 1      02270 0      01417 1
37,2470        12461 1   C: 07626 1   C: 01542 0   C: 01451 0   C: 00072 1   C: 02737 0   C: 01664 1   C: 01642 0

37,2500        00004 0      31572 0      05175 1   C: 02536 0      34746 0      54037 1      54040 1      54041 0
37,2510        00003 1      33075 0      55571 1      33076 0      02367 1      06060 1   I: 77735 0   C: 37057 1
37,2520     C: 25477 1   C: 37070 1   C: 26445 0   C: 37057 1   C: 00325 0   C: 01472 1   I: 77735 0   C: 02441 1
37,2530     I: 50076 0   C: 76534 1   I: 77624 1   C: 76401 0   I: 77776 1      03035 1      31576 1      00006 1

37,2540        12542 1      05263 0      11530 1      30000 1      55531 0      40000 0      55530 1      44744 0
37,2550        61562 1      00006 1      12556 1      31412 1      00006 1      62562 1      31572 0      05175 1
37,2560     C: 02536 0      34746 0      56037 0      54324 0      34746 0      56040 0      54326 1      34746 0
37,2570        56041 1      54330 0      34727 1      05076 0   C: 02577 0   C: 76065 0      05263 0      11562 0

37,2600        02602 1      02604 1      04607 1   C: 15333 0      06060 1   I: 77745 1   C: 37066 0   C: 24051 0
37,2610     C: 00325 0   I: 76505 0   C: 02643 1   I: 57545 1   C: 00160 0   C: 16523 1   C: 00162 1   C: 02527 0
37,2620     I: 76001 1   C: 00001 0   C: 00010 0   I: 57535 0   C: 02563 0   I: 77640 0   C: 76772 1   I: 50135 0
37,2630     C: 02532 1   C: 76644 0   I: 72174 0   C: 00014 1   C: 02444 1   I: 62143 0   C: 02243 0   C: 77775 1

37,2640     C: 12545 0   I: 66104 1   C: 76635 0   C: 02444 1   I: 77770 1   C: 00010 0   I: 41343 0   C: 02533 0
37,2650     C: 37100 1   I: 43661 1   C: 21212 0   C: 02501 1   C: 06501 0   I: 40725 0   C: 37102 0   C: 02521 0
37,2660     I: 77732 1   I: 45425 0   C: 71216 1   C: 06563 1   I: 77100 0   C: 76646 1   C: 00004 0   I: 56743 1
37,2670     C: 75324 0   C: 75240 0   C: 12453 0   I: 77104 1   C: 76667 1   C: 00010 0   I: 66140 1   C: 02445 0

37,2700     C: 02445 0   I: 56743 1   C: 02450 1   C: 75216 0   I: 77613 0   C: 75276 0   C: 12501 0   I: 42743 1
37,2710     C: 75314 0   C: 75230 1   C: 12463 0   I: 42673 0   C: 75216 0   C: 75266 1   C: 12511 1   I: 40743 0
37,2720     C: 37105 1   C: 75216 0   I: 42772 0   C: 75256 1   C: 12521 1   I: 76104 0   C: 76676 1   C: 00010 0
37,2730     I: 64743 0   C: 02523 1   C: 02521 0   I: 55523 0   C: 02531 1   I: 76521 0   C: 02001 1   I: 77745 1

37,2740     C: 00155 0   C: 06531 0   I: 77745 1   C: 00160 0   C: 06521 1   I: 77745 1   C: 00162 1   C: 06523 0
37,2750     I: 77700 0   C: 76730 1   I: 76174 1   C: 00006 1   C: 00002 0   I: 57343 1   C: 02503 0   C: 37110 0
37,2760     I: 77722 0   I: 73406 1   I: 56072 1   C: 00046 0   C: 10021 0   I: 77745 1   I: 77746 1   C: 10027 0
37,2770     I: 77704 1   C: 76755 1   I: 77776 1      35007 0      54003 0      01400 1      11412 0      03034 0
```

```
OCTAL LISTING FOR PARAGRAPH # 216,  WITH PARITY BIT IN BINARY AT THE RIGHT OF EACH WORD, "@" DENOTES UNUSED FIXED MEMORY

ALL VALID WORDS ARE BASIC INSTRUCTIONS EXCEPT THOSE MARKED "I" (INTERPRETIVE OPERATOR WORDS) OR "C" (CONSTANTS)

37,3000        11440 1        13003 0        03005 1        30032 0        55414 0        06060 1     I: 65345 0     C: 02473 0
37,3010     C: 02477 1     I: 55525 0     C: 02501 1     I: 74276 1     C: 37110 0     I: 74521 1     C: 02643 1     C: 02740 0
37,3020     I: 77776 1        32475 0        04607 1     C: 17310 0        02315 1        11440 1        02263 1        06060 1
37,3030     I: 77624 1     C: 76401 0     I: 77776 1        02117 1        55412 0        11440 1        02447 1        05146 1

37,3040        35005 1        54003 0        34744 1        55576 0        05571 1     C: 01600 0        02270 0        33054 0
37,3050        05740 1        05520 0     C: 00007 0        05146 1     C: 01601 1     C: 06200 0     C: 00000 1     C: 00000 1
37,3060     C: 00000 1     C: 00000 1     C: 00000 1     C: 00000 1     C: 00001 0     C: 00004 0     C: 00002 0     C: 00220 1
37,3070     C: 77776 1     C: 35730 0     C: 00035 1     C: 10317 0     C: 17550 1     C: 00115 1     C: 01443 0     C: 04133 1

37,3100     C: 02265 1     C: 57223 0     C: 66451 1     C: 05427 0     C: 12577 1     C: 77567 0     C: 44202 1     C: 24276 1
37,3110     C: 14066 1     C: 23073 1     C: 11773 1        40103 1        74740 1        00006 1        13371 0        40104 0
37,3120        74735 0        00006 1        13375 1        06060 1     I: 77634 0     C: 21603 1     C: 34041 0     C: 27115 1
37,3130     I: 77775 1     C: 00017 1     C: 26161 0     C: 00025 0     C: 16104 0     C: 00015 0     C: 02113 0     C: 34041 0

37,3140     C: 27101 1     I: 77775 1     C: 00017 1     C: 26131 0     C: 00025 0     C: 02172 1     I: 77776 1        40103 1
37,3150        74740 1        00006 1        13320 1        40104 0        74735 0        00006 1        13362 1        06060 1
37,3160     I: 77634 0     C: 21603 1     C: 34041 0     C: 27447 0     I: 43175 0     C: 02161 0     C: 00263 0     C: 25535 0
37,3170     C: 02104 0     C: 15543 1     C: 02113 0     I: 43014 0     C: 04344 0     C: 77177 0     C: 00063 1     I: 77614 1

37,3200     C: 01473 0     C: 35517 1     C: 27145 1     I: 77775 1     C: 00001 0     C: 26200 1     C: 00007 0     C: 36206 0
37,3210     C: 27447 0     I: 71214 0     C: 01473 0     C: 00015 0     C: 00041 1     I: 43175 0     C: 02131 0     C: 00263 0
37,3220     C: 25535 0     C: 02172 1     C: 15543 1     C: 02113 0     I: 43014 0     C: 04344 0     C: 77230 0     C: 00063 1
37,3230     C: 35517 1     C: 27145 1     I: 52375 1     C: 00001 0     C: 02200 1     I: 65234 1     C: 21722 0     C: 00045 0

37,3240     I: 77657 0     C: 20201 0     C: 26214 1     C: 00007 0     I: 50251 1     C: 02206 1     I: 77752 1     C: 26216 0
37,3250     C: 02200 1     I: 63256 0     C: 06477 0     I: 77624 1     C: 47653 1     I: 41505 1     C: 01732 0     I: 72431 1
37,3260     C: 00001 0     I: 53445 1     C: 00007 0     I: 47315 0     C: 00001 0     C: 02206 1     I: 50235 0     C: 00001 0
37,3270     C: 00015 0     I: 77715 1     I: 75241 1     C: 00007 0     C: 00015 0     I: 65512 1     C: 26220 0     C: 00001 0

37,3300     I: 51041 0     C: 00007 0     C: 77307 0     I: 45345 1     C: 06513 0     C: 02220 0     C: 02220 0     I: 77776 1
37,3310        34740 0        71043 0        00006 1        15474 1        41043 0        74731 1        27043 0        13147 1
37,3320        37731 0        05137 1        06060 1     I: 40375 1     C: 01220 0     C: 00001 0     C: 26200 1     C: 01226 0
37,3330     C: 26206 1     C: 01724 1     I: 65315 0     C: 01716 0     C: 01234 0     I: 77776 1        35006 1        05137 1

37,3340        06060 1     I: 77214 0     C: 03347 1     C: 77355 1     I: 60505 1     C: 01732 0     I: 77715 1     I: 76505 0
37,3350     C: 01732 0     I: 40206 1     C: 00001 0     I: 77650 1     C: 77232 1     I: 77624 1     C: 27447 0     I: 52014 0
37,3360     C: 01673 1     C: 77214 0        06060 1     I: 77634 0     C: 21603 1     C: 34041 0     C: 27115 1     I: 77650 1
37,3370     C: 77203 0        40102 0        74735 0        00006 1        13320 1        06060 1     I: 52034 1     C: 21603 1
```

```
OCTAL LISTING FOR PARAGRAPH # 217,  WITH PARITY BIT IN BINARY AT THE RIGHT OF EACH WORD, "@" DENOTES UNUSED FIXED MEMORY

ALL VALID WORDS ARE BASIC INSTRUCTIONS EXCEPT THOSE MARKED "I" (INTERPRETIVE OPERATOR WORDS) OR "C" (CONSTANTS)

37,3400      C: 77136 0     34750 1      03530 1      35022 1      05063 1   C: 03733 0   C: 14063 1      03543 0
37,3410         40103 1     74764 1      26103 1      44726 1      70076 1      54076 1      34742 1      55256 0
37,3420         37731 0     05076 0   C: 03661 0   C: 64067 1      34743 0      03524 1      34771 1      05226 1
37,3430         43537 1     60030 1      10000 0      44744 0      13436 1      34744 1      26030 0      03540 0

37,3440         34747 1     03530 1      34744 1      55256 0      34727 1      05076 0   C: 02121 1   C: 66067 0
37,3450         34734 0     00006 1      05011 1      30103 0      74740 1      00006 1      13516 1      30102 1
37,3460         74735 0     00006 1      13514 0      40107 0      74726 1      00006 1      13473 0      33536 1
37,3470         05205 0  C: 03142 0   C: 52067 1      10754 0      13514 0      34750 1      55055 1      40025 1

37,3500         64747 1     64725 0      64725 0      57054 1      34352 1      54001 1      40000 0      52754 0
37,3510         36007 0     05205 0   C: 02042 0   C: 42067 0      34742 1      13425 0      00006 1      33535 1
37,3520         53252 1     34742 1      03524 1      05263 0      54001 1      40025 1      55062 0      13531 1
37,3530         54001 1     40001 1      52762 0      00002 0   C: 03663 1   C: 44067 0   C: 00257 1   C: 37771 1

37,3540         00006 1     30025 0      53561 0      44746 1      55253 0      55254 1      55255 0      34746 0
37,3550         54330 0     54331 1      54326 1      54327 0      54325 1      55256 0      00006 1      40040 1
37,3560         53254 1     52040 1      54324 0      22326 0      40041 0      57255 1      56041 1      54330 0
37,3570         00006 1     31561 1      53247 0      00006 1      41234 1      21247 0      30032 0      55154 1

37,3600         30033 1     55155 0      30034 0      55156 0      30324 1      55157 1      30326 0      55160 0
37,3610         30330 1     55161 1      00002 0      11256 0      13430 1      33653 1      54002 1      10330 0
37,3620         13570 1     13624 0      13570 1      13570 1      22007 0      10326 1      13631 1      13640 1
37,3630         13631 1     22041 1      11255 0      41255 0      13567 1      13633 0      22330 1      13570 1

37,3640         11253 0     41253 0      13645 1      13641 0      13556 0      54324 0      41254 1      54326 1
37,3650         44746 1     52040 1      13564 1   C: 03440 1      05506 1   C: 00054 0      00004 0      00006 1
37,3660         30025 0     52315 1      03713 1      03656 1      52155 1      52317 0      00004 0      04607 1
37,3670      C: 17162 1     05520 0   C: 00007 0      05520 0   C: 00010 0      34732 0      00006 1      05013 0

37,3700         05355 1  C: 07024 0   C: 20000 0   C: 03733 0   C: 76060 0      34765 1      04607 1   C: 20635 0
37,3710         13705 1     13705 1      13705 1      00006 1      22156 0      04103 1      00003 1      52155 1
37,3720         34740 0     54001 1      34746 0      20155 1      44337 0      70155 1      56155 0      74337 0
37,3730         10000 0     24156 0      00156 0      44732 1      00006 1      03013 0      00004 0      34746 0

37,3740         54001 1     52025 1      03713 1      03736 0      00006 1      40317 0      20155 1      34733 1
37,3750         07330 0     34746 0      54156 1      07300 0      10154 0      03762 1      03762 1      03760 0
37,3760         34733 1     26154 0      00006 1      30315 0      20155 1      07300 0      52155 1      20025 1
37,3770         05520 0  C: 00054 0      06001 0   C: 03773 1   C: 03774 0 CKSM 54052 1         @            @
```

```
OCTAL LISTING FOR PARAGRAPH # 220,  WITH PARITY BIT IN BINARY AT THE RIGHT OF EACH WORD, "@" DENOTES UNUSED FIXED MEMORY

ALL VALID WORDS ARE BASIC INSTRUCTIONS EXCEPT THOSE MARKED "I" (INTERPRETIVE OPERATOR WORDS) OR "C" (CONSTANTS)

40,2000          00006 1        30036 1        52155 1        06060 1     I: 77624 1     C: 46065 0     C: 00001 0     C: 14007 0
40,2010       C: 06505 1     C: 24011 1     C: 00007 0     I: 77656 1     C: 00007 0     I: 77641 1     C: 06477 0     C: 24021 1
40,2020       C: 06503 1     I: 77641 1     C: 00007 0     C: 34023 1     C: 47303 1     I: 43244 1     C: 60030 1     C: 06513 0
40,2030       C: 26174 1     C: 00001 0     I: 77641 1     C: 06501 0     C: 24023 0     C: 00001 0     I: 77641 1     C: 00007 0

40,2040       C: 34021 0     C: 47303 1     I: 43244 1     C: 60045 0     C: 06513 0     C: 02172 1     I: 77776 1        34770 0
40,2050          04607 1     C: 01736 1        34740 0        71043 0        10000 0        02000 0        05474 0        34744 1
40,2060          57011 0        54115 0        11041 1        02065 0        02072 0        42136 0        60154 1        00006 1
40,2070          12072 1        04355 0        56154 1        54117 1        50000 1        02076 1        03463 0        02155 1

40,2100          02155 1        02155 1        02155 1        02155 1        02155 1        02155 1        02141 1        02141 1
40,2110          03463 0        03463 0        03463 0        03463 0        03463 0        03463 0        02153 1        02343 1
40,2120          03646 0        03463 0        03463 0        03463 0        03463 0        03463 0        03463 0        03517 1
40,2130          02376 1        02363 0        02137 0        03463 0        02456 1        02357 1     C: 00022 1        04626 1

40,2140       C: 62022 0        10776 0        02146 0        02146 0        05146 1        05146 1        36266 0        70777 1
40,2150          10000 0        02155 1        03463 0        34746 0        54117 1        10776 0        02162 0        02162 0
40,2160          02161 0        05146 1        02313 1        11014 1        34746 0        55014 1        02167 0        50117 0
40,2170          34066 0        74337 0        54124 1        30776 1        54143 0        03351 0        36266 0        70777 1

40,2200          10000 0        02212 1        50137 1        57000 0        54022 0        40022 0        40022 0        56022 1
40,2210          60117 0        02227 1        50137 1        57000 0        54154 0        34746 0        54155 1        34354 1
40,2220          07330 0        56155 0        60117 0        54155 1        02227 1        26154 0        02245 0        50137 1
40,2230          55000 1        40776 0        50137 1        62304 1        00006 1        12237 1        02301 1        36266 0

40,2240          70777 1        10000 0        02245 0        40776 0        02302 1        04607 1     C: 60250 0        02243 0
40,2250          44744 0        60137 1        00006 1        62243 0        02313 1        50137 1        31000 0        54155 1
40,2260          07124 1     C: 02311 0        36266 0        70777 1        50000 1        02265 1        02272 1        00006 1
40,2270          40156 1        52156 1        56156 0        50137 1        55003 1        56155 0        50137 1        55000 1

40,2300          04622 0        10776 0        54776 0        05146 1     C: 00022 1     C: 00020 0     C: 00012 1     C: 00005 1
40,2310       C: 00000 1     C: 05174 0     C: 13261 0        50776 1        32317 0        54137 0        00002 0     C: 00004 0
40,2320       C: 00004 0     C: 00004 0     C: 00004 0     C: 00004 0     C: 00003 1     C: 00003 1     C: 00003 1     C: 00003 1
40,2330       C: 00003 1     C: 00002 0     C: 00002 0     C: 00002 0     C: 00002 0     C: 00002 0        05701 1     C: 00001 0

40,2340       C: 00001 0     C: 00000 1     C: 00000 1        34746 0        55000 1        34351 1        54776 0        02570 1
40,2350          34744 1        54777 1        34746 0        55012 1        34210 0        54136 1        05146 1        34746 0
40,2360          55001 0        34352 1        02346 1        02435 1        02422 1        34743 0        50137 1        64736 1
40,2370          26777 1        11014 1        34746 0        55014 1        02375 1        05146 1        02435 1        02402 0
```

```
OCTAL LISTING FOR PARAGRAPH # 221,  WITH PARITY BIT IN BINARY AT THE RIGHT OF EACH WORD, "@" DENOTES UNUSED FIXED MEMORY

ALL VALID WORDS ARE BASIC INSTRUCTIONS EXCEPT THOSE MARKED "I" (INTERPRETIVE OPERATOR WORDS) OR "C" (CONSTANTS)

40,2400          34744 1      02366 0      22002 0      02313 1      50137 1      32430 1      54123 0      64744 1
40,2410          54122 1      34746 0      54124 1      56123 1      03433 0      34732 0      54124 1      56122 0
40,2420          03433 0      00001 0      22002 0      02313 1      50137 1      32430 1      54122 1      64744 1
40,2430          54123 0      02411 1   C: 00005 1   C: 00003 1   C: 00000 1      22002 0      36266 0      70777 1

40,2440          10000 0      05146 1      44310 0      02451 0      44311 1      02451 0      44312 1      02451 0
40,2450          05146 1      60776 1      00006 1      12455 0      00002 0      00001 0      10776 0      64744 1
40,2460          02462 0      64744 1      50000 1      32317 0      54137 0      11014 1      02474 1      02471 1
40,2470          02471 1      30137 1      02516 1      02511 0      10137 0      54137 0      02516 1      32566 0

40,2500          27012 1      30137 1      54125 0      00006 1      27000 1      04607 1   C: 62367 1      30125 1
40,2510          54137 0      02514 0      25014 0      05146 1      22002 0      02527 0      67767 0      10000 0
40,2520          00002 0      05701 1      05146 1      00002 0      54776 0      22002 0      02313 1      34746 0
40,2530          50137 1      55000 1      50137 1      55003 1      54124 1      50137 1      44736 0      70777 1

40,2540          72567 0      54777 1      50137 1      32557 1      54143 0      03351 0      50137 1      32562 1
40,2550          54776 0      02570 1      44743 1      26776 0      02570 1      50137 1      34306 0      54776 0
40,2560          00001 0   C: 00016 0   C: 00005 1   C: 00004 0   C: 00015 0   C: 00011 1   C: 00003 1   C: 77774 0
40,2570          30776 1      54021 0      42603 1      00004 0      50021 1      57022 0      00006 1      62601 1

40,2600          25015 1      00003 1      00002 0   C: 04000 0      34746 0      54156 1      02701 0      02611 0
40,2610          02674 0      02712 1      02614 0      02604 1      30154 1      74724 0      00006 1      12623 0
40,2620          40154 0      64744 1      54154 0      00002 0      00006 1      00033 1      00006 1      74733 0
40,2630          40000 0      76266 1      54154 0      02726 0      02664 1      40110 0      74742 0      10000 0

40,2640          02646 1      52155 1      20001 1      20001 1      20001 1      52155 1      07124 1   C: 00123 1
40,2650          02740 0      02664 1      00006 1      42663 1      20155 1      34354 1      07330 0      52156 1
40,2660          52155 1      02646 1   C: 00001 0   C: 01150 1      34724 1      70154 0      54155 1      30154 1
40,2670          60000 1      74744 0      54154 0      00002 0      00006 1      50156 0      32723 0      52124 1

40,2700          00002 0      10154 0      00002 0      00002 0      12705 0      44726 1      70154 0      54154 0
40,2710          50002 0      00001 0      00006 1      50156 0      32723 0      52155 1      07330 0      52124 1
40,2720          20155 1      02731 0   C: 05605 1   C: 03656 1   C: 16314 0   C: 31463 1      52124 1      52155 1
40,2730          04406 1      04626 1   C: 62615 1      52124 1      52155 1      04406 1      02740 0      02752 0

40,2740          56156 0      56155 0      54154 0      02731 0      02752 0      02731 0      02752 0      36263 0
40,2750          03202 1      02731 0      56002 0      54162 0      02776 0      07300 0      07124 1   C: 00123 1
40,2760          00162 1      02525 1      02402 0      30154 1      03335 1      46266 1      50117 0      64310 1
40,2770          54776 0      02776 0      30155 0      03335 1      04626 1   C: 62617 0      56002 0      54144 1
```

```
OCTAL LISTING FOR PARAGRAPH # 222, WITH PARITY BIT IN BINARY AT THE RIGHT OF EACH WORD, "@" DENOTES UNUSED FIXED MEMORY

ALL VALID WORDS ARE BASIC INSTRUCTIONS EXCEPT THOSE MARKED "I" (INTERPRETIVE OPERATOR WORDS) OR "C" (CONSTANTS)

40,3000      50140 1      03001 0      03016 0      50117 0      30150 0      74347 1      04304 1      00006 1
40,3010      50000 1      30001 0      52155 1      34746 0      54156 1      00144 0      30145 1      03007 0
40,3020      50140 1      03021 1      03024 1      03447 0      00006 1      50145 1      30001 0      52155 1
40,3030      34310 1      54776 0      34746 0      54156 1      07300 0      03322 1      00136 0      07124 1

40,3040   C: 03123 1      10155 1      34732 0      03045 0      44732 1      60155 0      03214 0      04375 1
40,3050      04375 1      03223 1      04375 1      10154 0      03060 1      03060 1      40000 0      54154 0
40,3060      10152 0      03117 0      03072 1      10154 0      05701 1      03115 1      03067 0      56154 1
40,3070      74724 0      54154 0      50140 1      03073 0      03077 1      03107 1      03100 0      03112 0

40,3100      40000 0      64743 0      00006 1      13105 1      02614 0      04626 1   C: 63225 1      04607 1
40,3110   C: 63104 1      03076 0      04607 1   C: 63076 0      03100 0      44724 0      03071 1      40154 0
40,3120      74724 0      40000 0      03071 1   C: 26161 0   C: 30707 1      07124 1   C: 00123 1      56156 0
40,3130      56155 0      56154 1      00006 1      13135 1      06020 0      03212 0      03223 1      03105 0

40,3140      07124 1   C: 00123 1      03135 0      07124 1   C: 00123 1      56156 0      60000 1      54156 1
40,3150      34746 0      60155 0      03214 0      03223 1      50140 1      03155 0      03166 0      30117 0
40,3160      60145 1      54002 1      56155 0      50002 0      54001 1      03105 0      34746 0      03160 0
40,3170      07124 1   C: 00123 1      36263 0      03202 1      03145 1      07124 1   C: 00123 1      34743 0

40,3200      03202 1      03145 1      56002 0      54124 1      56002 0      54123 0      04375 1      10123 0
40,3210      03205 0      00124 0      56155 0      60000 1      54155 1      00002 0      60154 1      54154 0
40,3220      00002 0      54162 0      00002 0      10162 0      06020 0      00002 0      06020 0      56002 0
40,3230      54144 1      10154 0      03242 0      03242 0      64744 1      54154 0      02422 1      40155 1

40,3240      54155 1      00144 0      02402 0      00144 0      00006 1      33310 0      20155 1      00006 1
40,3250      13254 0      00006 1      34724 1      52155 1      00002 0      56002 0      54115 0      03227 0
40,3260      03244 0      34742 1      54137 0      34354 1      07330 0      50154 1      34066 0      74337 0
40,3270      54124 1      34746 0      56156 0      56155 0      54154 0      56776 1      54143 0      10000 0

40,3300      54776 0      03351 0      10137 0      03262 1      44351 0      54776 0      00115 1   C: 00000 1
40,3310   C: 02476 0      56002 0      54115 0      03227 0      03261 1      56002 0      54115 0      03227 0
40,3320      34744 1      03262 1      56002 0      54115 0      34746 0      54124 1      36266 0      03433 0
40,3330      34742 1      03433 0      03227 0      34311 0      03262 1      00006 1      73345 1      22154 1

40,3340      34746 0      54155 1      56002 0      54115 0      03320 0   C: 00244 0      03335 1      04626 1
40,3350   C: 62376 1      56002 0      54114 1      34337 1      70143 0      54021 0      56021 1      54141 1
40,3360      34744 1      70143 0      10000 0      03365 1      03375 0      56124 0      04331 1      54124 1
40,3370      34727 1      70143 0      10000 0      34743 0      64744 1      54143 0      00004 0      50141 0
```

OCTAL LISTING FOR PARAGRAPH # 223, WITH PARITY BIT IN BINARY AT THE RIGHT OF EACH WORD, "@" DENOTES UNUSED FIXED MEMORY

ALL VALID WORDS ARE BASIC INSTRUCTIONS EXCEPT THOSE MARKED "I" (INTERPRETIVE OPERATOR WORDS) OR "C" (CONSTANTS)

```
40,3400        11022 1        03403 0        05701 1        64744 1        54142 1        50143 1        73427 1        00006 1
40,3410        60124 0        00006 1        13425 0        50143 1        43427 1        70142 1        60124 0        40000 0
40,3420        50141 0        57022 0        00006 1        63425 1        25015 1        00003 1        00114 0     C: 00037 0
40,3430     C: 01740 0     C: 02000 0     C: 03740 1        54141 1        34743 0        54143 0        56002 0        54114 1

40,3440        03376 0        03351 0        33444 0        04631 1     C: 63463 0        44351 0        54776 0        43470 0
40,3450        60136 0        00006 1        13465 1        43467 0        60136 0        00006 1        13460 1        03463 0
40,3460        04175 0        04355 0        04124 1        04355 0        05146 1        05644 1     C: 21501 0     C: 04124 1
40,3470        04173 0        34744 1        55013 0        04175 0        04450 1        04424 1        03605 1        44744 0

40,3500        03472 0        41000 1        63516 0        00006 1        26000 0        00006 1        13463 1        34746 0
40,3510        55012 1        44351 0        54776 0        03471 0        44746 1        03472 0     C: 00026 0        44742 0
40,3520        00006 1        03011 1        10115 0        34727 1        71020 0        10000 0        03535 1        04450 1
40,3530        11041 1        03533 1        05146 1        04626 1     C: 21062 0        34746 0        55011 1        11041 1

40,3540        05146 1        04473 0        05146 1        30776 1        54132 0        34744 1        03565 1        34310 1
40,3550        02524 0        34743 0        03565 1        34311 0        02524 0        34742 1        03565 1        34312 0
40,3560        02524 0        30132 1        54776 0        52131 0        05170 1        70123 0        10000 0        00002 0
40,3570        50002 0        00002 0        34353 0        56776 1        54140 0        11010 0        64744 1        03335 1

40,3600        03602 0        02570 1        55140 1        54776 0        05146 1        11041 1        03610 0        05146 1
40,3610        34746 0        57041 0        00004 0        05130 0        11013 0        03637 0        05146 1        03635 1
40,3620        34743 0        50064 0        60164 1        50064 0        54164 0        31001 1        54001 1        31000 0
40,3630        50064 0        52155 1        00003 1        04450 1        05146 1        34746 0        03621 1        34744 1

40,3640        03621 1        34346 1        05063 1     C: 03734 1     C: 62102 0        05263 0        56115 1        55011 1
40,3650        00004 0        34733 1        00006 1        05011 1        33735 0        71035 1        64726 0        55035 1
40,3660        45017 0        71300 1        65017 1        55300 1        44733 0        71277 0        64733 1        55277 0
40,3670        43734 0        70110 0        64736 1        54110 0        06040 0        44733 0        00006 1        03013 0

40,3700        43733 1        00006 1        03011 1        34354 1        54117 1        00004 0        50117 0        11022 1
40,3710        64744 1        03716 1        64744 1        40000 0        73736 1        03721 0        40000 0        73736 1
40,3720        40000 0        50117 0        55022 1        00003 1        10117 1        03704 1        34746 0        54375 1
40,3730        54376 1        55357 0        05146 1     C: 00104 1     C: 00330 1     C: 00053 1     C: 73777 1     C: 26501 1

40,3740     C: 07463 1        35[illegible]6 1        05076 0     C: 03113 1     C: 76067 1        05223 1     C: 00144 0        31043 1
40,3750        74731 1        00006 1        13745 0        35010 0        05063 1     C: 03761 1     C: 60107 1        15263 1
40,3760     C: 04066 0        33760 0        04607 1     C: 20323 1        05565 1        05565 1        13761 0     C: 03767 1
40,3770     C: 03770 1   CKSM 57770 0           @              @              @              @              @              @
```

```
OCTAL LISTING FOR PARAGRAPH # 224,  WITH PARITY BIT IN BINARY AT THE RIGHT OF EACH WORD, "@" DENOTES UNUSED FIXED MEMORY

ALL VALID WORDS ARE BASIC INSTRUCTIONS EXCEPT THOSE MARKED "I" (INTERPRETIVE OPERATOR WORDS) OR "C" (CONSTANTS)

41,2000         3501[illegible] 0      05076 0   C: 02000 0   C: 60104 1      34731 0      05137 1      32017 0      04607 1
41,2010      C: 20345 1      05565 1      05565 1      05565 1      34742 1      05466 0      05146 1   C: 04070 1
41,2020         03613 0      03045 0      34746 0      55014 1      34210 0      54136 1      11012 1      02062 1
41,2030         02062 1      02032 1      32060 0      61012 0      00006 1      12047 1      36266 0      70777 1

41,2040         10000 0      02043 1      02047 0      10776 0      02053 0      02053 0      02047 0      41012 1
41,2050         55012 1      04424 1      01012 0      34746 0      54154 0      04607 1   C: 60254 1      02047 0
41,2060      C: 03471 0   C: 00034 0      34746 0      54777 1      44351 0      54776 0      41000 1      55040 0
41,2070         62061 1      00006 1      62160 1      00006 1      32141 1      52006 0      50140 1      02077 0

41,2100         02102 0      02246 0      10146 0      02156 1      02400 1      02111 1      25016 1      04302 1
41,2110         02145 0      34726 0      55014 1      44210 1      60136 0      00006 1      12120 1      02143 0
41,2120         02336 0      10777 1      06020 0      44351 0      54776 0      11041 1      02131 0      02132 0
41,2130         02131 0      04420 0      57004 1      04274 1      00006 1      32141 1      52006 0      02160 1

41,2140      C: 02110 0   C: 64171 0   C: 77772 0      30156 0      04274 1      44747 0      61000 0      00006 1
41,2150         12160 0      34312 0      54776 0      31016 1      03435 0      02160 1      64744 1      04274 1
41,2160         42172 0      61000 0      10000 0      64744 1      02166 1      02173 0      54154 0      04450 1
41,2170         04626 1   C: 66000 1   C: 00050 1      51000 0      32176 0      04631 1   C: 62400 1   C: 62414 1

41,2200      C: 62422 1   C: 62427 1   C: 62407 0   C: 62402 0   C: 62552 1   C: 61020 1   C: 62400 1   C: 62400 1
41,2210      C: 61447 1   C: 63302 0   C: 63302 0   C: 63302 0   C: 63302 0   C: 63302 0   C: 63302 0   C: 63302 0
41,2220      C: 62400 1   C: 62400 1   C: 62400 1   C: 63002 0   C: 63013 0   C: 63030 1   C: 62753 1   C: 62647 0
41,2230      C: 62400 1   C: 63425 1   C: 62400 1   C: 62400 1   C: 63526 0   C: 63557 0   C: 61514 0   C: 61471 1

41,2240      C: 61477 1   C: 63662 0   C: 12454 1   C: 63470 1   C: 62400 1   C: 62400 1      10146 0      02253 1
41,2250         62400 1      02253 1      02253 1      46263 1      61000 0      00006 1      62260 1      02160 1
41,2260         34743 0      54117 1      62305 0      54145 0      50117 0      30150 0      54122 1      03104 1
41,2270         02306 0      02273 0      24122 0      30122 0      74347 1      04304 1      50000 1      30000 1

41,2300         50145 1      56000 1      10117 1      02261 0      02160 1      00125 1      50000 1      12310 0
41,2310         00002 0      00002 0      00002 0      00002 0      12330 1      12330 1      00002 0      12330 1
41,2320         00002 0      00002 0      12330 1      00002 0      00002 0      00002 0      00002 0      00002 0
41,2330         50002 0      00001 0      34310 1      12337 0      34311 0      12337 0      34312 0      54776 0

41,2340         40002 1      55012 1      04607 1   C: 60525 0      04420 0      00136 0      55001 0      56002 0
41,2350         54117 1      00006 1      32141 1      52006 0      10146 0      64744 1      12361 0      12362 0
41,2360         12362 0      04274 1      34352 1      54776 0      31001 1      12374 1      55000 1      56002 0
41,2370         54117 1      34351 1      54776 0      31000 0      04626 1   C: 61346 1      00117 0      06020 0
```

```
OCTAL LISTING FOR PARAGRAPH # 225,  WITH PARITY BIT IN BINARY AT THE RIGHT OF EACH WORD, "@" DENOTES UNUSED FIXED MEMORY

ALL VALID WORDS ARE BASIC INSTRUCTIONS EXCEPT THOSE MARKED "I" (INTERPRETIVE OPERATOR WORDS) OR "C" (CONSTANTS)

41,2400         04626 1    C: 61447 1       44743 1       02453 1       50145 1       40002 1       56132 1       44744 0
41,2410         02453 1       50145 1       40001 1       56131 1       02472 1       02515 1       50145 1       40000 0
41,2420         56130 0       02434 0       44744 0       02466 1       50145 1       40001 1       02420 0       44743 1
41,2430         02466 1       50145 1       40002 1       02420 0       44743 1       61000 0       10000 0       02442 1

41,2440         00136 0       02442 1       54122 1       50000 1       34310 1       54776 0       50122 0       40130 1
41,2450         03435 0       56122 0       02436 1       54123 0       22002 0       02544 0       04322 0       76266 1
41,2460         60123 1       10000 0       00001 0       05701 1       02400 1       00001 0       54123 0       22002 0
41,2470         02472 1       02455 1       00006 1       22156 0       02544 0       74727 0       10000 0       02400 1

41,2500         00156 0       22002 0       02544 0       74727 0       10000 0       06020 0       00001 0       22002 0
41,2510         02544 0       10000 0       00001 0       00001 0       02400 1       22002 0       30146 1       64744 1
41,2520         00006 1       12533 1       50140 1       02523 1       02526 1       00001 0       03076 0       02306 0
41,2530         00001 0       24145 1       00001 0       31016 1       74775 1       00006 1       50000 1       00000 1

41,2540         40000 0       12420 1    C: 00147 0    C: 00146 1       50140 1       32541 0       50000 1       30000 1
41,2550         74341 1       00002 0       02544 0       04322 0       76266 1       54117 1       54122 1       60145 1
41,2560         50000 1       40000 0       50122 0       57002 1       10122 1       02556 0       34746 0       54155 1
41,2570         54156 1       50117 0       34310 1       54776 0       50117 0       41002 0       54154 0       03117 0

41,2600         54123 0       00006 1       32614 0       52006 0       50140 1       02605 0       02611 0       03104 1
41,2610         02624 0       03076 0       02624 0    C: 02146 0    C: 64101 0       04607 1    C: 61255 1       10117 1
41,2620         02622 0       00136 0       54117 1       02566 0       50000 1       32627 0       04631 1    C: 61445 0
41,2630      C: 62615 1    C: 60604 0    C: 60726 1    C: 60737 1    C: 60744 0    C: 60624 1    C: 60746 1    C: 65241 0

41,2640      C: 65314 1    C: 60744 0    C: 60733 0    C: 60761 1    C: 60612 1    C: 60634 0    C: 60651 0       44743 1
41,2650         02453 1       02507 1       33056 1       02366 0       02332 1       33057 0       02366 0       02334 1
41,2660         33060 1       02366 0       02336 0       46263 1       03061 0       00006 1       32141 1       52006 0
41,2670         34746 0       03145 1       50145 1       54000 0       34744 1       03145 1       50145 1       54001 1

41,2700         34743 0       03145 1       50145 1       54002 1       44750 0       61001 1       00006 1       12711 0
41,2710         03045 0       00004 0       44754 1       61002 1       00006 1       62725 0       31002 1       04275 0
41,2720         50145 1       30000 1       54001 1       34744 1       55002 0       64352 1       00006 1       12751 1
41,2730         31004 1       00006 1       62740 0       31003 0       00006 1       51002 1       05000 1       12744 0

41,2740         41003 1       00006 1       51002 1       03000 1       11002 0       10000 0       12751 1       50145 1
41,2750         22000 1       00003 1       03045 0       44744 0       02453 1       02507 1       33056 1       02366 0
41,2760         02332 1       33057 0       02366 0       02334 1       44747 0       03061 0       00006 1       32141 1
41,2770         52006 0       34746 0       03145 1       50145 1       54000 0       34744 1       03145 1       50145 1
```

```
OCTAL LISTING FOR PARAGRAPH # 226,  WITH PARITY BIT IN BINARY AT THE RIGHT OF EACH WORD, "@" DENOTES UNUSED FIXED MEMORY

ALL VALID WORDS ARE BASIC INSTRUCTIONS EXCEPT THOSE MARKED "I" (INTERPRETIVE OPERATOR WORDS) OR "C" (CONSTANTS)

41,3000       54001 1     03045 0     02332 1     00006 1     32141 1     52006 0     34746 0     03145 1
41,3010       50145 1     54000 0     03045 0     44744 0     02453 1     34726 0     55014 1     02334 1
41,3020       00006 1     32141 1     52006 0     34744 1     03145 1     50145 1     54001 1     03045 0
41,3030       44743 1     02453 1     34726 0     55014 1     02336 0     00006 1     32141 1     52006 0

41,3040       34743 0     03145 1     50145 1     54002 1     03045 0     34746 0     54777 1     44746 1
41,3050       55013 0     04450 1     44351 0     54776 0     04626 1  C: 61605 0  C: 00025 0  C: 00026 0
41,3060    C: 00027 1     54117 1     40777 1     54021 0     40021 0     40021 0     10000 0     13071 0
41,3070       00002 0     60117 0     00006 1     13075 1     06020 0     00002 0     56002 0     54114 1

41,3100       34340 1     70147 1     04313 1     00114 0     56002 0     54114 1     50117 0     33136 0
41,3110       54001 1     50117 0     34337 1     70153 1     50001 0     00000 1     00114 0     56002 0
41,3120       54114 1     50140 1     03122 0     03141 0     50117 0     33136 0     54001 1     50117 0
41,3130       34337 1     70147 1     50001 0     00000 1     60000 1     00114 0     03075 0     04313 1

41,3140       04322 0     34337 1     70147 1     60000 1     00114 0     54117 1     56002 0     54115 0
41,3150       34746 0     54162 0     50117 0     57005 0     54155 1     50117 0     57002 1     54154 0
41,3170       60160 1     03145 1     00207 1     00247 0     30500 1     05107 1     08306 1     00226 1

41,3200       24145 1     30145 1     26117 1     34746 0     50117 0     53777 0     03225 1     04302 1
41,3210       10777 1     03244 0     02501 1     03076 0     02306 0     03221 0     34746 0     54117 1
41,3220       03200 0     30146 1     64744 1     00006 1     13231 0     56154 1     00115 1  C: 02154 0
41,3230    C: 64101 0     44750 0     61016 1     00006 1     13045 1     31016 1     74775 1     56154 1

41,3240       00006 1     50154 1     01000 0     03045 0     03117 0     54123 0     00006 1     33230 0
41,3250       52006 0     50140 1     03252 1     03256 0     03104 1     03257 1     03076 0     50000 1
41,3260       33252 1     04631 1  C: 62377 0  C: 61135 1  C: 61037 1  C: 61125 0  C: 61143 0  C: 61170 0
41,3270    C: 61447 1  C: 61143 0  C: 65463 0  C: 61447 1  C: 61175 0  C: 61140 0  C: 61447 1  C: 61037 1

41,3300    C: 61447 1  C: 61447 1     43311 0     71016 0     54155 1     40136 1     64210 0     10000 0
41,3310       03317 1  C: 60000 1     03317 1     34727 1     26155 1     34746 0     55021 1     36115 1
41,3320       71000 1     04322 0     54022 0     40022 0     56022 1     61001 1     54154 0     34746 0
41,3330       55011 1     11041 1     03334 0     04473 0     00004 0     11017 1     03343 0     34744 1

41,3340       05205 0  C: 03347 1  C: 62101 0     52155 1     53020 0     00003 1     00136 0     04371 0
41,3350       11020 0     03355 1     03355 1     03366 1     03366 1     33372 1     05205 0  C: 03347 1
41,3360    C: 62101 0     34346 1     05063 1  C: 03373 0  C: 62101 0     05263 0     34746 0     55017 1
41,3370       55020 0     05263 0  C: 00144 0     11020 0     03400 0     03400 0     05146 1     05146 1
```

```
OCTAL LISTING FOR PARAGRAPH # 227,  WITH PARITY BIT IN BINARY AT THE RIGHT OF EACH WORD, "@" DENOTES UNUSED FIXED MEMORY

ALL VALID WORDS ARE BASIC INSTRUCTIONS EXCEPT THOSE MARKED "I" (INTERPRETIVE OPERATOR WORDS) OR "C" (CONSTANTS)

41,3400         11011 1      03423 1      36115 1      71017 1      02346 1      34144 1      71017 1      63421 0
41,3410         54023 1      30023 0      55000 1      33422 0      54136 1      43311 0      71020 0      54156 1
41,3420         02073 1   C: 75377 0   C: 04124 1      04365 0      05146 1      34310 1      54776 0      31046 1
41,3430         54001 1      31016 1      04642 0      03435 0      05146 1      54022 0      56002 0      54115 0

41,3440         34727 1      26776 0      34742 1      54137 0      40022 0      40022 0      40022 0      40000 0
41,3450         74750 0      50000 1      34066 0      74337 0      54124 1      56776 1      54143 0      10000 0
41,3460         54776 0      04626 1   C: 61441 1      10137 0      03443 1      44351 0      54776 0      00115 1
41,3470         03512 1      34740 0      60776 1      00006 1      13476 0      06020 0      34746 0      57001 1

41,3500         54154 0      34352 1      54775 0      04607 1   C: 60570 0      44351 0      54776 0      30154 1
41,3510         04626 1   C: 10054 1      40002 1      55012 1      34352 1      54776 0      34746 0      55001 0
41,3520         04607 1   C: 60570 0      04420 0      34744 1      54777 1      00136 0      34732 0      54003 0
41,3530         34744 1      71771 0      10000 0      03555 1      34342 0      54154 0      44744 0      71771 0

41,3540         54160 1      04450 1      31771 1      00006 1      12400 0      34210 0      54157 0      00006 1
41,3550         31773 0      52156 1      30160 0      00004 0      00154 1      34345 1      03535 1      34343 1
41,3560         54154 0      34732 0      54003 0      31771 1      03540 0      64750 1      00004 0      54124 1
41,3570         44731 1      50124 0      57022 0      10000 0      25015 1      03576 0      10124 1      03567 0

41,3600         00003 1      50123 1      03607 0      03604 0      55000 1      55001 0      55014 1      44351 0
41,3610         54776 0      04424 1      03635 1      33637 0      54136 1      10123 0      03622 1      02400 1
41,3620         03565 1      02400 1      36115 1      70123 0      54157 0      30123 1      54023 1      30023 0
41,3630         54160 1      10157 0      03640 0      30160 0      02366 0      34746 0      55012 1      04173 0

41,3640         10160 1      03645 0      30157 1      02346 1      04173 0      30156 0      54161 0      30160 0
41,3650         02366 0      30157 1      02346 1      34746 0      55013 0      55014 1      55012 1      30161 1
41,3660         54156 1      02062 1      00004 0      04607 1   C: 66121 0      44744 0      71300 1      64744 1
41,3670         55300 1      33730 0      00006 1      05011 1      33731 1      55035 1      06040 0      34733 1

41,3700         00006 1      05013 0      34354 1      54117 1      43726 0      50117 0      55022 1      10117 1
41,3710         03703 0      43727 1      55023 0      55026 0      55030 1      34751 0      55015 0      00003 1
41,3720         33733 0      00004 0      05205 0   C: 03641 1   C: 60102 1      05146 1   C: 05675 0   C: 07675 1
41,3730      C: 00175 1   C: 40677 0   C: 00115 1   C: 00764 1      43732 0      00004 0      00006 1      03011 1

41,3740         06040 0      44733 0      00006 1      03013 0      34741 1      00006 1      02012 0      64726 0
41,3750         55035 1      43774 1      71300 1      65017 1      55300 1      43776 0      71277 0      65016 0
41,3760         55277 0      43775 0      70110 0      64736 1      54110 0      00003 1      04607 1   C: 10657 1
41,3770         04175 0      04424 1      04626 1   C: 61527 0   C: 16001 1   C: 00330 1   C: 55000 1 CKSM 10772 1
```

```
OCTAL LISTING FOR PARAGRAPH # 23 ,  WITH PARITY BIT IN BINARY AT THE RIGHT OF EACH WORD, "@" DENOTES UNUSED FIXED MEMORY

ALL VALID WORDS ARE BASIC INSTRUCTIONS EXCEPT THOSE MARKED "I" (INTERPRETIVE OPERATOR WORDS) OR "C" (CONSTANTS)

42,2000     C: 26723 0   C: 00450 0      35012 1      05137 1      32034 1      04607 1   C: 20323 1      05474 0
42,2010        05474 0      47033 1      60154 1      00006 1      12016 0      05474 0      00004 0      34746 0
42,2020        54156 1      54001 1      52025 1      52155 1      53051 0      20155 1      07300 0      52155 1
42,2030        20025 1      00003 1      05474 0   C: 00027 1   C: 06230 0      34743 0      54002 1      50000 1

42,2040        30321 1      00006 1      72053 1      50002 0      56050 1      10002 1      12036 1      37761 0
42,2050        00006 1      05014 1      15263 1   C: 03146 1      34727 1      55073 0      06060 1   I: 43014 0
42,2060     C: 00267 1   C: 00670 0   I: 77624 1   C: 27447 0   I: 77776 1      05355 1   C: 00002 0      00004 0
42,2070        04665 0   C: 40166 1      04665 0   C: 40115 0      06027 1      44727 0      00006 1      03012 1

42,2100        44740 1      70075 1      54075 1      46017 0      70074 0      54074 0      04626 1   C: 12772 0
42,2110        52152 0      51001 1      32161 0      54146 0      51001 1      32325 1      54147 1      41001 0
42,2120        64762 0      00006 1      62126 0      34744 1      54140 0      02144 1      34743 0      54140 0
42,2130        51001 1      23075 0      54153 1      35003 1      70146 0      54002 1      50000 1      32661 1

42,2140        54150 1      00006 1      50002 0      32663 0      52152 0      52006 0      52124 1      00006 1
42,2150        50000 1      32566 0      52124 1      52006 0      52124 1      00006 1      50000 1      32472 1
42,2160        12152 1   C: 00000 1   C: 40000 0   C: 40000 0   C: 40000 0   C: 01044 0   C: 01044 0   C: 01143 0
42,2170     C: 01002 1   C: 01363 0   C: 00375 0   C: 77776 1   C: 03633 1   C: 01050 0   C: 01774 1   C: 01050 0

42,2200     C: 77777 0   C: 01050 0   C: 00000 1   C: 02335 0   C: 00000 1   C: 00032 0   C: 00037 0   C: 00321 1
42,2210     C: 00000 1   C: 01050 0   C: 01044 0   C: 02371 0   C: 01362 1   C: 00000 1   C: 00000 1   C: 00000 1
42,2220     C: 00000 1   C: 02133 1   C: 03441 0   C: 01044 0   C: 03453 0   C: 00024 1   C: 03635 1   C: 01516 1
42,2230     C: 00000 1   C: 64000 0   C: 02003 0   C: 24006 1   C: 24011 1   C: 64014 0   C: 64017 0   C: 02022 0

42,2240     C: 22025 0   C: 22030 1   C: 24033 1   C: 00000 1   C: 22041 1   C: 00044 1   C: 00000 1   C: 24052 0
42,2250     C: 24055 1   C: 02060 0   C: 00000 1   C: 24066 1   C: 24071 1   C: 24074 1   C: 64077 0   C: 64102 0
42,2260     C: 24105 0   C: 64110 0   C: 24113 1   C: 62116 0   C: 04121 1   C: 64124 1   C: 24127 0   C: 04132 0
42,2270     C: 04135 1   C: 02140 0   C: 02143 0   C: 64146 0   C: 64151 0   C: 24154 1   C: 64157 0   C: 64162 0

42,2300     C: 24165 0   C: 02170 0   C: 24173 1   C: 24176 1   C: 24201 1   C: 24204 1   C: 24207 1   C: 24212 0
42,2310     C: 02215 0   C: 24220 1   C: 24223 1   C: 24226 1   C: 04231 0   C: 04234 0   C: 04237 0   C: 64242 1
42,2320     C: 00000 1   C: 00010 1   C: 04253 1   C: 04256 1   C: 24261 1   C: 00000 1   C: 04040 1   C: 04140 0
42,2330     C: 04102 0   C: 00504 0   C: 00504 0   C: 04000 0   C: 04000 0   C: 04000 0   C: 04000 0   C: 00000 1

42,2340     C: 24400 0   C: 02000 1   C: 24400 0   C: 04140 0   C: 00000 1   C: 24400 0   C: 00000 1   C: 04102 0
42,2350     C: 00000 1   C: 04102 0   C: 04140 0   C: 04102 0   C: 00000 1   C: 24400 0   C: 04140 0   C: 04000 0
42,2360     C: 04140 1   C: 00000 1   C: 00000 1   C: 00000 1   C: 00000 1   C: 24400 0   C: 24400 0   C: 24400 0
42,2370     C: 24400 0   C: 24400 0   C: 24400 0   C: 24400 0   C: 00000 1   C: 24500 1   C: 00542 1   C: 24410 1
```

```
OCTAL LISTING FOR PARAGRAPH # 231,  WITH PARITY BIT IN BINARY AT THE RIGHT OF EACH WORD, "@" DENOTES UNUSED FIXED MEMORY

ALL VALID WORDS ARE BASIC INSTRUCTIONS EXCEPT THOSE MARKED "I" (INTERPRETIVE OPERATOR WORDS) OR "C" (CONSTANTS)

42,2400     C: 20204 0    C: 00410 1    C: 10000 0    C: 00000 1    C: 00306 1    C: 01367 1    C: 00507 0    C: 00000 1
42,2410     C: 50204 1    C: 00004 0    C: 00000 1    C: 10507 1    C: 10200 1    C: 00204 1    C: 00000 1    C: 24510 0
42,2420     C: 24512 1    C: 60535 1    C: 54000 0    C: 24012 1    C: 60530 1    C: 60500 1    C: 00000 1    C: 00016 0
42,2430     C: 53223 1    C: 24026 0    C: 61430 1    C: 00000 1    C: 00000 1    C: 00102 1    C: 00102 1    C: 10200 1

42,2440     C: 00010 0    C: 20512 0    C: 24500 1    C: 00654 0    C: 00102 1    C: 00200 0    C: 24512 1    C: 24512 1
42,2450     C: 24512 1    C: 24512 1    C: 24512 1    C: 24512 1    C: 00102 1    C: 00000 1    C: 16143 0    C: 10507 1
42,2460     C: 10450 1    C: 60500 1    C: 06143 1    C: 60512 1    C: 00000 1    C: 00000 1    C: 00000 1    C: 00000 1
42,2470     C: 71572 1    C: 00006 1    C: 03240 1    C: 00000 1    C: 00000 1    C: 00000 1    C: 00000 1    C: 10707 0

42,2500     C: 03435 0    C: 13070 1    C: 34345 1    C: 00005 1    C: 21616 0    C: 26113 0    C: 31713 0    C: 00070 0
42,2510     C: 20460 1    C: 01065 0    C: 05740 1    C: 11414 0    C: 31463 1    C: 07475 0    C: 16051 1    C: 00001 0
42,2520     C: 03434 1    C: 00047 1    C: 21135 0    C: 77766 0    C: 50711 0    C: 00005 1    C: 25006 0    C: 00002 0
42,2530     C: 23224 1    C: 00014 1    C: 06500 1    C: 00001 0    C: 03036 1    C: 04256 1    C: 07071 0    C: 77766 0

42,2540     C: 60557 0    C: 00005 1    C: 01114 1    C: 00007 0    C: 01247 1    C: 04324 0    C: 27600 1    C: 00036 1
42,2550     C: 20440 0    C: 00035 1    C: 30400 0    C: 23420 0    C: 00000 1    C: 01670 1    C: 20000 0    C: 07475 0
42,2560     C: 16051 1    C: 14400 0    C: 00000 1    C: 36365 1    C: 30244 0    C: 05174 0    C: 13261 0    C: 00000 1
42,2570     C: 00000 1    C: 00000 1    C: 00000 1    C: 00714 0    C: 31463 1    C: 13412 1    C: 07534 1    C: 05605 1

42,2600     C: 03656 1    C: 00001 0    C: 16170 0    C: 00441 0    C: 34306 0    C: 07176 0    C: 21603 1    C: 15340 1
42,2610     C: 15340 1    C: 01031 1    C: 21032 0    C: 34631 1    C: 23146 0    C: 00636 1    C: 14552 0    C: 74552 0
42,2620     C: 70307 1    C: 05520 0    C: 15312 0    C: 14226 1    C: 31757 0    C: 02476 0    C: 05531 0    C: 35152 1
42,2630     C: 21203 0    C: 00007 0    C: 13734 0    C: 74477 0    C: 50643 0    C: 06265 0    C: 16004 1    C: 04426 0

42,2640     C: 31433 1    C: 34772 1    C: 07016 1    C: 01030 0    C: 33675 0    C: 01046 1    C: 15700 1    C: 00321 1
42,2650     C: 26706 1    C: 04231 0    C: 27400 0    C: 01031 1    C: 21032 0    C: 12172 0    C: 34122 1    C: 00206 0
42,2660     C: 14206 0    C: 03453 0    C: 03663 1    C: 03507 0    C: 01044 0    C: 01045 1    C: 00000 1    C: 02307 1
42,2670     C: 02311 0    C: 03663 1    C: 01117 1    C: 01121 1    C: 01123 0    C: 02112 1    C: 02114 1    C: 02131 0

42,2700     C: 03462 1    C: 03453 0    C: 02243 0    C: 01340 1    C: 00374 1    C: 00000 1    C: 01326 1    C: 01327 0
42,2710     C: 00000 1    C: 03002 0    C: 03001 0    C: 00000 1    C: 00314 1    C: 00316 0    C: 01353 0    C: 00000 1
42,2720     C: 00000 1    C: 00000 1    C: 02171 1    C: 02173 0    C: 00000 1    C: 01753 1    C: 00000 1    C: 00000 1
42,2730     C: 00000 1    C: 00000 1    C: 00000 1    C: 02213 0    C: 02215 0    C: 02217 1    C: 03466 0    C: 02247 1

42,2740     C: 03620 0    C: 02171 1    C: 02173 0    C: 00000 1    C: 00000 1    C: 00000 1    C: 00000 1    C: 03605 1
42,2750     C: 03575 0    C: 02340 1    C: 02273 0    C: 02275 0    C: 02277 1    C: 03734 1    C: 03473 1    C: 03774 0
42,2760     C: 03475 1    C: 03453 0    C: 02613 1    C: 03471 0    C: 03453 0    C: 03507 0    C: 03664 0    C: 03473 1
42,2770     C: 03774 0    C: 03666 1    C: 03473 1    C: 03534 0    C: 00013 0    C: 00013 0    C: 00013 0    C: 02177 1
```

```
OCTAL LISTING FOR PARAGRAPH # 232,  WITH PARITY BIT IN BINARY AT THE RIGHT OF EACH WORD, "@" DENOTES UNUSED FIXED MEMORY

ALL VALID WORDS ARE BASIC INSTRUCTIONS EXCEPT THOSE MARKED "I" (INTERPRETIVE OPERATOR WORDS) OR "C" (CONSTANTS)

42,3000     C: 00000 1   C: 00000 1   C: 02171 1   C: 02173 0   C: 02175 0   C: 02613 1   C: 03475 1   C: 03471 0
42,3010     C: 02635 0   C: 02633 0   C: 02631 1   C: 01235 1   C: 01236 1   C: 01237 0   C: 01235 1   C: 01236 1
42,3020     C: 01237 0   C: 00035 1   C: 00036 1   C: 00000 1   C: 01106 1   C: 01107 0   C: 00000 1   C: 03453 0
42,3030     C: 02353 0   C: 02355 0   C: 03577 1   C: 02243 0   C: 02245 0   C: 02267 0   C: 02263 1   C: 03642 1

42,3040     C: 03453 0   C: 03503 1   C: 03471 0   C: 01330 0   C: 01331 1   C: 01271 1   C: 01240 0   C: 01241 1
42,3050     C: 00734 1   C: 03733 0   C: 03734 1   C: 00000 1   C: 03433 0   C: 03435 0   C: 03437 1   C: 03433 0
42,3060     C: 03435 0   C: 03437 1   C: 03622 1   C: 03624 1   C: 03626 0   C: 01250 1   C: 01252 0   C: 01254 0
42,3070     C: 03501 0   C: 03503 1   C: 03505 1   C: 03433 0   C: 03435 0   C: 03437 1   C: 01344 0   C: 01345 1

42,3100     C: 00000 1   C: 02706 1   C: 02710 0   C: 02712 1   C: 02706 1   C: 02710 0   C: 02712 1   C: 02171 1
42,3110     C: 02173 0   C: 02175 0   C: 03715 1   C: 03711 0   C: 03713 1   C: 03750 0   C: 03473 1   C: 03774 0
42,3120     C: 02737 0   C: 02741 1   C: 02743 0   C: 03501 0   C: 03473 1   C: 03534 0   C: 00000 1   C: 00000 1
42,3130     C: 00000 1   C: 00000 1   C: 00000 1   C: 00000 1   C: 01044 0   C: 01045 1   C: 01046 1   C: 01047 0

42,3140     C: 01050 0   C: 01051 1   C: 02171 1   C: 02173 0   C: 02175 0   C: 16351 1   C: 00142 0   C: 16347 0
42,3150     C: 16512 0   C: 22347 1   C: 24443 1   C: 00000 1   C: 00553 1   C: 00143 1   C: 06344 1   C: 00000 1
42,3160     C: 00512 1   C: 00012 1   C: 00000 1   C: 24344 1   C: 24503 1   C: 00512 1   C: 00000 1   C: 16347 0
42,3170     C: 16347 0   C: 10347 0   C: 24451 1   C: 16447 1   C: 10344 0   C: 10354 1   C: 20410 0   C: 00304 0

42,3200     C: 10204 0   C: 16452 0   C: 10204 0   C: 00000 1   C: 00000 1   C: 00115 1   C: 00115 1   C: 24511 1
42,3210     C: 22447 0   C: 16347 0   C: 16351 1   C: 22756 0   C: 06102 1   C: 00503 1   C: 16347 0   C: 16347 0
42,3220     C: 16347 0   C: 16347 0   C: 16347 0   C: 16347 0   C: 00102 1   C: 02041 0   C: 10347 0   C: 24344 1
42,3230     C: 24507 0   C: 10343 1   C: 16347 0   C: 10347 0   C: 00000 1   C: 00000 1   C: 06143 1   C: 06043 0

42,3240     C: 24247 0      04607 1   C: 60776 1      07300 0      03430 0      07124 1   C: 03302 0      34312 0
42,3250        54776 0      04607 1   C: 61255 1      03446 1      33304 0      56154 1      55006 1      33305 1
42,3260        56155 0      04406 1      34311 0      54776 0      04607 1   C: 61255 1      00006 1      33311 1
42,3270        52155 1      31006 0      04406 1      34310 1      54776 0      04607 1   C: 61255 1      00136 0

42,3300     C: 25660 0   C: 31742 1   C: 01727 1   C: 01217 1   C: 00011 1   C: 32445 0   C: 02104 0   C: 10422 1
42,3310     C: 05174 0   C: 13201 0   C: 00000 1   C: 00062 0      04607 1   C: 60776 1      07300 0      10154 0
42,3320        03322 1      03353 1      63410 1      10000 0      03337 0      03353 1      03353 1      10155 1
42,3330        03332 0      03353 1      63411 0      10000 0      03337 0      03353 1      03353 1      10154 0

42,3340        33413 1      03350 1      43413 0      54154 0      43414 1      54155 1      33412 0      03431 1
42,3350        54154 0      33414 0      03345 0      03415 1      33406 0      07330 0      46266 1      26776 0
42,3360        04607 1   C: 61315 1      34746 0      54124 1      44743 1      50117 0      64310 1      54143 0
42,3370        04607 1   C: 61351 1      03446 1      56155 0      00006 1      73407 0      52155 1      50117 0
```

```
OCTAL LISTING FOR PARAGRAPH # 233,  WITH PARITY BIT IN BINARY AT THE RIGHT OF EACH WORD, "@" DENOTES UNUSED FIXED MEMORY

ALL VALID WORDS ARE BASIC INSTRUCTIONS EXCEPT THOSE MARKED "I" (INTERPRETIVE OPERATOR WORDS) OR "C" (CONSTANTS)

42,3400         34310 1      54776 0      04607 1   C: 61315 1      04626 1   C: 62617 0   C: 23147 1   C: 23346 1
42,3410      C: 77753 0   C: 41126 1   C: 03354 0   C: 00025 0   C: 37016 1      10155 1      13425 0      13425 0
42,3420         13421 1      00006 1      43313 1      20155 1      13430 1      00006 1      33313 0      13423 0
42,3430         56002 0      54144 1      07124 1   C: 03300 1      00006 1      30155 0      53007 0      04375 1

42,3440         04375 1      34746 0      56156 0      56155 0      56154 1      00144 0      56002 0      54144 1
42,3450         31007 1      00006 1      74742 0      00006 1      74730 0      22155 0      31006 0      54154 0
42,3460         07124 1   C: 03306 1      00144 0      03604 0      07124 1   C: 03545 0      03554 0      34746 0
42,3470         54156 1      33547 1      54154 0      33550 1      56155 0      07330 0      03565 1      52156 1

42,3500         52124 1      31073 0      23006 0      52155 1      07124 1   C: 03545 0      03554 0      43552 1
42,3510         03572 1      56155 0      00006 1      73551 1      20124 1      00006 1      13520 1      06020 0
42,3520         31004 1      23007 1      52155 1      07124 1   C: 03545 0      03554 0      43553 0      03572 1
42,3530         52124 1      20155 1      00006 1      13535 0      06020 0      34746 0      54156 1      07300 0

42,3540         52155 1      50145 1      52001 1      04626 1   C: 63045 0   C: 00006 1   C: 03240 1   C: 00025 0
42,3550      C: 37100 1   C: 13560 0   C: 00073 0   C: 13557 1      56156 0      60000 1      54156 1      34746 0
42,3560         60155 0      54155 1      34746 0      60154 1      56154 1      10154 0      06020 0      00002 0
42,3570         06020 0      00002 0      54156 1      10155 1      64744 1      13577 0      64744 1      60156 0

42,3600         00006 1      63603 1      06020 0      00002 0      43611 0      70777 1      63611 1      10000 0
42,3610         03614 1   C: 77743 1      03614 1      00002 0      46010 1      55040 0      06020 0      06060 1
42,3620      I: 47001 0   C: 00001 0   C: 21603 1   C: 34041 0   C: 27136 0   I: 46135 1   C: 00050 1   C: 65645 0
42,3630      I: 77775 1   C: 00001 0   C: 16176 0   C: 00015 0   I: 77624 1   C: 33646 0   I: 74375 0   C: 02723 0

42,3640      C: 24001 0   I: 53372 1   C: 02176 0   I: 77650 1   C: 65647 1   I: 77775 1   C: 00001 0   I: 53401 1
42,3650      C: 00001 0   I: 45076 1   C: 47522 1   I: 76521 0   C: 01732 0   I: 71206 0   C: 06505 1   C: 02172 1
42,3660      C: 26174 1   I: 77624 1   C: 47563 1   C: 16176 0   C: 02200 1   I: 45206 1   C: 02176 0   I: 77605 1
42,3670      C: 21740 1   C: 16200 1   I: 41215 1   C: 02176 0   C: 21740 1   C: 26176 0   C: 02176 0   I: 63256 0

42,3700      C: 02176 0   I: 72431 1   C: 06501 0   I: 40045 1   C: 02176 0   C: 65706 0   I: 40056 0   C: 65754 1
42,3710      I: 47206 0   C: 06477 0   I: 57572 0   C: 02176 0   I: 63241 0   C: 06501 0   C: 02176 0   I: 75246 0
42,3720      I: 77736 0   C: 26172 1   C: 00007 0   I: 51041 0   C: 06477 0   C: 65732 1   I: 45345 1   C: 06503 1
42,3730      C: 02172 1   C: 02172 1   I: 47375 0   C: 00001 0   C: 00007 0   I: 77772 0   C: 16176 0   C: 02172 1

42,3740      I: 74356 1   C: 06477 0   I: 71525 0   C: 02172 1   I: 52361 1   C: 06503 1   I: 63241 0   C: 02176 0
42,3750      C: 02176 0   I: 75246 0   I: 77736 0   C: 02174 1   I: 77776 1      31043 1      74740 1      00006 1
42,3760         15474 1      35010 0      05137 1      33776 1      04607 1   C: 20345 1      05565 1      05565 1
42,3770         05146 1      34742 1      05466 0      34731 0      05137 1      03617 1   C: 01463 1 CKSM 53301 0
```

```
OCTAL LISTING FOR PARAGRAPH # 234,  WITH PARITY BIT IN BINARY AT THE RIGHT OF EACH WORD, "@" DENOTES UNUSED FIXED MEMORY

ALL VALID WORDS ARE BASIC INSTRUCTIONS EXCEPT THOSE MARKED "I" (INTERPRETIVE OPERATOR WORDS) OR "C" (CONSTANTS)

43,2000        50154 1      020[illegible]2 1      02126 0      02177 1      02344 0      02702 0      02310 1      02116 0
43,2010        02116 0      02403 1      03134 1      13011 0      02375 1      02116 0      02375 1      02375 1
43,2020        02375 1      02415 0      03020 0      02333 0      02336 0      02147 1      02174 1      02164 0
43,2030        02167 0      02430 1      02674 0      03224 0      03141 0      03216 1      02341 0      02037 1

43,2040        03727 0      03731 1      03733 0      03735 0      03040 0      03227 0      03000 1      03003 1
43,2050        02420 0      02630 0      03044 1      03047 1      02741 1      02751 0      02116 0      03232 1
43,2060        02116 0      02116 0      02116 0      02757 0      02766 1      03077 1      03057 0      03072 1
43,2070        02116 0      030[illegible]4 0      03211 0      02375 1      02116 0      02375 1      11043 0      02116 0

43,2100        30100 0      72125 1      10000 0      02116 0      34353 0      55043 0      30002 0      54155 1
43,2110        44743 1      04145 0      02113 0      10067 1      05113 1      00155 0      04355 0      04626 1
43,2120     C: 21062 0      31010 1      00006 1      16763 1      02116 0   C: 24100 0      02202 0      02131 0
43,2130        02140 0      02411 1      04607 1   C: 16701 0      04607 1   C: 17735 0      02137 0      02117 1

43,2140        02653 0      04607 1   C: 52334 1      04607 1   C: 17733 0      12146 1      02117 1      30103 0
43,2150        74740 1      00006 1      12161 1      40107 0      74726 1      00006 1      12116 1      04626 1
43,2160     C: 53577 1      02653 0      04607 1   C: 53566 1      05520 0   C: 00013 0      12171 0      05506 1
43,2170     C: 00013 0      05520 0   C: 00000 1      02117 1      05506 1   C: 00000 1      02117 1      02202 0

43,2200        02213 0      02235 1      46007 1      61001 1      00006 1      16763 1      62212 1      00006 1
43,2210        16760 1      02116 0   C: 77713 1      02411 1      02076 1      32233 1      04607 1   C: 20323 1
43,2220        05474 0      12222 0      32234 0      04607 1   C: 20632 1      04607 1   C: 16765 1      04607 1
43,2230     C: 17735 0      05474 0      05474 0   C: 06226 1   C: 12200 0      02653 0      02076 1      30110 1

43,2240        77731 1      00006 1      12246 1      04607 1   C: 01735 1      12237 1      06027 1      32266 1
43,2250        04607 1   C: 20323 1      05474 0      12247 0      04607 1   C: 46000 0      32234 0      04607 1
43,2260     C: 20632 1      34727 1      05076 0   C: 02267 0   C: 66107 1      15474 1   C: 06111 0      04607 1
43,2270     C: 52466 1      02272 1      30167 1      74775 1      10000 0      50000 1      54000 0      40000 0

43,2300        26167 0      04607 1   C: 17733 0      02305 0      05146 1      05571 1   C: 00503 1      05146 1
43,2310        10110 0      12117 0      12117 0      12314 1      30110 1      77731 1      00006 1      12324 1
43,2320        34770 0      04607 1   C: 01736 1      02314 0      06027 1      34770 0      04607 1   C: 01736 1
43,2330        05520 0   C: 00126 1      12117 0      05506 1   C: 00254 1      02117 1      05520 0   C: 00254 1

43,2340        02117 1      05506 1   C: 00023 0      12117 0      02411 1      02076 1      32373 1      04607 1
43,2350     C: 20323 1      05474 0      02353 0      32374 0      04607 1   C: 20632 1      04607 1   C: 17175 1
43,2360        04607 1   C: 17735 0      05474 0      32372 0      04607 1   C: 17310 0      04607 1   C: 17735 0
43,2370        05474 0      05474 0   C: 02737 0   C: 06335 1   C: 12400 0      04424 1      34172 1      00006 1
```

```
OCTAL LISTING FOR PARAGRAPH # 235,  WITH PARITY BIT IN BINARY AT THE RIGHT OF EACH WORD, "@" DENOTES UNUSED FIXED MEMORY

ALL VALID WORDS ARE BASIC INSTRUCTIONS EXCEPT THOSE MARKED "I" (INTERPRETIVE OPERATOR WORDS) OR "C" (CONSTANTS)

43,2400        01007 1      04626 1   C: 62021 0      02076 1      34731 0      05076 0   C: 02005 0   C: 64066 0
43,2410        05146 1      31301 1      00006 1      16763 1      02116 0      02076 1      04626 1   C: 64002 1
43,2420        02653 0      30077 1      74734 1      10000 0      02116 0      05506 1   C: 00117 0      12434 1
43,2430        02653 0      02076 1      05506 1   C: 00063 1      34732 0      54003 0      32651 1      55770 1

43,2440        34746 0      55767 1      55566 1      00004 0      42652 0      70110 0      54110 0      32652 1
43,2450        00006 1      02033 0      26110 0      00003 1      40077 0      74734 1      10000 0      12606 1
43,2460        34744 1      55051 0      34742 1      55050 1      32646 1      04607 1   C: 20345 1      12614 1
43,2470        12475 1      12464 1      34742 1      05466 0      05146 1      31051 1      55764 1      36263 0

43,2500        71764 1      10000 0      12610 0      55766 0      34743 0      00006 1      02033 0      00006 1
43,2510        12521 1      32650 0      55044 1      32647 0      04607 1   C: 20337 1      12614 1      12504 0
43,2520        12511 1      34727 1      00006 1      05012 1      34743 0      55765 0      05205 0   C: 02162 0
43,2530     C: 32104 0      00003 1      40077 0      74734 1      10000 0      12117 0      36263 0      71764 1

43,2540        10000 0      12556 1      32642 0      04607 1   C: 20323 1      12614 1      12550 1      12542 1
43,2550        32643 1      04607 1   C: 20323 1      12614 1      12572 1      12542 1      32644 0      04607 1
43,2560     C: 20323 1      12614 1      12564 0      12556 1      32645 1      04607 1   C: 20323 1      12614 1
43,2570        12572 1      12556 1      34746 0      55770 1      04607 1   C: 01735 1      32651 1      55770 1

43,2600        34746 0      55767 1      11766 0      44744 0      64743 0      12476 1      34757 0      55770 1
43,2610        34743 0      55766 0      36263 0      12525 0      34746 0      55770 1      34735 1      04607 1
43,2620     C: 01736 1      00004 0      44727 0      00006 1      03012 1      05520 0   C: 00063 1      05474 0
43,2630        34732 0      54003 0      34746 0      55770 1      34737 0      04607 1   C: 01736 1      05520 0

43,2640     C: 00117 0      12117 0   C: 04110 0   C: 04116 0   C: 04102 0   C: 04103 1   C: 01014 0   C: 14431 1
43,2650     C: 00201 1   C: 00145 1   C: 00444 0      30101 1      74732 1      10000 0      02116 0      40103 1
43,2660        74737 1      10000 0      12667 0      30107 1      74726 1      00006 1      12116 1      40075 1
43,2670        74740 1      10000 0      00002 0      02116 0      02076 1      34731 0      05076 0   C: 03617 1

43,2700     C: 64104 0      05146 1      02121 1      34754 0      00006 1      02012 0      10000 0      12116 1
43,2710        34346 1      00006 1      06031 0      74346 0      00006 1      12717 0      12116 1      02076 1
43,2720        32233 1      04607 1   C: 20323 1      05474 0      02725 0      32740 0      04607 1   C: 20632 1
43,2730        34737 0      00006 1      05012 1      34743 0      05205 0   C: 02035 0   C: 64100 1      15474 1

43,2740     C: 12600 1      02076 1      35012 1      05137 1      00006 1      32750 1      05167 1   C: 03244 0
43,2750     C: 44104 0      02076 1      34743 0      05205 0   C: 03741 0   C: 60107 1      05146 1      02121 1
43,2760        02076 1      34730 1      05076 0   C: 02024 0   C: 54104 0      05146 1      40103 1      74737 1
43,2770        00006 1      12116 1      02076 1      35012 1      05076 0   C: 02677 0   C: 10107 0      15146 0
```

```
OCTAL LISTING FOR PARAGRAPH # 236,  WITH PARITY BIT IN BINARY AT THE RIGHT OF EACH WORD, "@" DENOTES UNUSED FIXED MEMORY

ALL VALID WORDS ARE BASIC INSTRUCTIONS EXCEPT THOSE MARKED "I" (INTERPRETIVE OPERATOR WORDS) OR "C" (CONSTANTS)

43,3000        05506 1   C: 00303 1      12117 0      05520 0   C: 00303 1      00004 0      04665 0   C: 40154 0
43,3010        02117 1      02121 1      02076 1      34730 1      05076 0   C: 02103 1   C: 46106 1      05146 1
43,3020        36017 1      70074 0      00006 1      12117 0      05520 0   C: 00037 0      34740 0      70075 1
43,3030        00006 1      13034 1      04626 1   C: 64054 1      46017 0      70074 0      54074 0      12117 0

43,3040        33043 0      54335 0      02117 1   C: 03723 1      05520 0   C: 00026 0      03051 0      05506 1
43,3050     C: 00026 0      05520 0   C: 00030 1      12117 0      05506 1   C: 00030 1      02117 1      02121 1
43,3060        40077 0      74732 1      00006 1      12116 1      02076 1      37731 0      05076 0   C: 02002 1
43,3070     C: 76065 0      05146 1      00004 0      44744 0      70101 0      54101 0      02117 1      02121 1

43,3100        02076 1      35012 1      05137 1      34744 1      55376 0      34746 0      55362 0      33250 0
43,3110        55361 0      03525 0      23372 0      23373 1      33247 0      54156 1      33127 0      04607 1
43,3120     C: 20323 1      03124 0      03636 1      03114 0      33250 0      55371 1      05474 0   C: 01201 0
43,3130        31376 1      00006 1      13341 0      03525 0      02076 1      35012 1      05137 1      04626 1

43,3140     C: 40004 1      40104 0      74735 0      00006 1      12116 1      34730 1      05076 0   C: 03152 1
43,3150     C: 66103 0      05146 1      06060 1   I: 77624 1   C: 27447 0   I: 43014 0   C: 04063 0   C: 04304 1
43,3160     C: 67163 1   I: 77614 1   C: 04263 1   I: 77776 1      33207 1      05546 0   C: 01626 1   C: 01554 1
43,3170        00003 1      06060 1   I: 77624 1   C: 27016 0   I: 45154 0   C: 02030 0   C: 26114 1   I: 77776 1

43,3200        33210 1      50120 1      54052 1      04626 1   C: 27460 0   I: 77634 0   C: 21062 0   C: 00051 0
43,3210     C: 67205 1      05506 1   C: 00221 0      34746 0      04626 1   C: 10054 1      02076 1      35010 0
43,3220        05076 0   C: 02007 1   C: 62064 1      05146 1      05506 1   C: 00115 1      02117 1      05520 0
43,3230     C: 00115 1      02117 1      02076 1      04626 1   C: 62000 0   C: 00061 0   C: 01373 1   C: 01461 0

43,3240     C: 01773 0   C: 00060 1   C: 50017 1   C: 17777 0   C: 25252 0   C: 52400 1   C: 76777 1   C: 01371 0
43,3250     C: 03341 1      31360 0      00006 1      13262 0      00006 1      31376 1      51377 0      52001 1
43,3260        34746 0      55360 1      00004 0      30002 0      55357 0      55363 1      25365 0      05573 0
43,3270     C: 01102 0      11362 0      34746 0      55362 0      03341 1      01357 1      10000 0      13251 0

43,3300        13251 0      10000 0      13251 0      00002 0      00006 1      23371 0      03335 1      11362 0
43,3310        03315 0      03316 1      03315 0      25366 0      01371 0      65652 0      00006 1      63321 1
43,3320        03272 0      25366 0      64750 1      50000 1      03325 0      01371 0      01371 0      01371 0
43,3330        03342 1      03523 0      01371 0      01371 0      01371 0      00006 1      23361 1      04626 1

43,3340     C: 03216 1      03304 0      34744 1      55372 1      34746 0      54003 0      33237 1      55377 1
43,3350        35003 1      55373 0      03372 1      35000 1      55377 1      35003 1      55373 0      03372 1
43,3360        35000 1      55377 1      33240 1      55373 0      03372 1      55372 1      33235 0      55377 1
43,3370        33236 0      55373 0      00004 0      30003 1      55374 1      00006 1      51377 0      30001 0
```

```
OCTAL LISTING FOR PARAGRAPH # 237,  WITH PARITY BIT IN BINARY AT THE RIGHT OF EACH WORD, "@" DENOTES UNUSED FIXED MEMORY

ALL VALID WORDS ARE BASIC INSTRUCTIONS EXCEPT THOSE MARKED "I" (INTERPRETIVE OPERATOR WORDS) OR "C" (CONSTANTS)

43,3400         53376 0      31377 0      55360 1      54001 1      24001 0      50000 1      52001 1      51377 0
43,3410         40001 1      51377 0      60000 1      03276 1      31360 0      00006 1      13442 1      00006 1
43,3420         51377 0      40001 1      51377 0      52001 1      51377 0      40000 0      51377 0      60001 0
43,3430         03276 1      31360 0      00006 1      13442 1      00006 1      31376 1      51377 0      52001 1

43,3440         34746 0      55360 1      00003 1      03335 1      31374 0      54003 0      25377 0      41377 1
43,3450         61373 1      00006 1      13454 0      03372 1      11372 1      03365 1      25372 0      30003 1
43,3460         64734 0      54003 0      63246 1      00006 1      13360 0      10003 0      03353 1      35000 1
43,3470         54003 0      34762 0      55372 1      64741 1      50000 1      40000 0      11372 1      03472 0

43,3500         33244 0      54020 1      54022 0      54021 0      54023 1      60020 0      60022 1      60021 1
43,3510         60023 0      63245 1      03276 1      60020 0      60022 1      60021 1      60023 0      64744 1
43,3520         03276 1      25367 1      03304 0      34745 0      55376 0      34746 0      55374 1      34744 1
43,3530         55377 1      34746 0      55371 1      55373 0      34744 1      55375 0      31374 0      54001 1

43,3540         74341 1      61373 1      04642 0      03566 1      64732 0      03577 1      40000 0      55377 1
43,3550         00006 1      13554 1      34731 0      03555 1      35011 1      55373 0      34746 0      55371 1
43,3560         34744 1      55375 0      51373 1      30000 1      03566 1      03577 1      55372 1      61371 0
43,3570         55371 1      34746 0      61371 0      55371 1      41372 1      61373 1      00002 0      22000 1

43,3600         31373 1      75003 0      64341 0      00006 1      13673 1      11375 0      03611 1      03611 1
43,3610         03673 0      10001 1      03621 1      03621 1      03621 1      11375 0      03622 1      37770 0
43,3620         03622 1      34744 1      55375 0      11376 0      10067 1      05113 1      03630 1      03335 1
43,3630         25373 1      11377 1      03536 1      03536 1      03562 0      03562 0      41374 1      63726 1

43,3640         00006 1      13130 1      31374 0      64732 0      55374 1      03651 0      34726 0      27374 1
43,3650         03665 1      74341 1      00006 1      13663 0      63243 1      00006 1      13660 0      03665 1
43,3660         33241        27374 1      03665 1      63242 0      27374 1      11377 1      03530 1      34744 1
43,3670         03546 0      34736 1      03530 1      31374 0      74341 1      04322 0      54001 1      31374 0

43,3700         74350 1      00006 1      13710 0      54021 0      30001 0      74750 0      60021 1      54001 1
43,3710         31376 1      00006 1      13714 1      03112 0      11371 1      03717 0      03720 1      64744 1
43,3720         55371 1      40001 1      61371 0      67770 0      03276 1      03636 1   C: 66100 0      34746 0
43,3730         13736 1      34744 1      13736 1      34743 0      13736 1      36266 0      55165 0      02076 1

43,3740         04626 1   C: 11372 1   C: 03742 0   C: 03743 1 CKSM 56166 0        @            @            @
43,3750           @            @            @            @            @            @            @            @
43,3760           @            @            @            @            @            @            @            @
43,3770           @            @            @            @            @            @            @            @
```

```
OCCUPIED LOCATIONS  PAGE      OCCUPIED LOCATIONS  PAGE      OCCUPIED LOCATIONS  PAGE      OCCUPIED LOCATIONS  PAGE

    4000  TO     4045  163        5430  TO     5437 1297        6511  TO     6543 1017     00,2236  TO  00,2276 1052
    4046  TO     4065  164        5440  TO     5446 1301        6544  TO     6577 1018     00,2277  TO  00,2331 1053
    4066  TO     4101  165        5447  TO     5457 1303        6600  TO     6645 1019     00,2332  TO  00,2352 1054
    4102  TO     4123  393                     5460 1304                     6646 1020     00,2353  TO  00,2421 1055

    4124  TO     4144  454        5461  TO     5465 1306        6647  TO     6707 1021     00,2422  TO  00,2436 1056
    4145  TO     4174  467        5466  TO     5505 1351        6710  TO     6743 1022     00,2437  TO  00,2477 1057
    4175  TO     4177  469        5506  TO     5534 1372        6744  TO     6767 1023     00,2500  TO  00,2537 1058
    4200  TO     4236  470        5535  TO     5545 1373        6770  TO     7023 1024     00,2540  TO  00,2567 1059

    4237  TO     4273  471        5546  TO     5564 1376        7024  TO     7025 1025     00,2570  TO  00,2607 1060
    4274  TO     4326  475        5565  TO     5570 1377        7026  TO     7102 1026     00,2610  TO  00,2624 1061
    4327  TO     4370  476        5571  TO     5621 1378        7103  TO     7111 1027     00,2625  TO  00,2641 1062
    4371  TO     4427  477        5622  TO     5637 1379        7112  TO     7123 1028     00,2642  TO  00,2653 1063

    4430  TO     4452  479        5640  TO     5715 1380        7124  TO     7156 1029     00,2654  TO  00,2720 1064
    4453  TO     4502  480        5716  TO     5746 1381        7157  TO     7174 1030     00,2721  TO  00,2747 1065
    4503  TO     4513  537        5747  TO     5770 1402        7175  TO     7235 1031     00,2750  TO  00,3006 1066
    4514  TO     4527  538        5771  TO     5772   29        7236  TO     7257 1032     00,3007  TO  00,3022 1067

    4530  TO     4554  539                     6000   41        7260  TO     7275 1033     00,3023  TO  00,3072 1068
    4555  TO     4570  540        6001  TO     6016  235        7276  TO     7336 1034                  00,3073 1069
    4571  TO     4606  541                     6017  299        7337  TO     7351 1035     00,3074  TO  00,3132 1070
    4607  TO     4635  996        6020  TO     6026  461        7352  TO     7362 1036     00,3133  TO  00,3150 1071

    4636  TO     4664  997        6027  TO     6037  531        7363  TO     7421 1037     00,3151  TO  00,3173 1072
    4665  TO     4717  998        6040  TO     6042  578        7422  TO     7445 1038     00,3174  TO  00,3206 1073
    4720  TO     4722  999        6043  TO     6047  613        7446  TO     7500 1039     00,3207  TO  00,3231 1074
    4723  TO     4753 1093        6050  TO     6057  745        7501  TO     7546 1040     00,3232  TO  00,3277 1075

    4754  TO     5001 1094        6060  TO     6077 1000        7547  TO     7612 1041     00,3300  TO  00,3342 1076
    5002  TO     5022 1095        6100  TO     6123 1001        7613  TO     7644 1042     00,3343  TO  00,3405 1077
    5023  TO     5062 1100        6124  TO     6135 1002        7645  TO     7675 1043     00,3406  TO  00,3455 1078
    5063  TO     5120 1101        6136  TO     6164 1003        7676  TO     7730 1044     00,3456  TO  00,3516 1079

    5121  TO     5123 1102        6165  TO     6233 1004        7731  TO     7743 1095     00,3517  TO  00,3552 1080
    5124  TO     5166 1103        6234  TO     6235 1005        7744  TO     7770 1096     00,3553  TO  00,3607 1081
    5167  TO     5174 1114        6236  TO     6267 1006        7771  TO     7774 1299     00,3610  TO  00,3651 1082
    5175  TO     5236 1117        6270  TO     6303 1007        7775  TO     7776 1457     00,3652  TO  00,3713 1083

                 5237 1118        6304  TO     6314 1008     00,2000  TO  00,2016 1011     00,3714  TO  00,3734 1084
    5240  TO     5262 1119        6315  TO     6354 1009     00,2017  TO  00,2041 1045     00,3735  TO  00,3767 1374
    5263  TO     5300 1127        6355  TO     6374 1010     00,2042  TO  00,2100 1046     00,3770  TO  00,3774 1375
    5301  TO     5302 1128        6375  TO     6412 1012     00,2101  TO  00,2120 1047     00,3775  TO  00,3776   29

    5303  TO     5312 1129        6413  TO     6434 1013     00,2121  TO  00,2143 1048     01,2000  TO  01,2001   45
    5313  TO     5330 1291        6435  TO     6454 1014     00,2144  TO  00,2171 1049     01,2002  TO  01,2032  250
    5331  TO     5361 1295        6455  TO     6500 1015     00,2172  TO  00,2213 1050     01,2033  TO  01,2070  251
    5362  TO     5427 1296        6501  TO     6510 1016     00,2214  TO  00,2235 1051     01,2071  TO  01,2133  252
```

```
OCCUPIED LOCATIONS  PAGE        OCCUPIED LOCATIONS  PAGE        OCCUPIED LOCATIONS  PAGE        OCCUPIED LOCATIONS  PAGE

01,2134  TO 01,2174  253        04,2000  TO 04,2023   47        04,3762  TO 04,3772 1393                    05,3776   30
01,2175  TO 01,2213  254        04,2024  TO 04,2037   54        04,3773  TO 04,3774   30        06,2000  TO 06,2011  165
01,2214  TO 01,2237  306        04,2040  TO 04,2053  236                    05,2000   45        06,2012  TO 06,2023  166
01,2240  TO 01,2316  307        04,2054  TO 04,2107  238        05,2001  TO 05,2020   53        06,2024  TO 06,2074  167

01,2317  TO 01,2347  308        04,2110  TO 04,2161  239        05,2021  TO 05,2044   54        06,2075  TO 06,2115  168
01,2350  TO 01,2375 1085        04,2162  TO 04,2222  240                    05,2045  204        06,2116  TO 06,2127  169
01,2376  TO 01,2432 1086        04,2223  TO 04,2267  241        05,2046  TO 05,2116  205        06,2130  TO 06,2171  170
01,2433  TO 01,2452 1087        04,2270  TO 04,2337  242        05,2117  TO 05,2152  206        06,2172  TO 06,2207  171

01,2453  TO 01,2472 1088        04,2340  TO 04,2404  243        05,2153  TO 05,2213  208        06,2210  TO 06,2226  172
01,2473  TO 01,2521 1089        04,2405  TO 04,2437  244        05,2214  TO 05,2220  209                    06,2227  173
01,2522  TO 01,2536 1090        04,2440  TO 04,2471  245        05,2221  TO 05,2264  210        06,2230  TO 06,2274  174
01,2537  TO 01,2560 1091        04,2472  TO 04,2542  246        05,2265  TO 05,2276  211        06,2275  TO 06,2342  175

01,2561  TO 01,2604 1092        04,2543  TO 04,2556  247        05,2277  TO 05,2337  212        06,2343  TO 06,2373  176
01,2605  TO 01,2641 1104        04,2557  TO 04,2616  260        05,2340  TO 05,2352  213        06,2374  TO 06,2415  177
01,2642  TO 01,2707 1105        04,2617  TO 04,2635  382        05,2353  TO 05,2411  214        06,2416  TO 06,2433  178
01,2710  TO 01,2763 1106        04,2636  TO 04,2651  383        05,2412  TO 05,2413  215        06,2434  TO 06,2457  179

01,2764  TO 01,2775 1107        04,2652  TO 04,2656  384        05,2414  TO 05,2445  216        06,2460  TO 06,2513  180
01,2776  TO 01,3026 1108        04,2657  TO 04,2667  472        05,2446  TO 05,2453  217        06,2514  TO 06,2532  181
01,3027  TO 01,3075 1109        04,2670  TO 04,2676  479        05,2454  TO 05,2515  222        06,2533  TO 06,2555  182
01,3076  TO 01,3106 1110        04,2677  TO 04,2755  704        05,2516  TO 05,2572  223        06,2556  TO 06,2564  183

01,3107  TO 01,3154 1111        04,2756  TO 04,3013  705        05,2573  TO 05,2650  224        06,2565  TO 06,2613  184
01,3155  TO 01,3157 1112        04,3014  TO 04,3027  981        05,2651  TO 05,2670  225        06,2614  TO 06,2621  185
01,3160  TO 01,3207 1113        04,3030  TO 04,3064 1183        05,2671  TO 05,2735  226        06,2622  TO 06,2647  186
01,3210  TO 01,3233 1114        04,3065  TO 04,3077 1184        05,2736  TO 05,3012  227        06,2650  TO 06,2670  187

01,3234  TO 01,3262 1120        04,3100  TO 04,3130 1185        05,3013  TO 05,3060  228        06,2671  TO 06,2702  188
01,3263  TO 01,3312 1121        04,3131  TO 04,3165 1186        05,3061  TO 05,3106  229        06,2703  TO 06,2717  189
01,3313  TO 01,3356 1122        04,3166  TO 04,3212 1222        05,3107  TO 05,3152  230        06,2720  TO 06,2754  190
01,3357  TO 01,3373 1123        04,3213  TO 04,3250 1223        05,3153  TO 05,3217  231        06,2755  TO 06,3022  191

01,3374  TO 01,3376 1124        04,3251  TO 04,3255 1244        05,3220  TO 05,3275  232        06,3023  TO 06,3034  192
01,3377  TO 01,3411 1125                    04,3256 1329        05,3276  TO 05,3351  233        06,3035  TO 06,3054  193
01,3412  TO 01,3454 1126        04,3257  TO 04,3301 1335        05,3352  TO 05,3416  234        06,3055  TO 06,3062  194
01,3455  TO 01,3503 1129        04,3302  TO 04,3356 1336        05,3417  TO 05,3465  833        06,3063  TO 06,3100  195

01,3504  TO 01,3527 1130        04,3357  TO 04,3371 1337        05,3466  TO 05,3506  834        06,3101  TO 06,3117  196
01,3530  TO 01,3567 1300        04,3372  TO 04,3431 1386        05,3507  TO 05,3527  989        06,3120  TO 06,3137  197
01,3570  TO 01,3612 1301        04,3432  TO 04,3503 1387        05,3530  TO 05,3606  990        06,3140  TO 06,3166  198
01,3613  TO 01,3663 1302        04,3504  TO 04,3541 1388        05,3607  TO 05,3647  991        06,3167  TO 06,3200  199

01,3664  TO 01,3710 1303        04,3542  TO 04,3603 1389        05,3650  TO 05,3720  992        06,3201  TO 06,3212  200
01,3711  TO 01,3747 1304        04,3604  TO 04,3653 1390        05,3721  TO 05,3722  993        06,3213  TO 06,3257  202
01,3750  TO 01,3774 1305        04,3654  TO 04,3720 1391        05,3723  TO 05,3725  994        06,3260  TO 06,3317  203
01,3775  TO 01,3776   29        04,3721  TO 04,3761 1392        05,3726  TO 05,3775  995        06,3320  TO 06,3332  263
```

```
OCCUPIED LOCATIONS  PAGE        OCCUPIED LOCATIONS  PAGE        OCCUPIED LOCATIONS  PAGE        OCCUPIED LOCATIONS  PAGE

06,3333  TO 06,3376  338        07,3354  TO 07,3371 1317        10,3554  TO 10,3571 1371        12,2156  TO 12,2235 1174
            06,3377  339        07,3372  TO 07,3415 1318        10,3572  TO 10,3602 1379        12,2236  TO 12,2307 1175
06,3400  TO 06,3425  340        07,3416  TO 07,3450 1319        10,3603  TO 10,3633 1394        12,2310  TO 12,2367 1176
06,3426  TO 06,3465  341        07,3451  TO 07,3513 1320        10,3634  TO 10,3675 1395        12,2370  TO 12,2420 1177

06,3466  TO 06,3474  342        07,3514  TO 07,3570 1321        10,3676  TO 10,3714 1396        12,2421  TO 12,2502 1178
06,3475  TO 06,3523  343        07,3571  TO 07,3605 1322        10,3715  TO 10,3721 1397        12,2503  TO 12,2535 1179
06,3524  TO 06,3556  344        07,3606  TO 07,3632 1323        10,3722  TO 10,3736 1398        12,2536  TO 12,2611 1180
06,3557  TO 06,3624  345        07,3633  TO 07,3700 1324        10,3737  TO 10,3772 1399        12,2612  TO 12,2652 1181

06,3625  TO 06,3674  346        07,3701  TO 07,3730 1325        10,3773  TO 10,3774   30        12,2653  TO 12,2731 1182
06,3675  TO 06,3713  347        07,3731  TO 07,3734 1326        11,2000  TO 11,2036  689        12,2732  TO 12,2766 1184
06,3714  TO 06,3762  348        07,3735  TO 07,3762 1327        11,2037  TO 11,2116  690        12,2767  TO 12,3041 1187
06,3763  TO 06,3764  349        07,3763  TO 07,3766 1328        11,2117  TO 11,2163  691        12,3042  TO 12,3117 1188

06,3765  TO 06,3775 1145        07,3767  TO 07,3770   30        11,2164  TO 11,2235  692        12,3120  TO 12,3173 1189
            06,3776   30        10,2000  TO 10,2027  696        11,2236  TO 11,2301  693        12,3174  TO 12,3211 1190
07,2000  TO 07,2043  255        10,2030  TO 10,2065 1262        11,2302  TO 11,2340  822        12,3212  TO 12,3272 1191
07,2044  TO 07,2055  256        10,2066  TO 10,2142 1263        11,2341  TO 11,2400  823        12,3273  TO 12,3352 1192

07,2056  TO 07,2123  257        10,2143  TO 10,2212 1264        11,2401  TO 11,2402  824        12,3353  TO 12,3431 1193
07,2124  TO 07,2137  258        10,2213  TO 10,2231 1297        11,2403  TO 11,2456 1225        12,3432  TO 12,3503 1194
07,2140  TO 07,2211  265        10,2232  TO 10,2300 1298        11,2457  TO 11,2502 1226        12,3504  TO 12,3556 1195
07,2212  TO 07,2270  266        10,2301  TO 10,2314 1299        11,2503  TO 11,2522 1227        12,3557  TO 12,3637 1196

07,2271  TO 07,2344  267        10,2315  TO 10,2317 1351        11,2523  TO 11,2601 1228        12,3640  TO 12,3703 1197
07,2345  TO 07,2353  268        10,2320  TO 10,2364 1352        11,2602  TO 11,2663 1229        12,3704  TO 12,3751 1198
07,2354  TO 07,2423  269        10,2365  TO 10,2424 1353        11,2664  TO 11,2745 1230        12,3752  TO 12,3754 1199
07,2424  TO 07,2466  270        10,2425  TO 10,2455 1354        11,2746  TO 11,3023 1231        12,3755  TO 12,3774 1244

07,2467  TO 07,2515  271        10,2456  TO 10,2516 1355        11,3024  TO 11,3102 1232        12,3775  TO 12,3776   31
07,2516  TO 07,2562  272        10,2517  TO 10,2564 1356        11,3103  TO 11,3164 1233        13,2000  TO 13,2025   48
07,2563  TO 07,2571  273        10,2565  TO 10,2630 1357        11,3165  TO 11,3246 1234        13,2026  TO 13,2051  247
07,2572  TO 07,2606  274        10,2631  TO 10,2671 1358        11,3247  TO 11,3330 1235        13,2052  TO 13,2067  248

07,2607  TO 07,2647  959        10,2672  TO 10,2732 1359        11,3331  TO 11,3412 1236        13,2070  TO 13,2113  332
07,2650  TO 07,2700  960        10,2733  TO 10,3000 1360        11,3413  TO 11,3472 1237        13,2114  TO 13,2132  333
07,2701  TO 07,2737 1307        10,3001  TO 10,3050 1361        11,3473  TO 11,3551 1239        13,2133  TO 13,2160  334
07,2740  TO 07,2764 1308        10,3051  TO 10,3112 1362        11,3552  TO 11,3631 1240        13,2161  TO 13,2206  335

07,2765  TO 07,3024 1309        10,3113  TO 10,3167 1363        11,3632  TO 11,3707 1241        13,2207  TO 13,2232  711
07,3025  TO 07,3071 1310        10,3170  TO 10,3237 1364        11,3710  TO 11,3711 1242        13,2233  TO 13,2314  712
07,3072  TO 07,3130 1311        10,3240  TO 10,3304 1365        11,3712  TO 11,3770 1243        13,2315  TO 13,2373  713
07,3131  TO 07,3174 1312        10,3305  TO 10,3354 1366        11,3771  TO 11,3775 1244        13,2374  TO 13,2405  929

07,3175  TO 07,3220 1313        10,3355  TO 10,3420 1367                    11,3776   30        13,2406  TO 13,2434 1131
07,3221  TO 07,3257 1314        10,3421  TO 10,3464 1368        12,2000  TO 12,2022 1099        13,2435  TO 13,2456 1132
07,3260  TO 07,3307 1315        10,3465  TO 10,3532 1369        12,2023  TO 12,2073 1172        13,2457  TO 13,2514 1133
07,3310  TO 07,3353 1316        10,3533  TO 10,3553 1370        12,2074  TO 12,2155 1173        13,2515  TO 13,2544 1134
```

```
OCCUPIED LOCATIONS  PAGE          OCCUPIED LOCATIONS  PAGE          OCCUPIED LOCATIONS  PAGE          OCCUPIED LOCATIONS  PAGE

13,2545  TO 13,2604 1135          14,3073  TO 14,3152  939          15,3177  TO 15,3255  970          16,3527  TO 16,3531 1437
13,2605  TO 13,2614 1136          14,3153  TO 14,3173  940          15,3256  TO 15,3272  971          16,3532  TO 16,3603 1438
13,2615  TO 13,2640 1137          14,3174  TO 14,3233  941                      15,3273  972          16,3604  TO 16,3641 1439
13,2641  TO 13,2655 1206          14,3234  TO 14,3264  942          15,3274  TO 15,3345  973          16,3642  TO 16,3713 1468

13,2656  TO 13,2724 1207          14,3265  TO 14,3315  943          15,3346  TO 15,3425  974          16,3714  TO 16,3735 1469
13,2725  TO 13,2771 1208          14,3316  TO 14,3366  944          15,3426  TO 15,3443  975          16,3736  TO 16,3766 1474
13,2772  TO 13,3045 1209          14,3367  TO 14,3403  945          15,3444  TO 15,3467  976          16,3767  TO 16,3772 1475
13,3046  TO 13,3100 1210          14,3404  TO 14,3461  947          15,3470  TO 15,3522  977          16,3773  TO 16,3774   32

13,3101  TO 13,3141 1211          14,3462  TO 14,3540  948          15,3523  TO 15,3556  978          17,2000  TO 17,2042  577
13,3142  TO 13,3171 1212          14,3541  TO 14,3602  949          15,3557  TO 15,3615  979          17,2043  TO 17,2054  578
13,3172  TO 13,3247 1213          14,3603  TO 14,3635  952          15,3616  TO 15,3633  980          17,2055  TO 17,2116 1401
13,3250  TO 13,3314 1214          14,3636  TO 14,3706  953          15,3634  TO 15,3645  981          17,2117  TO 17,2123 1402

13,3315  TO 13,3374 1215          14,3707  TO 14,3714  954          15,3646  TO 15,3667  983          17,2124  TO 17,2152 1440
13,3375  TO 13,3456 1216          14,3715  TO 14,3753  972          15,3670  TO 15,3751  984          17,2153  TO 17,2226 1441
13,3457  TO 13,3521 1217          14,3754  TO 14,3764 1291          15,3752  TO 15,3756  985          17,2227  TO 17,2270 1442
13,3522  TO 13,3557 1218          14,3765  TO 14,3776 1398          15,3757  TO 15,3771 1329          17,2271  TO 17,2346 1443

13,3560  TO 13,3605 1219          15,2000  TO 15,2003   54          15,3772  TO 15,3776 1330          17,2347  TO 17,2414 1444
13,3606  TO 13,3620 1220          15,2004  TO 15,2057  261          16,2000  TO 16,2026 1407          17,2415  TO 17,2476 1445
13,3621  TO 13,3676 1221          15,2060  TO 15,2140  262          16,2027  TO 16,2036 1408          17,2477  TO 17,2560 1446
13,3677  TO 13,3717 1222          15,2141  TO 15,2161  263          16,2037  TO 16,2111 1409          17,2561  TO 17,2627 1447

13,3720  TO 13,3744 1238          15,2162  TO 15,2200  505          16,2112  TO 16,2165 1410          17,2630  TO 17,2654 1448
13,3745  TO 13,3747 1244          15,2201  TO 15,2206  924          16,2166  TO 16,2216 1411          17,2655  TO 17,2707 1449
13,3750  TO 13,3774 1245          15,2207  TO 15,2263  925          16,2217  TO 16,2252 1419          17,2710  TO 17,2755 1450
13,3775  TO 13,3776   31          15,2264  TO 15,2273  926          16,2253  TO 16,2317 1420          17,2756  TO 17,3013 1451

14,2000  TO 14,2007   47          15,2274  TO 15,2325  927          16,2320  TO 16,2363 1421          17,3014  TO 17,3064 1452
14,2010  TO 14,2065   49          15,2326  TO 15,2354  928          16,2364  TO 16,2440 1422          17,3065  TO 17,3136 1453
14,2066  TO 14,2147   50          15,2355  TO 15,2401  929          16,2441  TO 16,2520 1423          17,3137  TO 17,3157 1454
14,2150  TO 14,2231   51          15,2402  TO 15,2443  955          16,2521  TO 16,2601 1424          17,3160  TO 17,3225 1455

14,2232  TO 14,2313   52          15,2444  TO 15,2521  956          16,2602  TO 16,2652 1425          17,3226  TO 17,3276 1456
14,2314  TO 14,2346   53          15,2522  TO 15,2575  957          16,2653  TO 16,2723 1426          17,3277  TO 17,3303 1457
14,2347  TO 14,2412  259          15,2576  TO 15,2614  958          16,2724  TO 16,2763 1427          17,3304  TO 17,3344 1459
14,2413  TO 14,2454  264          15,2615  TO 15,2626  961          16,2764  TO 16,3034 1428          17,3345  TO 17,3416 1460

14,2455  TO 14,2514  930          15,2627  TO 15,2666  962          16,3035  TO 16,3066 1429          17,3417  TO 17,3464 1461
14,2515  TO 14,2573  932          15,2667  TO 15,2743  963          16,3067  TO 16,3127 1430          17,3465  TO 17,3532 1462
14,2574  TO 14,2617  933          15,2744  TO 15,3016  964          16,3130  TO 16,3206 1431          17,3533  TO 17,3575 1463
14,2620  TO 14,2632  934                      15,3017  965          16,3207  TO 16,3265 1432          17,3576  TO 17,3640 1464

14,2633  TO 14,2714  935          15,3020  TO 15,3056  966          16,3266  TO 16,3346 1433          17,3641  TO 17,3662 1465
14,2715  TO 14,2775  936          15,3057  TO 15,3063  967          16,3347  TO 16,3403 1434          17,3663  TO 17,3724 1466
14,2776  TO 14,3022  937          15,3064  TO 15,3117  968          16,3404  TO 16,3455 1435          17,3725  TO 17,3776 1467
14,3023  TO 14,3072  938          15,3120  TO 15,3176  969          16,3456  TO 16,3526 1436                      20,2000   44
```

```
OCCUPIED LOCATIONS  PAGE       OCCUPIED LOCATIONS  PAGE       OCCUPIED LOCATIONS  PAGE       OCCUPIED LOCATIONS  PAGE

20,2001  TO 20,2003   45       21,2170  TO 21,2224  895       22,2360  TO 22,2421  369       23,2447  TO 23,2452  702
20,2004  TO 20,2005  304       21,2225  TO 21,2266  896       22,2422  TO 22,2503  370       23,2453  TO 23,2473  853
20,2006  TO 20,2066  305       21,2267  TO 21,2334  897       22,2504  TO 22,2546  371       23,2474  TO 23,2513 1098
20,2067  TO 20,2114  306       21,2335  TO 21,2404  898       22,2547  TO 22,2625  372       23,2514  TO 23,2533 1147

20,2115  TO 20,2142 1404       21,2405  TO 21,2453  899       22,2626  TO 22,2653  373       23,2534  TO 23,2615 1148
20,2143  TO 20,2204 1405       21,2454  TO 21,2515  900       22,2654  TO 22,2723  374       23,2616  TO 23,2677 1149
20,2205  TO 20,2226 1406       21,2516  TO 21,2570  901       22,2724  TO 22,2743  375       23,2700  TO 23,2725 1150
20,2227  TO 20,2236 1412       21,2571  TO 21,2633  902       22,2744  TO 22,3002  376       23,2726  TO 23,2754 1151

20,2237  TO 20,2307 1413       21,2634  TO 21,2672  903       22,3003  TO 22,3053  377       23,2755  TO 23,3036 1152
20,2310  TO 20,2335 1414       21,2673  TO 21,2706  904       22,3054  TO 22,3124  378       23,3037  TO 23,3120 1153
20,2336  TO 20,2376 1416       21,2707  TO 21,2737  950       22,3125  TO 22,3202  379       23,3121  TO 23,3202 1154
20,2377  TO 20,2451 1417       21,2740  TO 21,2757  951       22,3203  TO 22,3212  380       23,3203  TO 23,3231 1155

20,2452  TO 20,2462 1418       21,2760  TO 21,2763 1220       22,3213  TO 22,3241  381       23,3232  TO 23,3266 1246
20,2463  TO 20,2476 1484       21,2764  TO 21,3006 1328       22,3242  TO 22,3243  695       23,3267  TO 23,3302 1247
20,2477  TO 20,2552 1485       21,3007  TO 21,3013 1381       22,3244  TO 22,3302  716       23,3303  TO 23,3335 1248
20,2553  TO 20,2627 1486       21,3014  TO 21,3026 1382       22,3303  TO 22,3357  717       23,3336  TO 23,3402 1250

20,2630  TO 20,2677 1487       21,3027  TO 21,3052 1470       22,3360  TO 22,3431  718       23,3403  TO 23,3423 1251
20,2700  TO 20,2754 1488       21,3053  TO 21,3124 1471       22,3432  TO 22,3466  719       23,3424  TO 23,3463 1252
20,2755  TO 20,2757 1489       21,3125  TO 21,3172 1472       22,3467  TO 22,3541  720       23,3464  TO 23,3515 1253
20,2760  TO 20,3000 1490       21,3173  TO 21,3245 1473       22,3542  TO 22,3552  721       23,3516  TO 23,3521 1254

20,3001  TO 20,3042 1491       21,3246  TO 21,3256 1474       22,3553  TO 22,3613  723       23,3522  TO 23,3535 1256
20,3043  TO 20,3114 1492       21,3257  TO 21,3264 1476       22,3614  TO 22,3650  724       23,3536  TO 23,3577 1257
20,3115  TO 20,3170 1493       21,3265  TO 21,3337 1477       22,3651  TO 22,3662  830       23,3600  TO 23,3637 1258
20,3171  TO 20,3205 1494       21,3340  TO 21,3370 1478       22,3663  TO 22,3670  867       23,3640  TO 23,3662 1259

20,3206  TO 20,3251 1495       21,3371  TO 21,3427 1479       22,3671  TO 22,3711  868       23,3663  TO 23,3707 1260
20,3252  TO 20,3322 1496       21,3430  TO 21,3476 1480       22,3712  TO 22,3737 1155       23,3710  TO 23,3757 1261
20,3323  TO 20,3400 1497       21,3477  TO 21,3550 1481       22,3740  TO 22,3773 1156                   23,3760 1262
20,3401  TO 20,3450 1498       21,3551  TO 21,3575 1482       22,3774  TO 22,3775   33       23,3761  TO 23,3762   33

20,3451  TO 20,3524 1499       21,3576  TO 21,3605 1484       23,2000  TO 23,2007  283       24,2000  TO 24,2004  507
20,3525  TO 20,3574 1500       21,3606  TO 21,3624 1506       23,2010  TO 23,2040  284       24,2005  TO 24,2035  508
20,3575  TO 20,3647 1501       21,3625  TO 21,3705 1507       23,2041  TO 23,2102  336       24,2036  TO 24,2051  510
20,3650  TO 20,3720 1502       21,3706  TO 21,3727 1508       23,2103  TO 23,2115  500       24,2052  TO 24,2133  511

20,3721  TO 20,3737 1503       21,3730  TO 21,3731   32       23,2116  TO 23,2134  533       24,2134  TO 24,2205  512
20,3740  TO 20,3750 1504       22,2000  TO 22,2003   46       23,2135  TO 23,2216  534       24,2206  TO 24,2255  513
20,3751  TO 20,3752   32       22,2004  TO 22,2053  363       23,2217  TO 23,2276  535       24,2256  TO 24,2327  514
21,2000  TO 21,2005   44       22,2054  TO 22,2126  364       23,2277  TO 23,2334  536       24,2330  TO 24,2373  515

21,2006  TO 21,2041  695       22,2127  TO 22,2201  365       23,2335  TO 23,2364  698       24,2374  TO 24,2453  516
21,2042  TO 21,2104  831       22,2202  TO 22,2262  366       23,2365  TO 23,2400  699       24,2454  TO 24,2461  517
21,2105  TO 21,2147  832       22,2263  TO 22,2311  367       23,2401  TO 23,2436  700       24,2462  TO 24,2504  518
21,2150  TO 21,2167  837       22,2312  TO 22,2357  368       23,2437  TO 23,2446  701       24,2505  TO 24,2526  519
```

```
OCCUPIED LOCATIONS  PAGE          OCCUPIED LOCATIONS  PAGE          OCCUPIED LOCATIONS  PAGE          OCCUPIED LOCATIONS  PAGE

24,2527  TO 24,2550  520          25,2334  TO 25,2363  553          26,2221  TO 26,2265  490          27,2253  TO 27,2332  761
24,2551  TO 24,2630  521          25,2364  TO 25,2365  554          26,2266  TO 26,2277  491          27,2333  TO 27,2412  762
24,2631  TO 24,2710  522          25,2366  TO 25,2422  555          26,2300  TO 26,2302  492          27,2413  TO 27,2446  764
24,2711  TO 24,2755  523          25,2423  TO 25,2432  556          26,2303  TO 26,2360  493          27,2447  TO 27,2530  766

24,2756  TO 24,2775  524          25,2433  TO 25,2451  557                      26,2361  494          27,2531  TO 27,2535  767
24,2777  TO 24,3057  525          25,2452  TO 25,2465  558          26,2362  TO 26,2416  498          27,2536  TO 27,2563  768
24,3060  TO 24,3137  526          25,2466  TO 25,2534  559          26,2417  TO 26,2423  499          27,2564  TO 27,2643  769
24,3140  TO 24,3217  527          25,2535  TO 25,2563  560          26,2424  TO 26,2474  595          27,2644  TO 27,2710  770

24,3220  TO 24,3251  528                      25,2564  561          26,2475  TO 26,2556  596          27,2711  TO 27,2763  772
24,3252  TO 24,3270  529          25,2565  TO 25,2625  562          26,2557  TO 26,2637  597          27,2764  TO 27,3045  773
24,3271  TO 24,3310  530          25,2626  TO 25,2674  564          26,2640  TO 26,2721  598          27,3046  TO 27,3127  774
24,3311  TO 24,3335  531          25,2675  TO 25,2704  565          26,2722  TO 26,3001  599          27,3130  TO 27,3211  775

            24,3336  532          25,2705  TO 25,2752  566          26,3002  TO 26,3063  600          27,3212  TO 27,3220  776
24,3337  TO 24,3415  583          25,2753  TO 25,3025  567          26,3064  TO 26,3144  601          27,3221  TO 27,3256  777
24,3416  TO 24,3432  592          25,3026  TO 25,3061  568          26,3145  TO 26,3205  602          27,3257  TO 27,3270  778
24,3433  TO 24,3440  593          25,3062  TO 25,3123  569          26,3206  TO 26,3247  603          27,3271  TO 27,3274  780

24,3441  TO 24,3506  658          25,3124  TO 25,3156  570          26,3250  TO 26,3312  604          27,3275  TO 27,3314  852
24,3507  TO 24,3570  659          25,3157  TO 25,3213  571          26,3313  TO 26,3357  605          27,3315  TO 27,3323  856
24,3571  TO 24,3633  660          25,3214  TO 25,3264  572          26,3360  TO 26,3433  606          27,3324  TO 27,3360  869
24,3634  TO 24,3643  767          25,3265  TO 25,3333  573          26,3434  TO 26,3440  607          27,3361  TO 27,3362  870

24,3644  TO 24,3673 1140          25,3334  TO 25,3401  574          26,3441  TO 26,3444  608          27,3363  TO 27,3412 1268
24,3674  TO 24,3726 1141          25,3402  TO 25,3450  575          26,3445  TO 26,3522  609          27,3413  TO 27,3431 1269
24,3727  TO 24,3742 1142          25,3451  TO 25,3510  576          26,3523  TO 26,3602  610          27,3432  TO 27,3467 1271
24,3743  TO 24,3767 1143          25,3511  TO 25,3552  579          26,3603  TO 26,3621  611          27,3470  TO 27,3536 1274

24,3770  TO 24,3774 1223          25,3553  TO 25,3606  580          26,3622  TO 26,3667  612          27,3537  TO 27,3577 1275
24,3775  TO 24,3776 1224          25,3607  TO 25,3625  581          26,3670  TO 26,3715  613          27,3600  TO 27,3647 1276
25,2000  TO 25,2002   42          25,3626  TO 25,3637  585          26,3716  TO 26,3740 1138          27,3650  TO 27,3714 1277
25,2003  TO 25,2016  505          25,3640  TO 25,3641  586          26,3741  TO 26,3742 1139          27,3715  TO 27,3737 1278

25,2017  TO 25,2052  506          25,3642  TO 25,3650  604          26,3743  TO 26,3774 1144          27,3740  TO 27,3756 1279
25,2053  TO 25,2061  542          25,3651  TO 25,3711  618          26,3775  TO 26,3776   34          27,3757  TO 27,3774 1280
25,2062  TO 25,2101  543          25,3712  TO 25,3752 1142          27,2000  TO 27,2011   39          27,3775  TO 27,3776   34
25,2102  TO 25,2117  544          25,3753  TO 25,3770 1143          27,2012  TO 27,2021   40          30,2000  TO 30,2001   40

25,2120  TO 25,2123  545          25,3771  TO 25,3772   33          27,2022  TO 27,2027   46          30,2002  TO 30,2053  616
25,2124  TO 25,2161  546          26,2000  TO 26,2001   54          27,2030  TO 27,2031   48          30,2054  TO 30,2060  617
25,2162  TO 25,2170  547          26,2002  TO 26,2023   55          27,2032  TO 27,2105  496          30,2061  TO 30,2126  839
25,2171  TO 25,2231  548          26,2024  TO 26,2073  351          27,2106  TO 27,2157  497          30,2127  TO 30,2203  840

25,2232  TO 25,2242  549          26,2074  TO 26,2122  352          27,2160  TO 27,2177  498          30,2204  TO 30,2262  841
25,2243  TO 25,2276  550          26,2123  TO 26,2124  353                      27,2200  745          30,2263  TO 30,2306  842
25,2277  TO 25,2313  551          26,2125  TO 26,2147  488          27,2201  TO 27,2245  746          30,2307  TO 30,2357  846
25,2314  TO 25,2333  552          26,2150  TO 26,2220  489          27,2246  TO 27,2252  760          30,2360  TO 30,2441  847
```

```
OCCUPIED LOCATIONS  PAGE        OCCUPIED LOCATIONS  PAGE        OCCUPIED LOCATIONS  PAGE        OCCUPIED LOCATIONS  PAGE

30,2442  TO 30,2523  848        31,2562  TO 31,2615  800        32,2763  TO 32,3033  784        33,3064  TO 33,3131  886
30,2524  TO 30,2605  849        31,2616  TO 31,2661  801        32,3034  TO 32,3072  785        33,3132  TO 33,3171  887
30,2606  TO 30,2667  850        31,2662  TO 31,2736  802                    32,3073  786        33,3172  TO 33,3246  888
30,2670  TO 30,2751  851        31,2737  TO 31,2765  803        32,3074  TO 32,3134  815        33,3247  TO 33,3323  889

30,2752  TO 30,2776  852        31,2766  TO 31,3036  804        32,3135  TO 32,3200  816        33,3324  TO 33,3372  890
30,2777  TO 30,3014  858        31,3037  TO 31,3065  805        32,3201  TO 32,3244  817        33,3373  TO 33,3437  891
30,3015  TO 30,3062  859        31,3066  TO 31,3145  806        32,3245  TO 32,3320  818        33,3440  TO 33,3504  892
30,3063  TO 30,3113  907        31,3146  TO 31,3216  807        32,3321  TO 32,3372  819        33,3505  TO 33,3554  893

30,3114  TO 30,3142  908        31,3217  TO 31,3265  808        32,3373  TO 32,3434  820        33,3555  TO 33,3574  894
30,3143  TO 30,3173  909        31,3266  TO 31,3327  809        32,3435  TO 32,3442  821        33,3575  TO 33,3576   35
30,3174  TO 30,3241  910        31,3330  TO 31,3377  910        32,3443  TO 32,3463  834        34,2000  TO 34,2005  622
30,3242  TO 30,3306  911        31,3400  TO 31,3436  811        32,3464  TO 32,3544  835        34,2006  TO 34,2056  623

30,3307  TO 30,3317  912        31,3437  TO 31,3505  812        32,3545  TO 32,3612  836        34,2057  TO 34,2115  638
30,3320  TO 30,3361  913        31,3506  TO 31,3516  813        32,3613  TO 32,3626  837        34,2116  TO 34,2177  639
30,3362  TO 30,3423  914        31,3517  TO 31,3544  814        32,3627  TO 32,3655  838        34,2200  TO 34,2261  640
30,3424  TO 30,3466  915        31,3545  TO 31,3607  825        32,3656  TO 32,3660  870        34,2262  TO 34,2343  641

30,3467  TO 30,3516  916        31,3610  TO 31,3660  826        32,3661  TO 32,3715  871        34,2344  TO 34,2425  642
30,3517  TO 30,3563  917        31,3661  TO 31,3724  827        32,3716  TO 32,3717   35        34,2426  TO 34,2507  643
30,3564  TO 30,3605  918        31,3725  TO 31,3750  828        33,2000  TO 33,2001   40        34,2510  TO 34,2571  644
30,3606  TO 30,3655  919        31,3751  TO 31,3763  829        33,2002  TO 33,2031   42        34,2572  TO 34,2653  645

30,3656  TO 30,3712  920        31,3764  TO 31,3772  830        33,2032  TO 33,2076   43        34,2654  TO 34,2735  646
30,3713  TO 30,3744  921        31,3773  TO 31,3774   35        33,2077  TO 33,2106   46        34,2736  TO 34,3015  647
30,3745  TO 30,3760  922                    32,2000   41        33,2107  TO 33,2112   47        34,3016  TO 34,3051  648
30,3761  TO 30,3762   35        32,2001  TO 32,2004   42        33,2113  TO 33,2120  858        34,3052  TO 34,3061  649

31,2000  TO 31,2001   40        32,2005  TO 32,2010  218        33,2121  TO 33,2167  864        34,3062  TO 34,3077  650
31,2002  TO 31,2006   41        32,2011  TO 32,2063  219        33,2170  TO 33,2235  865        34,3100  TO 34,3117  651
31,2007  TO 31,2056  614        32,2064  TO 32,2140  220        33,2236  TO 33,2304  866        34,3120  TO 34,3132  652
31,2057  TO 31,2140  615        32,2141  TO 32,2212  221        33,2305  TO 33,2343  867        34,3133  TO 34,3204  653

31,2141  TO 31,2143  616        32,2213  TO 32,2236  508        33,2344  TO 33,2352  871        34,3205  TO 34,3266  654
31,2144  TO 31,2176  789        32,2237  TO 32,2320  509        33,2353  TO 33,2366  872        34,3267  TO 34,3270  655
31,2177  TO 31,2244  790        32,2321  TO 32,2361  510        33,2367  TO 33,2407  876        34,3271  TO 34,3334  787
31,2245  TO 31,2273  791        32,2362  TO 32,2424  588        33,2410  TO 33,2457  877        34,3335  TO 34,3345  788

31,2274  TO 31,2343  792        32,2425  TO 32,2504  589        33,2460  TO 33,2504  878        34,3346  TO 34,3374  842
31,2344  TO 31,2365  793        32,2505  TO 32,2564  590        33,2505  TO 33,2557  879        34,3375  TO 34,3446  844
31,2366  TO 31,2402  794        32,2565  TO 32,2567  591        33,2560  TO 33,2632  880        34,3447  TO 34,3450  845
31,2403  TO 31,2416  795        32,2570  TO 32,2574  752        33,2633  TO 33,2641  881        34,3451  TO 34,3500  853

31,2417  TO 31,2435  796        32,2575  TO 32,2601  753        33,2642  TO 33,2717  882        34,3501  TO 34,3550  854
31,2436  TO 31,2475  797        32,2602  TO 32,2636  781        33,2720  TO 33,2743  893        34,3551  TO 34,3624  855
31,2476  TO 31,2527  798        32,2637  TO 32,2711  782        33,2744  TO 33,3016  884        34,3625  TO 34,3664  856
31,2530  TO 31,2561  799        32,2712  TO 32,2762  783        33,3017  TO 33,3063  885        34,3665  TO 34,3666   36
```

```
OCCUPIED LOCATIONS  PAGE        OCCUPIED LOCATIONS  PAGE        OCCUPIED LOCATIONS  PAGE        OCCUPIED LOCATIONS  PAGE

35,2000  TO 35,2021  620        36,2046  TO 36,2112  727        37,2460  TO 37,2477  393        40,3037  TO 40,3107  446
35,2022  TO 35,2033  621        36,2113  TO 36,2151  728        37,2500  TO 37,2535  395        40,3110  TO 40,3161  447
35,2034  TO 35,2073  627        36,2152  TO 36,2227  729        37,2536  TO 37,2576  396        40,3162  TO 40,3226  448
35,2074  TO 35,2155  628        36,2230  TO 36,2274  730        37,2577  TO 37,2656  397        40,3227  TO 40,3277  456

35,2156  TO 35,2222  629        36,2275  TO 36,2341  731        37,2657  TO 37,2736  398        40,3300  TO 40,3334  457
35,2223  TO 35,2301  633        36,2342  TO 36,2401  732        37,2737  TO 37,3004  399        40,3335  TO 40,3350  458
35,2302  TO 35,2353  634        36,2402  TO 36,2451  733        37,3005  TO 37,3057  400        40,3351  TO 40,3413  459
35,2354  TO 35,2374  635        36,2452  TO 36,2521  734        37,3060  TO 37,3112  401        40,3414  TO 40,3456  460

35,2375  TO 35,2414  636        36,2522  TO 36,2565  735        37,3113  TO 37,3124  706        40,3457  TO 40,3470  461
35,2415  TO 35,2436  637        36,2566  TO 36,2567  736        37,3125  TO 37,3203  707        40,3471  TO 40,3504  463
35,2437  TO 35,2454  656        36,2570  TO 36,2634  737        37,3204  TO 37,3265  708        40,3505  TO 40,3516  464
35,2455  TO 35,2507  664        36,2635  TO 36,2674  738        37,3266  TO 37,3343  709        40,3517  TO 40,3542  465

35,2510  TO 35,2567  665        36,2675  TO 36,2743  739        37,3344  TO 37,3400  710        40,3543  TO 40,3546  471
35,2570  TO 35,2642  666        36,2744  TO 36,3006  740        37,3401  TO 37,3427  860        40,3547  TO 40,3571  472
35,2643  TO 35,2701  669        36,3007  TO 36,3053  741        37,3430  TO 37,3472  861        40,3572  TO 40,3637  473
35,2702  TO 35,2761  670        36,3054  TO 36,3117  742        37,3473  TO 37,3535  862                    40,3640  474

35,2762  TO 35,3043  671        36,3120  TO 36,3131  743        37,3536  TO 37,3537  863        40,3641  TO 40,3645  483
35,3044  TO 35,3125  672        36,3132  TO 36,3145  744                    37,3540  873        40,3646  TO 40,3710  485
35,3126  TO 35,3207  673        36,3146  TO 36,3167  748        37,3541  TO 37,3612  874        40,3711  TO 40,3736  486
35,3210  TO 35,3211  674        36,3170  TO 36,3234  749        37,3613  TO 37,3653  875        40,3737  TO 40,3740  504

35,3212  TO 35,3223  675        36,3235  TO 36,3305  750        37,3654  TO 37,3712 1332        40,3741  TO 40,3766  706
35,3224  TO 35,3301  676        36,3306  TO 36,3351  751        37,3713  TO 37,3746 1333        40,3767  TO 40,3770   37
35,3302  TO 35,3314  677        36,3352  TO 36,3410  752        37,3747  TO 37,3772 1334        41,2000  TO 41,2017  311
35,3315  TO 35,3357  678        36,3411  TO 36,3445  753        37,3773  TO 37,3774   37        41,2020  TO 41,2056  419

35,3360  TO 35,3364  679        36,3446  TO 36,3513  754        40,2000  TO 40,2015  311        41,2057  TO 41,2134  420
35,3365  TO 35,3437  680        36,3514  TO 36,3561  755        40,2016  TO 40,2056  312        41,2135  TO 41,2207  421
35,3440  TO 35,3505  681        36,3562  TO 36,3635  756        40,2057  TO 40,2130  410        41,2210  TO 41,2245  422
35,3506  TO 35,3515  682        36,3636  TO 36,3707  757        40,2131  TO 40,2176  411        41,2246  TO 41,2311  423

35,3516  TO 35,3562  683        36,3710  TO 36,3754  758        40,2177  TO 40,2260  412        41,2312  TO 41,2367  424
35,3563  TO 35,3603  684        36,3755  TO 36,3756  759        40,2261  TO 40,2331  413        41,2370  TO 41,2401  425
35,3604  TO 35,3613  685        36,3757  TO 36,3760   37        40,2332  TO 40,2404  414        41,2402  TO 41,2457  427
35,3614  TO 35,3632  686        37,2000  TO 37,2001   46        40,2405  TO 40,2455  415        41,2460  TO 41,2524  428

35,3633  TO 35,3656  687        37,2002  TO 37,2036  385        40,2456  TO 40,2523  416        41,2525  TO 41,2577  429
35,3657  TO 35,3707  736        37,2037  TO 37,2117  386        40,2524  TO 40,2577  417        41,2600  TO 41,2646  430
35,3710  TO 35,3741  743        37,2120  TO 37,2171  387        40,2600  TO 40,2603  418        41,2647  TO 41,2710  439
            35,3742  744        37,2172  TO 37,2251  388        40,2604  TO 40,2636  431        41,2711  TO 41,2757  440

35,3743  TO 35,3744   36        37,2252  TO 37,2274  389        40,2637  TO 40,2713  432        41,2760  TO 41,3036  441
36,2000  TO 36,2021   39        37,2275  TO 37,2346  390        40,2714  TO 40,2757  433        41,3037  TO 41,3106  442
36,2022  TO 36,2023   41        37,2347  TO 37,2400  391        40,2760  TO 40,3017  434        41,3107  TO 41,3161  443
36,2024  TO 36,2045  726        37,2401  TO 37,2457  392        40,3020  TO 40,3036  438        41,3162  TO 41,3231  444
```

```
OCCUPIED LOCATIONS  PAGE          OCCUPIED LOCATIONS  PAGE          OCCUPIED LOCATIONS  PAGE          OCCUPIED LOCATIONS  PAGE

41,3232  TO 41,3301  445          42,3463  TO 42,3541  449          43,3235  TO 43,3273 1283
41,3302  TO 41,3327  452          42,3542  TO 42,3613  450          43,3274  TO 43,3341 1284
41,3330  TO 41,3401  453          42,3614  TO 42,3616  451          43,3342  TO 43,3415 1285
41,3402  TO 41,3424  454                      42,3617  501          43,3416  TO 43,3475 1286

41,3425  TO 41,3434  455          42,3620  TO 42,3701  502          43,3476  TO 43,3540 1287
41,3435  TO 41,3466  458          42,3702  TO 42,3763  503          43,3541  TO 43,3617 1288
            41,3467  459          42,3764  TO 42,3776  504          43,3620  TO 43,3676 1289
41,3470  TO 41,3501  461          43,2000  TO 43,2045  275          43,3677  TO 43,3726 1290

41,3502  TO 41,3545  462          43,2046  TO 43,2115  276          43,3727  TO 43,3741 1385
41,3546  TO 41,3564  463          43,2116  TO 43,2125  277          43,3742  TO 43,3743   37
41,3565  TO 41,3644  468          43,2126  TO 43,2161  278
41,3645  TO 41,3661  469          43,2162  TO 43,2176  279

41,3662  TO 41,3727  482          43,2177  TO 43,2204  280
41,3730  TO 41,3762  483          43,2205  TO 43,2234  281
41,3763  TO 41,3776  484          43,2235  TO 43,2277  282
42,2000  TO 42,2001   48          43,2300  TO 43,2332  283

42,2002  TO 42,2034  287          43,2333  TO 43,2343  284
42,2035  TO 42,2053  294          43,2344  TO 43,2374  285
42,2054  TO 42,2060  299          43,2375  TO 43,2414  286
42,2061  TO 42,2107  300          43,2415  TO 43,2417  287

42,2110  TO 42,2146  316          43,2420  TO 43,2462  288
42,2147  TO 42,2214  317          43,2463  TO 43,2533  289
42,2215  TO 42,2247  318          43,2534  TO 43,2606  290
42,2250  TO 42,2274  319          43,2607  TO 43,2652  291

42,2275  TO 42,2324  320          43,2653  TO 43,2701  292
42,2325  TO 42,2400  321          43,2702  TO 43,2737  293
42,2401  TO 42,2436  322                      43,2740  294
42,2437  TO 42,2474  323          43,2741  TO 43,2756  295

42,2475  TO 42,2556  324          43,2757  TO 43,3002  296
42,2557  TO 42,2636  325          43,3003  TO 43,3010  297
42,2637  TO 42,2713  326          43,3011  TO 43,3017  298
42,2714  TO 42,2775  327          43,3020  TO 43,3037  299

42,2776  TO 42,3057  328          43,3040  TO 43,3043  300
42,3060  TO 42,3141  329          43,3044  TO 43,3056  301
42,3142  TO 42,3216  330          43,3057  TO 43,3116  302
42,3217  TO 42,3240  331          43,3117  TO 43,3133  303

42,3241  TO 42,3313  435          43,3134  TO 43,3140  304
42,3314  TO 42,3374  436          43,3141  TO 43,3200  309
42,3375  TO 42,3450  437          43,3201  TO 43,3231  310
42,3451  TO 42,3462  438          43,3232  TO 43,3234  311
```

```
THE SUBROUTINES IN THIS PROGRAM ARE AS FOLLOWS:

                LUMERASE.176
                LEMONAID.156
                LEMP20S .168
                LEMP30S .105
                KISSING .067
                FLY     .157
                LEMP50S .130
                SKIPPER .131
                LMDAP   .032


THE ASSEMBLY WAS GOOD AND MANUFACTURABLE. NO LINES WERE CUSSED.

BINARY RECORDS FOR "LUMINARY.R210" SUCCESSFULLY STORED.
```

23PC